

Occupational Hazards and their Relation with Health Problems among Construction Building Workers at El Sherouk City

Heba Al-kotb Mohamed*

Lecturer of Community Health Nursing, Faculty of Nursing, Suez Canal University, Ismailia, Egypt

*Corresponding author: hebakotb1549@gmail.com

Abstract World health organization (WHO) showed that more than half of all occupational injuries and deaths worldwide among construction building workers. The aim of this study was to assess occupational hazards and their relation with health problems among construction building workers at El Shorouk City. **Design:** correctional research design was utilized for this study. **Setting:** The present study was conducted at two different private construction agreed to the work of the study on the construction workers from total 22 building and Reconstruction Company at El-Shorouk City. **Sample:** All construction building workers in two companies out of “472” were included as study sample. **Tools:** Two tools were used for data collection I- Occupational hazards questionnaire designed to collect data about demographic characteristics of workers and occupational hazards related to construction industry. II- Health Problem questionnaire to assess medical health history, injuries and illness that occur in case of exposure to occupational hazards at workplace during last 12 month. **Results:** they revealed that the majority of construction building workers had occupational injuries as, eye injuries, fractures, cut/lacerated wounds and strain/sprain. Most of them had skin dermatitis and muscles skeletal disorders. **Conclusion:** There were statistically significant between occupational hazards and health problems among construction building workers. **Recommendations:** Continues of occupational health program to all workers at construction company to upgrade their knowledge and practice for prevention of occupational injuries related to workplace, it includes the following: Training courses about occupational injuries, health problems and their prevention, safety measure, using personal protective devices and first aid.

Keywords: *construction industry, occupational injuries, occupational hazards*

Cite This Article: Heba Al-kotb Mohamed, “Occupational Hazards and their Relation with Health Problems among Construction Building Workers at El Sherouk City.” *American Journal of Nursing Research*, vol. 5, no. 3 (2017): 96-103. doi: 10.12691/ajnr-5-3-4.

1. Introduction

Occupational health is the study of promotion and maintenance of the highest degree of physical, mental and social well-being workers in all occupations. The main focus in occupational health is to maintain worker's health and working capacity, to improve the working environment to become conducive to safety and health, and to develop the working organizations and cultures in a direction which supports health and safety of people [1,2,3].

Occupational hazard of the most important public health problems in the workplace [4]. It is recognized widely that it has increased the incidents that cause absenteeism from work and lost productivity rate, permanent disability and even death and human suffering caused by harmless for the employee and the employer and society injuries [5].

World health organization (WHO) showed that more than half all occupational injuries and illness among

construction building workers [6,7]. This is because the construction building workers exposed to very specific hazards at workplace, like work at heights, work with power tools, more than one trade and more than one employer/contractor working on a single site with lack of coordination, working in the outdoor elements, contractual work as opposed to permanent employment, lack of standards or regulations among workers in terms of expertise in their trade and training standards, less regulation and enforcement than other sectors [5,8]. Construction workers are exposed to a wide variety of health hazards at work [9,10].

Health problems related to construction industry are classified into two groups: the first group include those who translate into an abrupt disruption of the balance between the conditions and the working environment and workers' health, such as occupational accidents and occupational poisonings; the second group includes chronic nature of diseases: the typical occupational disease, defined as inherent or peculiar to a particular group of activities [11,12]

Construction building workers are exposed to a wide variety of occupational hazards at work. The exposure differs from job to job. The hazards for construction workers are classified into four classes:- chemical hazards such as dusts, fumes, mists, vapors, or gases. Physical hazards, including extreme heat or cold, work in windy, rainy, snowy, or foggy weather, non-ionizing ultraviolet radiation usually from exposure to the sun, and electric arc welding [11,13]. Biological hazards, such as animal attacks and histoplasmosis. Workers may also be at risk of malaria or yellow fever if they work in areas where these organisms and their insect vector are prevalent[14]. Social hazards, Employment is intermittent and constantly changing many projects requires living in work camps away from one's home and family. These features of construction work, as well as heavy workload, limited control, and limited social support are the factors associated with increased stress [15].

Occupational health is concerned with health in its relation to work and working environment. It implies not only prevention and health promotion but also emergency care, curative services, and rehabilitative services [16,17]. The accident rate is very high in the industry in comparison with other industries. It is scheduled that the lack of safety awareness in personnel management and workers who kinked action and conduct unsafe. In fact, most of the construction workers and the lack of proper education, they did not receive training on safety and trade skills training in the field of construction [5,18].

