



## Occupational Health Related Hazard among Workers at Al-Najaf Governmental Cement Factories

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### Abstract

A descriptive / cross-sectional study was conducted to assess the occupational health related hazards among workers in Al-Najaf cement factories and its association with socio-demographic characteristics of workers in the province of Najaf, during the period from 1<sup>st</sup> November 2015 to 19<sup>th</sup> September 2016. Two hundreds male workers were selected by non-probability sampling (purposive sample) and data were collected by using a pre-constructed questionnaire consist of two parts concerned with socio-demographic characteristics and exposure of workers to hazards. The study found that the overall hazard score was intermediate. The higher hazard was the psychosocial hazards and the least hazard reported for the safety measures and protective equipment. No statistically significant association had been found between the overall hazard score and demographic characteristics of the participants, ( $P > 0.05$ ). A statistically significant association had been found between the overall hazard score and each of job title and work place, ( $P < 0.05$ ). Education program and legislation for the use of safety measures and further studies were highly suggested.

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### Keywords

Occupational Health  
Related Hazard,  
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### Introduction

While the industrial revolution began in Europe and moved labor frequently to cities where the industry many incidents leading to the injury of those immigrants who do not have knowledge of the industry and its dangers appear, and the plants infested with various kinds of risks (Harrison & Hutchins, 2013).

According to World Health Organization (WHO) definition Occupational health is a very important science aims to protect all aspects of workers health in workplace from hazards that may cause injuries to the workers and threaten their lives (WPRO, 2015).

Occupational health was developed from mono-disciplinary to multi-disciplinary and comprehensive approach that deals with person's Physical, mental and social health, the work environment may impose positive or negative influences on person's health and the productivity is influenced by physical and psychological of workers well-being (Lie *et al.*, 2013). Recent years emerged a large developments as in the field of occupational safety and health and continued to study the great changes taking place in the industrial, economic and technological developments, he must risk occupational safety and provide better services to the worker study to prevent hazard To effect negatively on the lives of workers in the industry occurs (Alli, 2012).

In order to protect workers and reduce injuries and improve health performance, which ensures development on the health and economic level of the country's workers and private investment programs. Several agreements and consultations have been conducted with the organization represent workers slide under the supervision of occupational safety organization with the aim of reinforcing the health factor because it represents the core segment of the country and the development and strength of the industrial nations (Alli, 2008). To enhance the safety of workers who are considered an important part constitutes the working conditions and improve the quality of work and stand on the important strategic ways to serve the worker and serve the community on a level economic and aimed at strengthening the health of workers leads to serve the country and serve the public good and thus guarantee the main criterion, a health worker means the health and the quality of the country's economy Less the job security, part of time and current work for Reality of the medal workplace. New chemical, substance of The development of the processes, tools, and marketed for Ever, increase the cost exposure to this hazard (Stanhope & Lancaster, 2012).

Adversely risks affecting the lives of workers working in the field of industries in case of failure to take measures crisis to prevent them and is on several types (physical - chemical - biological - and emotional or psychological) and prevent, control and taking measures crisis provided by the Occupational Safety Organization of the World Health Organization and follow the means of control and then risk assessment. To evaluate the risks that affect workers in all fields of industry workers must determine the proportion of those risks and processed by sticking to the duties of occupational safety and guidance and tools that serve to protect the interests of the world (Rogers *et al.*, 2013).

One of the main reasons for increased occupational hazards level is the costs of care and the lack of commitment by the private sectors in addressing environmental policy and therefore workers exposed to occupational hazards and failure to provide for that slide care (private industry) and the failure to provide health insurance for the class labor by the government and with the piece increases injury rate among workers of this side and the other hand must coordinate with the industrial government to work to reduce the risks and increase the proportion of occupational safety and health (Erhabor *et al.*, 2013; Meo, Al-Drees *et al.*, 2013). To ensure the well-being of more workers because it represents

important segment on the level of industry and social he is human part of life must provide psychosocial support through the equivalent or through training courses on how hazard assessment and increased health awareness to prevent injuries and to improve worker health and increasing trends, skills and knowledge of those risks and thus serve the interests productivity and health, a goal of global safety for the workers organization (Cherrie *et al.*, 2011)

### **History and evaluation of occupational health nursing**

Nursing care for workers began in 1888 and was called industrial nursing. A group of coal miners hired Betty Molder, a graduate of the Bleckley Hospital School of Nursing in Philadelphia) now Philadelphia General Hospital), to take care of their ailing co-workers and families (Ivanov and Blue, 2008; Maurer and Smith, 2013).