Disease Control and Prevention, focused attention on integrated approaches to worker health and safety to integrate protection from work-related safety and health hazards with promotion of injury and illness prevention efforts to advance worker well-being which called total worker health (TWH) program. It must apply this program to improve worker health and safety [7,13,18]

Justification of the study:

The construction industry is not only the process of building. It involves many other types of work aside from the building process, such as painting, landscaping, electrical supply, telecommunications, plastering, and paving. All these types of work make up one industry, but each of them involves different exposure and thus differing health hazards [6,15].

Globally, 17% of all work-related fatalities are in the construction sector [15]. In Egypt there are 4 million workers in construction industry. Meanwhile, the area of the construction industry has a high vulnerability to accidents with about 13% of work related deaths and 18% of occupational illness were recorded among construction workers [19,20]. Workers in the construction industry are exposed to work-related diseases, which have been defined by WHO as diseases that may be aggravated, accelerated, or exacerbated by workplace exposures and that may impair working capacity [15].

Occupational health nurse have a pivotal role regarding promoting the health of the workers, preventing illness, and injury, providing pre employ renin assessment of prospective employees, conducting periodic screening tests, and monitoring the work environment for health hazards, providing first aid for injuries and treating existing health problems and participate in planning the occupational health program and in evaluating [3,21].

1.1. Aim of the Study

The aim of this study was to assess occupational hazards and their relation with health problems among construction building workers at El Shorouk City through:

1. Assess occupational hazards among construction building workers.
2. Assess health problems that occur in case of exposure to occupational hazards among construction building workers.
3. Assess relationship between exposure to occupational hazards and health problems among construction building workers.

1.2. Research Questions

1. What are occupational hazards among construction building workers?
2. What are health problems that occur in case of exposure to occupational hazards among construction building workers?
3. Is there a relationship between exposure to occupational hazards and health problems among construction building workers?

1.3. Research Hypothesis

There is a relationship between exposure to occupational hazards and health problems among construction building workers.

2. Methods

2.1. Study Design

Correlational design was used to assess Occupational hazards and relation with health problems among construction building workers.

2.2. Setting

The present study was conducted at two different private construction namely Safety House construction Building company and Modern company for Construction Building Company under the supervision El- Shorouk City Authority from total 22 building and reconstruction company and because only two companies who agreed to the work of the study on the construction workers, the company's work location, after explaining the purpose of the study and the approval of each worker to participate.

2.3. Sampling

This study has been carried out on all construction building workers, regardless years of experience. It was found that the total number of building workers at the pre-mentioned setting about "543" worker. The disabled, low intellectual level and communicate disabled were excluded (17). The pilot study was conducted on "10%" building workers from the total sample of them, which equal the number size of "54" workers who were

excluded out of the total sample .Finally, the estimated total sample number is equal to “472” building construction workers.

2.4. Tools of Data Collection

2.4.1. Instruments

Tool 1: Occupational hazards interview questionnaire was developed by researcher after reviewing literature related to occupational hazards checklist by Occupational Safety and Health Association (OSHA, 2009) [22]. It included:

- (1) Socio characteristics such as such as age, level of education and type of job (Digging the area, erection of steel), employment pattern, (fixed, temporary contracts), and years of experience.
- (2) Occupational hazards related to construction industry such as what types of occupational hazards do you expose during your work?, “Have you ever had any health problems (injury/ disease) resulting from construction work in the last 12 month and “What are the main causes of health problems at this workplace?

Tool 2: Health Problem questionnaire will be developed by the researcher to suit Egyptian culture based on International Data Sheet on Occupation [23], Health and Safety Authority[24] Which include two parts:

- (1) Medical health history for chronic diseases such as liver disease, hypertension, asthma ...etc.)
- (2) Injuries and illness that occur in case of exposure to occupational hazards at workplace during last 12 month.

2.4.2. Reliability of the Tools

Reliability was applied by the researcher for testing the internal consistency of the instruments, by administration of the same instruments to the same subjects under similar conditions on one or more occasions. Answers from repeated testing were compared (Test-re-test reliability). The reliability of the study instrument was tested using Cronbach Apha. It amounted to be 0.773 indicating good reliability of the instrument. It is acceptable inters the consistency (see Equation 1). They were tested for content validity by jury panel of five experts in the field of Community Health Nursing and obstetric Specialty to ascertain relevance and completeness.

$$\alpha = \frac{N - C^-}{V^- + (N - 1).C^-} \quad (1)$$

N: number; C: variable corin; V: average Varian.

2.5. Pilot Study

Pilot Study was conducted to test the practicality and applicability of the questionnaire and to detect the problems that may encounter during data collection. Also to help to estimate the time needed to fill the questionnaire. The pilot study was conducted on 54 construction building workers. Construction building workers who participated in the pilot study were not involved in the sample. The

pilot study has also saved to estimate the time needed for each subject to fill in the questions.

2.6. Ethical Consideration

The agreements for participation of the subjects were taken after the aim of the study was explained to them. Before data collection, the construction workers were informed about the aim of the study and what would be done with the results. They were given the opportunity to refuse to participate and they could withdraw at any stage of the research. Also, they were assured that the information would remain confidential and used for the research purpose only. The ethics committee approval is in the Faculty of Nursing, Suez Canal University, Egypt on the subject of research.

2.7. Procedure and data collection Approval

- (1) An official letter was issued from the Dean of Faculty of Nursing, Suez Canal University to the directors Safety House building company and modern Company of building reconstruction and estate real to conduct the study to seek their approval for carrying out the study in the selected areas for data collection.
- (2) Data were collected during the first of May 2016 until the end of September 2016
 - Before starting the data collection, the agreements and the aim of the study were explained to each supervisor of workers at building project to gain their cooperation.
 - The researcher met the construction workers in the waiting room, in camp project. The researcher introduced herself and explained to the workers the aim of the study and their consent to participate was obtained.
 - Each worker was personally interviewed and sometimes groups of workers (minimum one worker and maximum six workers) in the project camp.
 - The interview lasted for from 12:30–2:30 AM, three times per week, in a period of 5 months.
 - Filling in the baseline questionnaire related to exposure of occupational hazards during day work about 15-20 minutes and health problems (injuries / illness) occurs during last 12 month in 10-15 minutes.

2.8. Statistical Analysis

Data was coded and transformed into specially designed form to be suitable for computer entry process. Data was entered and analyzed by using SPSS (Statistical Package for Social Science) statistical package version 16. Graphics were done using Excel program. For numerical values, the range mean and standard deviations were calculated. For categorical variable, the number and percentage were calculated and differences between subcategories were tested by chi square (χ^2). The level of significant was adopted at $p < .05$.

3. Results

Table 1 54.6% of construction workers age were less than 30 years, with a mean of 31.65 ± 10.4 years. 55.9% were married. Those with basic education constituted 35.4%; while illiterates' constituted 40.3%, and those graduated from technical diploma. Most of the participants were temporary work 76.5% and only 23.5% were permanent. The average of years of experience was 11.10 ± 7.44 years. 65.5% of them were working more than 8 hours per day.

Figure 1 showed that the type of work for construction building workers under study sample. 30% of them were working in erection of steel, 19% working in digging the area, and 18% working in laying of roofs, 17% builder and 16% working as painter.

Table 2 shows the occupational hazards contributing to the occurrence of health problems among workers studied according to their type of work. First physical hazards as demonstrated, regarding the type of work 38% of the study sample working in erection of steel were exposed to extreme heat and cold followed by 28.7% of them exposed to slippery floors.

As regard chemical hazards 29.2% of painter and erection of steel exposed to volatile substance (kerosene & Tunar) and 17.7% of builder exposed to cement materials. 22.2% and 20% respectively of laying roofs workers and digging area exposed to a lot of amount of dust during daily work.

Related to mechanical hazards, table demonstrated that 31.6% of erection steel workers were exposed to rapidly moving parts and moving heavy tools. 24.3% of laying of roofs workers living in working camps.

Table 1. Distribution of the construction building workers according to their socio demographic characteristics (n=472).