Employee health services grew rapidly during the early 1900s as companies recognized that the provision of worksite health services led to a more productive workforce. Occupational health plays a central role in people's lives, since most workers spend at least eight hours a day in the workplace. Every day workers all over the world are faced with multiple health hazards, such as: (dusts; gases; noise; vibration and extreme temperatures) (Harrison and Hutchins, 2013).

Occupational hazards can have harmful effects on workers, their families, and other people in the community, as well as on the physical environment around the workplace (National Seafood HACCP Alliance, 2001). Overall, efforts in occupational health and safety must aim to prevent industrial accidents and diseases, and at the same time recognize the connection between worker health and safety, the workplace, and the environment outside the workplace (Rogers, 2012).

### **Occupational hazards**

Include chemical, Physical and Psychosocial.

#### **Chemical hazard**

Almost more than three hundreds billion pounds of chemical materials are manufactured each year in the USA alone, these industries of almost two million chemicals, nonetheless, only less than 0.1% of these chemicals were sufficiently studied regarding their effects on human being (Levy *et al.*, 2006). As a

consequence of the public environmental contact with different chemical agent at workplace, home or other places, therefore, (Levy *et al.*, 2006). Many chemical agents in different work places may be at lower levels of hazardous exposure, however, they stay carrying cumulative and effect on workers' health. On the other hand, some of these chemicals may be combined and interaction occurred resulting in further health effects (Maurer & Smith, 2013). Assessment of the work related chemical hazards include the risks related to these factors in addition to the protection and safety measures and the adverse outcome due to exposure to these factors (Martins *et al.*, 2011). The risk should be assessed in comparison with standard guidelines. However, the safety measures and hazardous characteristics of each chemical agent in addition to the safe handling methods could obtain from the labels inserted on the packages and containers of these substances and also from the recent safe handling standards (Goniewicz *et al.*, 2012). Data sheets including the information on safety measures should be supplied with each product, kept updated and easily accessible to all employers, the worker should be curtailed that the risks are kept to minimum level and safety measures are at higher levels (Al-juboori, 2008). Check of alternative substances and exchange the process may be conducted for determination of magnitude in the health care services, therapeutic care & sanitation measures (Meo, 2008). Despite the knowledge on the means of prevention, illnesses due to exposure to the dusts of minerals are still incident worldwide. Disease prevention can be achieved by the application of engineering techniques that limit workers exposure to mineral dust. Such technologies can supplement by administrative strategies and by the use of personal protective equipment (Damby *et al.*, 2013; Sauter, 2013). The toxicity of chemicals may be intermittent which is most frequently faced at work place or continuous on constant levels in special circumstances. Hence, the levels of concentration have no role in determination of level of exposure and the expected hazard. Conversely, the hazardous effect of heavy metals depends have a cumulative properties and depend on the concentration (Diepgen & Kanerva, 2009). Longer hours of work in services make the worker suffering functional disorders and might exposed to cumulative effect of some drugs (Reijnders, 2007; Wesseling *et al.*, 2013).

### Physical hazards

These are hazards that occur at workplace leading to different effects of different energy forms. These factors include the lightening of workplace, temperatures, noises

and radiation at work place (Thornbory, 2013). Physical hazards are observable and evident; however, they are different from other hazards such as chemical and biological, where the recognition of physical hazards not needs laboratory investigations. The physical hazards could be *natural or artificial*.

There are different types of injuries and physical hazards and there are many causes for these hazards or injuries; as in accidents, falls, impacts, sliding, etc. that may cause limb fractures and could occur in different circumstances due to unsafe behavior or non-use of safety and protective measures. It is widely known, that the prevention and managing physical hazardous factors include the elimination, if it is possible, conversion or reduction in exposure of human to these factors using protective measures. Also management of these hazards may involve the reduction of the adverse outcomes due to exposure to these factors (WHO, 2016).

Physical hazards are associated with the work process and conditions, they may cause health hazards due to the effect of certain tasks such as repetitive motion, worker poor fitness with the work station, sliding floor, disordered work-place or lifting heavy loaded objects) (BLS, 2006).

There are some key considerations should be taken into account in assessment and evaluation of hazards these include:

1. The existence of natural or artificial hazardous factor and its nature.
2. The outcome severity due to exposure to this hazard.
3. The application of regenerative and remedial initiations.
4. Kind, times and density of exposure to hazard (Purser & McAllister, 2016).

**Noise:** Noise could be continuous: which include the current noise level at the workplace. The daily levels of exposure to noise; Lower contact action: value of 80 decibel, high exposure activities with a value of 85 decibel or more and noise level of 87 dB, this is the maximum level. Workers should use hearing protective measures and prepare a noise abatement program and when reached or exceeded the maximum levels it should be reduced to minimal accepted level. Noise may lead to

harmful effect via interference with communications or poor performance (Eisler, 2012).

**Temperature and humidity** The work-place temperatures and humidity must be kept regulated as it is possible. The recommended temperatures and the maximum allowed levels are set according to the type and nature of work and WHO recommended the ideal temperatures for each individual work circumstances (WHO, 2016). Microclimate, is a term referred to the combined factors with an adverse effect on human body, these factors include temperatures, humidity and air speed which together affecting the temperatures of the workplace, Microclimate has an effect on the thermal-exchange between the body and the workplace environment (Qassim, 2008).

Vibration is another hazardous factor affected the worker environment and it is defined as the intermittent motion of particles or the mechanical system. . It is stated that vibration exceeding the allowed levels lead to development of what is called vibration syndrome which occurred after exposure to total vibration (Graber *et al.*, 2014). The control of worker exposure to these agent frequently depends on the worker 's compliance with preventive actions, such as practicing safety habits at work and using protection tools (Ivanov & Blue, 2008; WHO, 2010).

### **Psychosocial hazard**

Psychosocial hazards are factors that affected the psychological and or social well-being of persons. The response to the workplace environment happened when the employee act optionally regarding the relationship harmony (Pretorius *et al.*, 2009). The risk and hazard due to psychosocial factors related directly to the exposure and experiencing of stresses related to the work. From other point of view, previous studies reported with no doubt the association between work-related stress and chronic diseases like, cardiovascular, musculo-skeletal and mental disorders. All these factors lead to further impact on the public expenditures and elevate the healthcare related costs (Bongers *et al.*, 2006).

For the importance of the psychosocial factors and hazards, the social determinants of health commission suggested involvement of work related stresses and harm behaviors in the occupational health and safety policy (Bongers *et al.*, 2006; WHO, 2010). Work-related stress and psychosocial hazard exposure is rising in the community, and there are many stressors that increase

the risk of development of an illness, these stressors including emotional, work time and working hours, aggression and violence at work place, jobless status, work rules, conflicting conditions, and inadequate rewards (Tullamarine, 2012). The assessment and evaluation of the psychosocial hazards and its relation to occupational health must be outlined and discussed carefully (Victoria, 2012).

### **Personal Protective Equipment (PPE) (safety measure)**

Workers should use the PPE whenever the hazardous processes, environmental hazards, chemicals, radiations, or mechanical hazards are present and possibly causing injuries or health problems to any part of the body, via the different way of effect such as inhalation, direct contact or absorption (Lemen *et al.*, 2010).

The PPE includes:

Eye and Face Protection standard (Lemen *et al.*, 2010), Respiratory Protection standard, every worker should supplied with respirator to protect their respiratory system when deal with corrosive vapours or chemical gases that may lead to suffocation or irritation on inhalation (Kincade & McLaughlin, 2012). Protection of the head using a firm, rigid and resistant shell could protect and deflects these hazards. Shock absorption is also another protection way when the hat or helmet supplied with suspension system which play a significant role in as a shock-absorber, there are some types of hats that act as insulators to protect versus the electric-shock. Another type of hats provided with face shield (United States Department of Labor, 2016). Protection of the hands approximately 20% of all accidents (disabling) in the workplace included the hand and therefore, the ability to work is greatly affected (United States Department of Labor, 2016). Employer must be ascertain that workers using their safety and protection measures for the hands and use appropriate measures, particularly when the hands exposed to hazardous materials which are possibly absorbed through the skin, or in cases of presence of cuts, scratches, wounds, abrasions or punctures in the skin. Additionally the employer should be sure that the workers will not exposed to chemical burns, or excessive harmful temperatures (Kincade & McLaughlin, 2012). Hazards on feet: Feet of the workers exposed to different types of hazards including: Injuries: due to spilling or splashing, Injuries due to compression, electricity and exposure to extreme cold, heat or moist hence protective measures of feet are important to all workers (OHS, 2013).