Items	Frequency	Percent
Age (years) :		
≤ 30	258	54.6
>30	214	45.4
Mean± SD	31.65±10.04	
Marital status:		
Single	194	41.1%
Married	264	55.9%
Divorced /widowed	14	3.0%
Education level:		
Read and write	71	15.0%
Basic education	167	35.4%
Diploma or technical degree	190	40.3%
High education	44	9.3%
Monthly income:		
Not Enough	392	83.1%
Enough	69	14.6%
Saving and Enough	11	2.3%
Years of Experience:		
< 10 years	246	52.1
≥ 10years	226	47.9
Mean± SD	11.10±7.44	
Working hours per day:		
≤ 8 hours	163	34.5%
≥ 8 hours	309	65.5%
Employment pattern:		
Permanent	111	23.5%
Temporary	361	76.5%

Table 2. Distribution of occupational hazards according to their type of work among workers studies (n=472)

Items	Type of work					Total	
	Digging the area	Erection of steel	Builder	Painter	Laying of roofs		
Physical hazards	Noise	14	11	12	8	14	59
		23.7%	18.6%	20.3%	13.6%	23.7%	100.0%
	Poor illumination	39	51	46	23	27	186
		21%	27.4%	24.7%	12.3%	17.9%	100.0%
	Slippery floors	38	54	30	36	39	197
20.2%		28.7%	16.0%	18.2%	20.7%	100.0%	
Broken floors	15	27	14	16	16	86	
	18.8%	33.8%	17.5%	20.0%	20.0%	100.0%	
extreme heat or cold	10	27	16	10	8	71	
	14.1%	38.0%	22.5%	14.1%	11.3%	100.0%	
Chemical hazards	Dust	18	23	15	14	20	188
		20.0%	25.6%	16.7%	15.6%	22.2%	100.0%
	Volatile substances (kerosene / tanner)	15	28	17	16	20	149
15.6%		29.2%	17.7%	16.7%	20.8%	100.0%	
Mechanical hazards	Heavy tools	24	30	21	18	16	109
		22.0%	27.5%	19.3%	16.5%	14.7%	100.0%
	Rapidly moving parts	18	30	20	14	13	95
18.9%		31.6%	21.1%	14.7%	13.7%	100.0%	
Social hazards	Living in work camps	20	27	14	20	26	107
		18.7%	25.2%	13.1%	18.7%	24.3%	100.0%

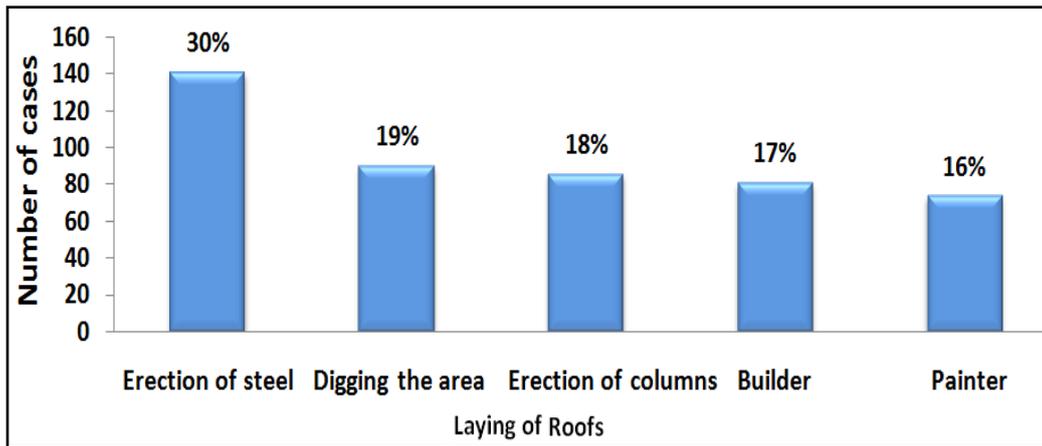


Figure 1. Distribution of building workers according to the type of work

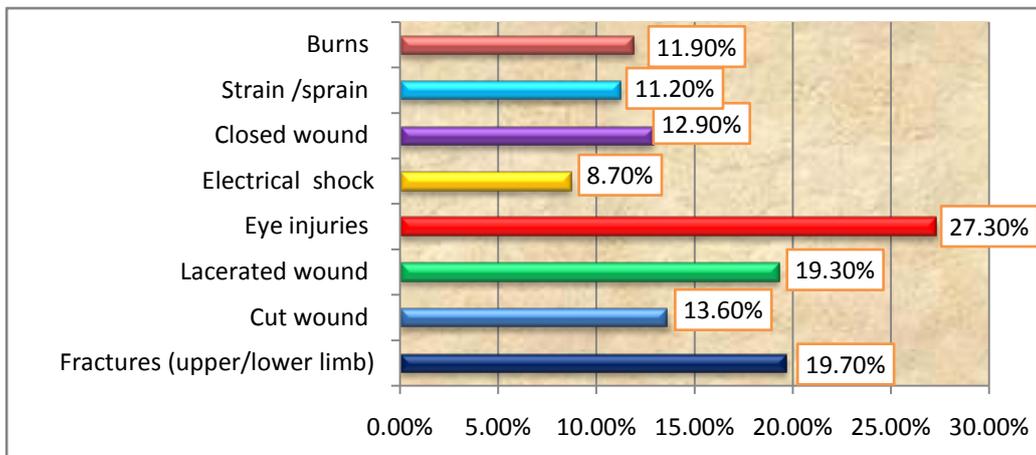


Figure 2. Distribution of building construction workers according to their occupational injuries during last 6 months (n=346)

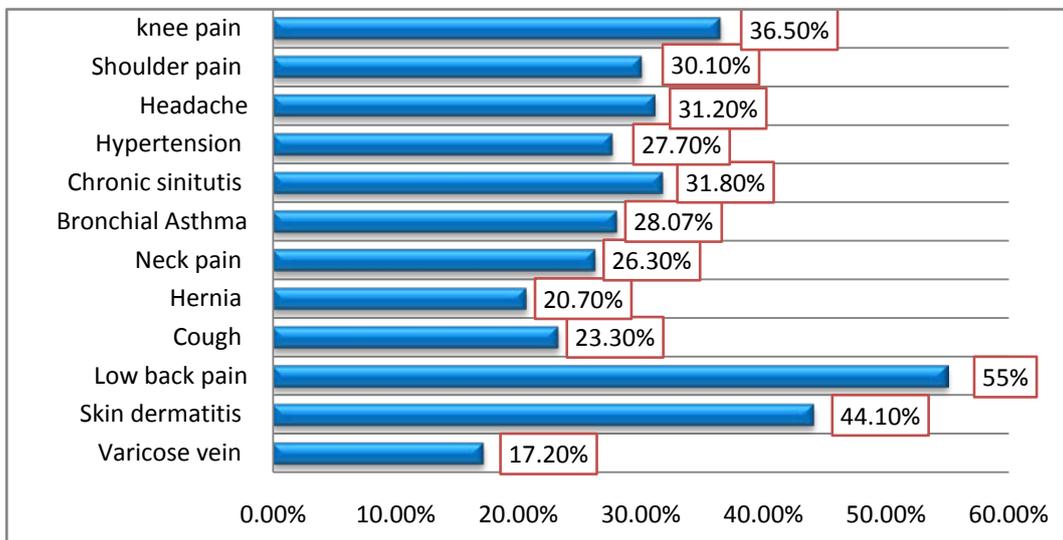


Figure 3. Distribution of building construction workers according to their health problems (n=342)

Figure 2, illustrate that occupational injuries in the past 12 months were reported by 346 out of 472 workers 73.2%. The most common body parts injured 19.7% were upper and lower limbs fractures results from falling. The majority of construction building workers occupational injuries was eye injuries (foreign body) 34.9% and lacerations wounds 19.30%. Following injuries suffered by construction building workers closed wounds, burns and sprain/strain 12.90%, 11.90% & 11.20% and 8.70%

for electrical shock.

Figure 3, shows that the majority of building construction workers complains of musculoskeletal problems as follows: 55% low back pain, 36.5% knee pain, 30 % for shoulder pain and 26.3% for neck pain. Figure also showed that 44% of workers complain from skin dermatitis, 31.8% for chronic sinusitis and 28.7% for bronchial asthma. 20.7% suffered from inguinal hernia/umbilical hernia and 17.20% of them have varicose vein.

Table 3. Relation between physical hazards and occupational injuries among construction building workers (n=346)

Physical Hazards		Occupational injuries		Total	Chi squared (P value)
		Not Injured	Injured		
Poor illumination		64	122	186	13.083 (0.00144)*
		34.4%	65.6%	100.0%	
Slippery floors		36	161	197	
		18.3%	81.7%	100.0%	
Broken floors		26	63	89	
		29.2%	70.8%	100.0%	

Table 4. Relation between chemical hazards, eye injuries and skin dermatitis among construction building workers

Health problems	Chemical Hazards				Total		X ² P value
	Dust		Volatile substances		No	%	
	No	%	No	%			
Eye injuries	94	28.8%	35	71.2	129	100	2.465 0.11640
Skin dermatitis	94	21.9%	114	78.1%	208	100	
Total	188	26.7%	149	73.3	472	100	