## **Methodology**

### **Study design and Setting**

A cross-sectional study was conducted with analytic utility during the period from 1<sup>st</sup> November 2015 to 19<sup>th</sup> September 2016. The present study was carried out at three settings; AL-Najaf cement industry (AL-Najaf cement factory; AL-kufa cement factory and Crushers cement department). Only cement factories were included in the study because all hazards required for study are present in the cement factories.

### **Ethical Issues**

Three official permission had been obtained of the ministry of planning & development cooperation center organization for statistical & information technology faculty of nursing and administrations of Najaf; kufa; crusher department cement factories. Also the occupations of worker who involved in study was taken.

### **Sample of study**

By using non-probability sampling technique a (purposive sample) of 200 workers were selected from a total of 1000 workers based on criteria of morning shifts and workers who worked at risk areas. The sample was selected from 10 divisions in the 3 cement factories (5 divisions in Al-Kufa, 3 division in Al-Najaf and 2 divisions in crushers factory), so that, 20 workers were selected from each division as next (100 from AL-Kufa cement factory; 60 from al-Najaf cement factory and 40 from crushers department cement factory). Workers who work at risk areas and those in the morning sifts were included, while office workers were excluded. Data were collected using a pre-constructed questionnaire of two main parts, the first for socio-demographic characteristic and the second part with four sections; injuries at work, medical history, work environment and personal protective measures.

### **Occupational hazards during the work**

**Physical hazard domain:** composed of (8) items which deal with the assessment of occupational factors (hazard) during the work such as (Falls during work; Sprain of ankle; Spondylolisthesis; Wounds during work; Fractures; Burns; Electric shock and Occupational deafness). The total score for this domain ranged 0 and 8. Natural & Environment Factors domain: consists of (4) items and the total score for this domain ranged 0 to 4. Chemical hazard domain: composed of (5) items which

deals with the assessment of chemical factors at work environment like (Proliferation of chemical vapors (fumes) is at normal level; The spread of organic material with dirt, dust; The use of pesticides to exterminate rodents and insects; Presence of oil and grease in the flooring work and Good disposal for industrial waste). Social and psychological hazard domain: composed of (8) items which deals with the assessment of Social and psychological factors at work environment like (A fair division of the workers in every section; Good relationship with other workers; There additional work for workers; There an addiction to drugs; Putting the right worker in the right place; Good relationship with heads of work and The salary is convincing for workers). Personal Protective Measures domain: is composed of (9) items which deal with the using personal protective equipment at workplace.

### **Scoring and assessment of hazard rating**

The scoring system used to assess the hazard for each item of the domains scored (1) if the worker exposed to the hazard and (0) if no. The higher score indicated higher hazard. The hazard calculated by the division of the sum of score on the total scoring for each domain. The hazard rate categorized into four categories; zero =no hazard, less than 33.3% low hazard, 33.4 % - 66.7 % intermediate hazard and more than 66.7 % - 100% as high hazard.

**Pilot of study:** This study was conducted on 34 workers from the factories, cement workers, the period is from February 10 to February 22, the pilot study was conducted to assess the time required for the interviewing each worker, and the clarity of the questionnaire

**Reliability of Questionnaire:** The reliability of the questionnaire in the present study the internal consistency has adopted has been estimated by Cronbach's alpha coefficients

**Statistical Analysis:** Through the statistical package for Social Sciences (SPSS) software for windows, version 24. Appropriate statistical tests were used accordingly.