Table 5. Relation between mechanical hazards, and muscles skeletal disorders among construction building workers

Health problems	Mechanical hazards		Total	Chi-square (p value)
	Heavy tools	Rapidly moving parts		
Low back pain	88	172	260	10.160 (0.00622)*
	33.6%	66.4%	100.0%	
Neck pain	33	92	125	
	26.5%	73.5%	100.0%	
Shoulder pain	19	122	141	
	13.5%	86.5%	100.0%	

Table 3 shows the statistical analysis of occupational injuries in relation to physical hazards of work. It revealed that occupational injuries such as (fractures, cut wound, sprain ...etc.) respectively, had the highest statically relation with physical hazards.

Table 4, illustrates that the statistical analysis of eye injuries and skin dermatitis in relation to chemical hazards of work. It revealed that there is no statistically significant between chemical hazards, eye injuries and skin dermatitis.

Table 5, revealed that mechanical hazards as heavy tools and rapidly moving parts respectively, had the highest statistically significant relation with low back pain, neck pain and shoulder pain.

4. Discussion

Globally Occupational hazards are the most important causes of disability and in life threatening conditions. The International Labor Organization (ILO) that there are more than 270 million occupational accidents causing two million deaths annually [13] Moreover, construction workers are exposed to a wide variety of safety hazards, this exposure differs according to the job demands.

This study to assess occupational hazards and their relation with health problems among construction building workers .The occupational hazards among workers studied were physical hazards as poor illumination, slippery floors and broken floors. Chemical hazards, such as dusts and volatile substances. In addition mechanical hazards which include heavy tools rapidly move parts and unsafe tools.

Most of worker studied living in work camp and transfer from work to another work leading to stress. This finding is in line with Gourab et al. [25] who assessed "Occupational health status of construction workers" in India. They reported construction work is one of the most hazardous sectors where health risks are significant due to dusts, noise, chemicals, manual handling, vibrating tools, excessive loads, and lack of safety awareness.

In the present study, the majority of workers studied exposed to occupational injuries in the last 12 months. The most common injuries were fractures in upper and lower limbs results from falling. The majority of construction building workers occupational injuries was eye injuries due to foreign body or dust, and lacerations wounds. Following injuries suffered by construction building workers closed wounds, burns and sprain/strain and electrical shock.

These findings came in agreement with Pratik et al., [26] who assessed "A study of morbidity profile amongst construction workers at selected construction sites in Surendranagar city" they reported that the most of the construction workers had suffered from mainly from abrasion , followed by cut injury, Prick, Blunt trauma and laceration respectively. In another study by Sebsibe and Dagnachew [5] who determined "Occupational injuries among building construction workers in Addis Ababa, Ethiopia" they reported that the common types of injuries were cutting and falling. Nearly half, of the incidents were leg injuries followed by finger/hand.

In study by Alazab and Raed [27]. Who identified "work-related diseases occurring among workers in the

construction industry” in Egypt they reported that the most common accidents among construction workers leading to falling at ground level and being hit by falling objects. In addition, and the presence of a foreign body in eye can be attributed to the daily exposure to dust generated by dry sweeping, drywall sanding, mortar mixing, and tamping. In another study by Jasani et al [26]. Who assessed “a study of morbidity profile amongst at selected construction sites in Surendranagar city” they reported nearly ten percent were suffering from ophthalmic problems, which were mainly watering and redness in the eye.

In the current study, showed also there was statistically significant relation between occupational injuries such as (fractures, cut wound, and sprain) and physical hazards at work place. These findings supported by Lay et al., [9]. Who decided “Individual, Occupational, and Workplace Correlates of Occupational Health and Safety Vulnerability in a Sample of Canadian Workers” they reported accident. Amal et al [8]. Who assessed “Construction Safety and Occupational Health Education in Egypt “they reported there are other common hazards in construction sites that may include power tools and equipment, heavy machinery, excavations, and confined spaces. These injuries may be from falls from height such as scaffolding or ladders, being struck by objects, being caught between objects, and electrocution.

In present study, there is no statistically significant between chemical hazards, eye injuries. This findings were disagreement with Stocks et al., [28]. Who studied “Occupation and work-related ill-health in UK construction workers” they reported that eye irritation and injuries among construction workers frequently associated with exposure to cement causing ophthalmic problems.

In the current study, the construction workers reported that they had health problems by 342 out of 472 construction building workers (74.4%). more than half complained from low back pain followed by knee and shoulder pain. This finding is in line with, Gupta & Gokhale [10]. Who assessed various health problems among construction workers they reported that most of construction workers complain from muscles skeletal disorders due to increased mechanization for carrying bricks, cement bags. These findings also confirmed with Boschman et al., [29]. Who investigated “Musculoskeletal disorders among construction workers: a one-year follow-up study” reported that the prevalence of MSDs among construction workers was 67%. Complaints of the back, knee and shoulder/upper arm among the bricklayers during work.

The present study revealed that there was statistically significant relation between heavy tools and rapidly moving parts with low back pain, neck pain and shoulder pain among workers studied. This finding was consistent with Ajslev et al., [30] who studied “Contradictory individualized self-blaming: a cross-sectional study of associations between expectations to managers, coworkers, one-self and risk factors for musculoskeletal disorders among construction workers” they reported that musculoskeletal disorders among construction workers related to type of work and the location of musculoskeletal symptoms corresponded to different construction trades. For example, crane operators, insulators and painters had higher odds of neck disorders, while roofers and floorers

had higher odds of WMSDs in the lower back and lower extremities.

Related to skin dermatitis, the current study revealed that less than half of workers studied suffering from skin dermatitis with statistically significant relation with chemical hazards. The finding came in agreement with Bhuiyan et al., [31]. They assessed “pattern of occupational skin diseases among construction workers in Dhaka city” they reported more than two thirds of workers studied suffering from dermatitis, itching and acne due to workers were involved in cement works followed by brick/stone works, tar/pitch works, metal work/welding, sand/mud works, wood work and wet works. These factors may contribute in the high rate of skin dermatitis

In this study illustrated also, more than one quarter of workers studied suffered from bronchial asthma and hypertension. Around one third respondents complained of headache and chronic sinusitis. Among these some workers studied had several health problems like inguinal hernia/umbilical hernia and varicose vein. The findings of the current study were in accordance with Sultana et al., [32]. Who assessed “health problems among the women building construction workers” they reported that the majority of them had respiratory problems, like chest tightness and shortness of breath, running nose, and chronic cough.

The finding were confirmed by Chakraborty et al., [33]. who assessed “Occupational stress, musculoskeletal disorders and other factors affecting the quality of life in Indian construction workers” they reported that 4.86% workers had suffered from respiratory problems, affecting 5.23% of male and 4.32% of female workers Chronic sinusitis and bronchial asthma can be attributed to the daily exposure to dust leading to nasal irritation and predisposing the individual to the activation of microorganisms, usually bacteria, resulting in infections at short intervals leading to infections in the short term due to the non-use of workers into personnel protective during work.

5. Conclusion

This is among the few studies describing occupational injuries among construction building workers in Egypt. In this study a relatively higher prevalence of injury was reported among construction building workers. Like eye injury, upper/ lower fractures, and strain or sprain and all types of wounds. Most of construction building workers had unsatisfactory knowledge and negative attitude about occupational injuries and health problems related to their work and important of safety measures. The current study founded there were statically between occupational injuries, workers attitudes, age and years of experiences.

6. Recommendations

Recommendations In the light of the finding of the current study the following recommendations are suggested:

- 1- Continues of occupational health program to all construction building workers to improve their knowledge and attitudes for prevention of occupational injuries and health problems related to their workplace, it includes the

following training for: (Safety measures and important for using personal protective devices and First aid) .

2- Regular periodic screening for all construction building workers is very important to early detecting of any health problems and giving suitable health care.

3- First aid facilities and personal protective devices should be available in all construction and building workplace.