### **Results and Discussion**

The higher hazard score percent was reported in the social and psychological factors, (64.3%), followed by chemical factors, (47.5%), and natural and physical factors (45.1%) and the three domains evaluated as

intermediate hazard. Other domains were evaluated as low hazard rate and the least hazard score reported for the safety measures, (22.4%) and the overall hazard score percent was 44.8% indicated an overall intermediate hazard (Tables 1).

Table 2 summarizes the distribution of the study participants according to their hazard scores for different domains, however, 98 participants (49%) had low overall hazard score and 102 (51%) had intermediate while none of the participants had high overall hazard score (Figure 1). The only significant association was found between low hazard score and the some job title, ( $P = 0.034$ ), where gangers, Observant technician and Assistant-Engineer had lower hazard score compared to other workers. Another significant association was found with the work place, where workers of the mills had the higher hazard score, compared to other workers in other places, ( $P=0.007$ ), (Tables 3 &4). The workforce represented almost half of the world's population, (Shafik & El-Mohsen, 2012). In Iraq and despite the elevated unemployment rate compared to other countries, the employment rate ranged 46.8% to 49.2% with more than nine millions employed persons (Iraq Central Statistical Organization, 2016). In the current study 34% of the studied group had falls during the work, 33% reported sprain of ankle, spondylolisthesis 39.5 %, wound during the work 48%, fractures 15%, burns 19.5 %, electric shock 14% and occupational deafness 14%. these findings consistent with that reported in previous studies and literatures, however, these injuries are not specific in cement industries but also shared with other industries such as chemical, water refinery (Alli, 2008; Bartram, Wooler, Pond, & Mood, 2000; CSI, 2004; Muhshin *et al.*, 2006). using safety measures and application of safety guidelines are potential factor in elimination or reduction of these injuries, work environment modification is an important factor in prevention of injuries at workplace(CSI, 2004; Iqbal *et al.*, 2010). The identification of occupational injuries among workers is essential for the overconfidence of unskilled and skilled workers. However, our finding was not unexpected with regard to the type and nature of the cement industry but incidence rate of these injuries still high. In the Bangladeshi study in 2010, Iqba *et al.*, (Iqbal *et al.*, 2010). reported that Arm and leg injuries were the more frequent followed by hand, head and eye injuries due to falls causing wounds and fractures, furthermore, Iqbal *et al* proved that majority of these injuries incident as a result of welding, belt conveyer and bucket elevator, on the other hand weight lifting represented the second more frequent agent of injuries and lead to back pain,

Spondylolisthesis and strains while person fall represented only 7.8% which is lower than our records (Iqbal *et al.*, 2010), the differences in the ranking of the frequency of incidence of these injuries according to the type might attributed to the geographical variation between both countries, and the differences between factories in addition to the variation in the application of safety measures in both countries. It is worth mentioning, that these injuries affected the production process and economic status through the loss of working hours and cost of compensation if present. From other point of view, Chung *et al.*, studied the burn injuries among cement workers and found that cement burns were rarely occur, nonetheless, among cement industry workers (Chung *et al.*, 2000). Regarding the medical history of the studied group, the present study found that almost half of the participant were suffering from a health problem due to the work, similar proportion reported that they were suffered from respiratory problems such as asthma, or continuous cough over the past year, on the other hand 45% of the study participants reported they were receiving treatment or medication or physical therapy, then 26.5% for the history of skin problem, 25% absent from the work due to ill health, 16% Leave work or deprived of the opportunity for health reasons and the least proportion, 7%, for the deprived of driving license for health reasons, Chung *et al* found that 71% of the participants had skin problem(Chung *et al.*, 2007). A previous study was conducted by Sana *et al.*, found higher proportion, 93%, of cement workers suffered from wheeze and 91% suffered from skin allergies, (Sana *et al.*, 2013), Mishra and Siddiqui mentioned that emission associated with cement production associated with asthma attacks, cardiovascular disease and even premature death (Mishra & Siddiqui, 2014).

### Natural and physical factors

The current study found and intermediate hazard score rate regarding and physical hazard in factories at work environment with a mean hazard score percent of 45.7%, however, only 42.5% of the workers mention that the temperature was good; 72.5 % mentions that the lighting was sufficient in the factories. Good ventilation in the factories was reported by 31% of the studied group weal moderate humidity was reported by 34.5 %. These findings, unfortunately, did not meet the standard and recommended criteria for the workplace, where the allowed temperature in the workplaces should at 16 degrees Celsius, the higher degree of temperature had a direct impact on the worker health; heat stroke, heat exhaustion, may occur on higher temperature at the

workplace room on the other side, low temperature also has a negative impact on worker health (Alli, 2008; Birmingham, 2006; Jerie, 2012). Regarding the humidity at saturation point is 100%, low level of humidity can deteriorate the respiratory system and skin condition, however, the allowed and recommended level should be between 40-70%, the major problem with low humidity because the dry air which might lead to electrostatic shock, this can be improved by supplying the plants with humidifier (Birmingham, 2006). Fresh air is needed and necessary for respiration, lightening should be adequate to enable working without eye strain (Birmingham, 2006)

### Chemical Factors

The distribution of chemical factory at work environment among the studied group revealed that mean hazard score percent for this domain was 47.5% which indicated intermediate hazard. However, the current study found that 41% of the studied group claimed that proliferation of chemical vapors (fumes) is at normal level, 69% of participants mentioned that there was a spread of organic material with dirt and dust, 32% mentioned that there was a use of pesticides to exterminate rodents and insects and 58% reported the presence of oil and grease in the floor

of work place, each of these categories had a great risk, poisoning gases and fire smoke vapors could be toxic work (Al-thowaini, 2007; Assessment, 2011; CSI, 2004).

The present study found that mean hazard rate for social and psychological factors domain was 64.3% indicated higher hazard rate for this domain compared to physical and chemical hazard despite the overall evaluation for this domain was intermediate, more than half of the study participants had high hazard score was in regard to social and psychological factors, these findings agreed that reported in previous studies where majority of cement workers reported a psycho social problems in regard to the relationship with the head of the work or the salary amount and unfair distribution of the worker on the work places; Muhsin and colleagues reported among the workers that social dislocation and social security play an important role in the behavioral and psychological factors among workers (Muhshin *et al.*, 2006). Also other studies concerned with these factors among workers of other types of industries such as Wood and oil industries and found similar findings (Assessment, 2011; Jerie, 2012; Meo *et al.*, 2013, Eyayo, 2014).

**Table.1** Distribution of mean Hazard score percent of different factors affecting the work environment

| Hazard category                  | Mean hazard rate | Minimum | Maximum |
|----------------------------------|------------------|---------|---------|
| Natural and physical factors     | 45.1%            | 0.0%    | 100.0%  |
| Chemical factors                 | 47.5%            | 0.0%    | 100.0%  |
| Social and Psychological factors | 64.3%            | 0.0%    | 100.0%  |
| Safety measure factors           | 22.4%            | 0.0%    | 100.0%  |
| Overall                          | 44.8%            | 4.0%    | 69.0%   |

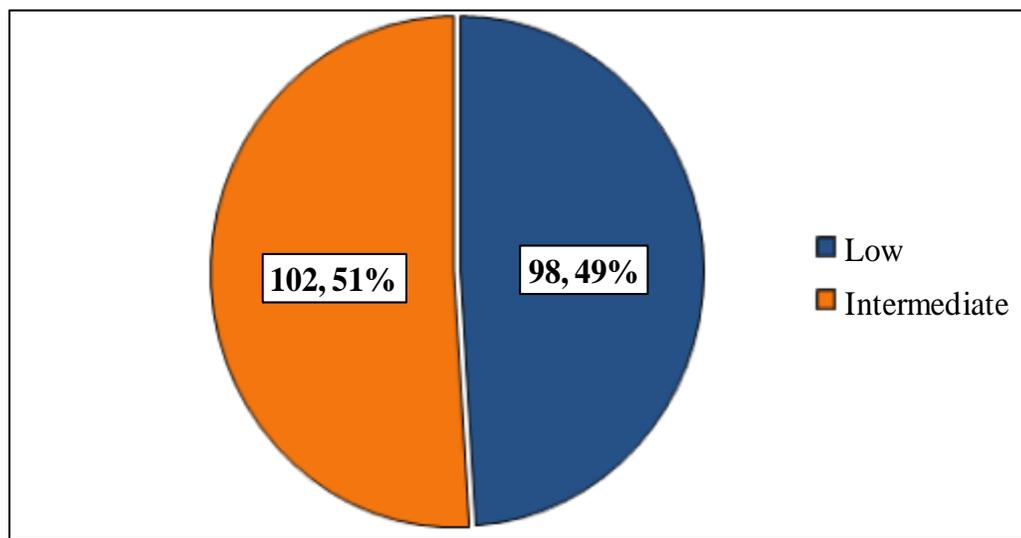
**Table.2** Distribution of hazard degree of different domains and overall hazard at work environment of the studied group

| Domain                | Low        |      | Intermediate |      | High      |      |
|-----------------------|------------|------|--------------|------|-----------|------|
|                       | No.        | %    | No.          | %    | No.       | %    |
| Natural hazard        | <b>94</b>  | 47.0 | <b>53</b>    | 26.5 | <b>53</b> | 26.5 |
| Chemical hazard       | <b>50</b>  | 25.0 | <b>114</b>   | 57.0 | <b>36</b> | 18.0 |
| Psychological hazard  | <b>22</b>  | 11.0 | <b>83</b>    | 41.5 | <b>95</b> | 47.5 |
| Safety measure hazard | <b>122</b> | 61.0 | <b>52</b>    | 26.0 | <b>26</b> | 13.0 |
| Overall hazard        | <b>98</b>  | 49.0 | <b>102</b>   | 51.0 | <b>0</b>  | 0.0  |

**Table.3** Relationship between overall rates of Hazard affecting the work environment and socio-demographic characteristics of the studied group (N = 200)

| Variable       |                                  | Overall hazard |      |              |      | P.value |
|----------------|----------------------------------|----------------|------|--------------|------|---------|
|                |                                  | Low            |      | Intermediate |      |         |
|                |                                  | No.            | %    | No.          | %    |         |
| Age (year)     | 21 – 30                          | <b>10</b>      | 71.4 | <b>4</b>     | 28.6 | 0.16    |
|                | 31 – 40                          | <b>29</b>      | 54.7 | <b>24</b>    | 45.3 |         |
|                | 41 – 50                          | <b>47</b>      | 45.6 | <b>56</b>    | 54.4 |         |
|                | 51 – 60                          | <b>10</b>      | 47.6 | <b>11</b>    | 52.4 |         |
|                | > 60                             | <b>2</b>       | 22.2 | <b>7</b>     | 77.8 |         |
| Marital status | Married                          | <b>96</b>      | 49.0 | <b>100</b>   | 51.0 | 1.0     |
|                | Unmarried                        | <b>2</b>       | 50.0 | <b>2</b>     | 50.0 |         |
| Education      | Illiterate                       | <b>2</b>       | 66.7 | <b>1</b>     | 33.3 | 0.51    |
|                | Read and Write                   | <b>8</b>       | 50.0 | <b>8</b>     | 50.0 |         |
|                | Primary                          | <b>14</b>      | 37.8 | <b>23</b>    | 62.2 |         |
|                | Intermediate                     | <b>35</b>      | 57.4 | <b>26</b>    | 42.6 |         |
|                | Secondary                        | <b>17</b>      | 51.5 | <b>16</b>    | 48.5 |         |
| Residence      | Institute and college and higher | <b>22</b>      | 44.0 | <b>28</b>    | 56.0 | 0.33    |
|                | Urban                            | <b>77</b>      | 51.0 | <b>74</b>    | 49.0 |         |
|                | Rural                            | <b>21</b>      | 42.9 | <b>28</b>    | 57.1 |         |
| Monthly income | Enough                           | <b>23</b>      | 46.9 | <b>26</b>    | 53.1 | 0.75    |
|                | Not enough                       | <b>75</b>      | 49.7 | <b>76</b>    | 50.3 |         |

**Fig.1** Distribution of study participants according to their hazard score



**Table.4** Relationship between overall rates of Hazard affecting the work environment and occupational characteristics (N = 200)

| Variable                   |                      | Overall hazard evaluation |      |                          |       | P.value      |
|----------------------------|----------------------|---------------------------|------|--------------------------|-------|--------------|
|                            |                      | Low<br>(n = 98)           |      | Intermediate<br>(N= 102) |       |              |
|                            |                      | No.                       | %    | No.                      | %     |              |
| <b>Job title</b>           | Worker               | 5                         | 41.7 | 7                        | 58.3  | <b>0.034</b> |
|                            | Ganger               | 15                        | 68.2 | 7                        | 31.8  |              |
|                            | Observant technician | 12                        | 70.6 | 5                        | 29.4  |              |
|                            | Supervisor           | 20                        | 35.1 | 37                       | 64.9  |              |
|                            | Engineer             | 6                         | 42.9 | 8                        | 57.1  |              |
|                            | Assistant-Engineer   | 6                         | 75.0 | 2                        | 25.0  |              |
|                            | Chief Engineer       | 8                         | 47.1 | 9                        | 52.9  |              |
|                            | Craftsman            | 2                         | 22.2 | 7                        | 77.8  |              |
|                            | Chief -Craftsman     | 24                        | 54.5 | 20                       | 45.5  |              |
| <b>Years of experience</b> | < 10                 | 15                        | 65.2 | 8                        | 34.8  | 0.39         |
|                            | 10 - 14              | 24                        | 53.3 | 21                       | 46.7  |              |
|                            | 15 - 19              | 33                        | 47.1 | 37                       | 52.9  |              |
|                            | 20 - 24              | 12                        | 40.0 | 18                       | 60.0  |              |
|                            | ≥ 25                 | 14                        | 43.8 | 18                       | 56.3  |              |
| <b>Work place</b>          | Ovens                | 17                        | 48.6 | 18                       | 51.4  | <b>0.007</b> |
|                            | Production           | 11                        | 55.0 | 9                        | 45.0  |              |
|                            | Cracking             | 15                        | 68.2 | 7                        | 31.8  |              |
|                            | Packing              | 6                         | 50.0 | 6                        | 50.0  |              |
|                            | Mills                | 12                        | 33.3 | 24                       | 66.7  |              |
|                            | Quarries             | 20                        | 62.5 | 12                       | 37.5  |              |
|                            | Maintenance          | 17                        | 51.5 | 16                       | 48.5  |              |
|                            | Others               | 0                         | 0.0  | 10                       | 100.0 |              |
| <b>Working hours/day</b>   | 7                    | 5                         | 5.5  | 6                        | 54.5  | 1.0          |
|                            | 8                    | 93                        | 49.2 | 96                       | 50.8  |              |

The safety measure and equipment are important factor for the safety and the protection of the workers in different workplaces the present study found that majority of the worker used protective clothing head

protection equipment; hand and feet's protection equipment; on the other hand; about three quarters of the studied group used the respiratory equipment, these findings agreed that reported in Bangladeshi and

Egyptian studies and these findings consistent with the legislations of occupational safety applied in these factories (Iqbal *et al.*, 2010, Shafik & El-Mohsen, 2012).

Regarding the relationship of overall hazard affecting the workers and their - socio demographic characteristics; the present study found no significant association with the age, marital status, level education, residence or mortality income, in all comparison this findings agreed that reported in Nigeria and Bangladesh (Musa *et al.*, 2012; Sana *et al.*, 2013), while disagreed the findings of Meo *et al.*, in Saudi Arabia (Meo *et al.*, 2013).

### Conclusions and Recommendations

The overall hazard score of the studied group was intermediate, injuries and health problems related to work are frequent among cement industry workers. Cement workers were at Intermediate physical, chemical and psycho-social hazards with higher hazard scores for psychosocial factors and lower hazard reported with safety and protective measures and equipment. The overall Hazard was insignificantly associated with the demographic characteristics of the cement industry worker, while it was significantly associated with job title and work place. Hence, the current study recommended education of cement industry workers about all types of the hazard that affect their health and using the protective safety measures. Application of standard guidelines for safety, prevention and controls of these hazards, enforcement of application of the established labor and safety laws and legislations of new suitable laws that organize the workplace environment. Cement industries workers should visit the health centers in their factories and keeping their health records updated. Healthcare providers in the cement factory and the occupational health and safety unit recommended to be in regular contact with the cement industry workers and managers and Screening for hazards associated with cement industries for early detection of any possible effect of the cement risks on health of workers. Additionally, further studies with larger sample size included other factories are highly suggested.

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