References

- [1] Sah, J.P., et al., Knowledge and practice related to Occupational Hazards among Maruti Cement Factory workers in Mirchaiya, Siraha, Nepal. *Microbes and Health*, 2016. 4(2): p. 11-18.
- [2] Yossif, H.A. and E.M.A. Elaal, Occupational Hazards: Prevention of Health Problems among Bakery Workers in Benha City. *Journal of American Science*, 2012. 8(3).
- [3] Shafik, S.A. and A.S.A. El-Mohsen, Occupational health: Health promotion program to improve health workers in Tourah Cement Factory. *Journal of American Science*, 2012. 8(3): p. 486-96.
- [4] Yiha, O. and A. Kumie, Assessment of occupational injuries in tendaho agricultural development SC, afar regional state. *Ethiopian Journal of Health Development*, 2010. 24(3).
- [5] Tadesse, S. and D. Israel, Occupational injuries among building construction workers in Addis Ababa, Ethiopia. *Journal of Occupational Medicine and Toxicology*, 2016. 11(1): p. 1.
- [6] Mersha, H., S.T. Mereta, and L. Dube, Prevalence of occupational injuries and associated factors among construction workers in Addis Ababa, Ethiopia. *Journal of Public Health and Epidemiology*, 2017. 9(1): p. 1-8.
- [7] Feltner, C., et al., The effectiveness of Total Worker Health interventions: a systematic review for a National Institutes of Health Pathways to Prevention Workshop. *Annals of internal medicine*, 2016.
- [8] Amal, E., E. Adel, and M. Maged, Construction Safety and Occupational Health Education in Egypt, the EU, and US Firms. *Open journal of civil engineering*, 2012. 2012.
- [9] Lay, A.M., et al., Individual, occupational, and workplace correlates of occupational health and safety vulnerability in a sample of Canadian workers. *American journal of industrial medicine*, 2016. 59(2): p. 119-128.
- [10] Gupta, A. and R. Gokhale, Assessment of Health Problems Among Construction Workers in An Urban Area. *International Journal of Scientific Research*, 2016. 5(5).
- [11] de Sena Junior, L.C.D., et al., Knowledge workers on occupational hazards in the industry of ceramics. *International Archives of Medicine*, 2016. 9(1).
- [12] Torén, K. and B. Järholm, Effect of occupational exposure to vapors, gases, dusts, and fumes on COPD mortality risk among Swedish construction workers: a longitudinal cohort study. *CHEST Journal*, 2014. 145(5): p. 992-997.
- [13] Choi, S.D., L. Yuan, and J.G. Borchardt, Musculoskeletal Disorders Construction: Practical Solutions From the Literature. *Professional Safety*, 2016. 61(1): p. 26.
- [14] Ekpenyong, C.E., Risk of Dehydration among Construction Workers in Relation to Job Task and Personal Risk Factors. *Italian Journal of Occupational and Environmental Hygiene*, 2016. 7(2).
- [15] Hatami, S.E., et al., Injuries and their burden in insured construction workers in Iran, 2012. *International journal of injury control and safety promotion*, 2017. 24(1): p. 89-96.
- [16] Jasani, P.K., et al., A study of knowledge and utilization of safety measures against occupational hazards among constructional workers in Surendranagar city, Gujarat, India. *International Journal of Community Medicine and Public Health*, 2016. 3(11): p. 3055-3058.
- [17] Welch, L.S., et al., Impact of Secondary Prevention in an Occupational High-Risk Group. *Journal of Occupational and Environmental Medicine*, 2017. 59(1): p. 67-73.
- [18] Basu, N., et al., Occupational and Environmental Health Risks Associated with Informal Sector Activities—Selected Case Studies from West Africa. *NEW SOLUTIONS: A Journal of Environmental and Occupational Health Policy*, 2016: p. 1048291116651726.
- [19] Abbas, R.A., M.M. Zalat, and N.S.E. Ghareeb, Non-Fatal Occupational Injuries and Safety Climate: A Cross-Sectional Study of Construction Building Workers in Mit-Ghamr City, Dakahlia Governorate, Egypt. *Open Journal of Safety Science and Technology*, 2013. 2013.
- [20] Nawar, S.E.-D., Owner time and cost contingency estimation for building construction projects in Egypt. 2017.
- [21] Kirk, H., *Contemporary Occupational Health Nursing: A Guide for Practitioners*. 2016, Soc Occupational Med.
- [22] Ahmed, H.O. and M. Newson-Smith, Knowledge and practices related to occupational hazards among cement workers in United arab emirates. *The Journal of the Egyptian Public Health Association*, 2009. 85(3-4): p. 149-167.
- [23] Ganzeboom, H.B. and D.J. Treiman, Three internationally standardised measures for comparative research on occupational status, in *Advances in cross-national comparison*. 2003, Springer. p. 159-193.
- [24] Alsamawi, A., et al., Trade in occupational safety and health: Tracing the embodied human and economic harm in labour along the global supply chain. *Journal of Cleaner Production*, 2017.
- [25] Biswas, G., A. Bhattacharya, and R. Bhattacharya, Occupational health status of construction workers: A review. *International Journal of Medical Science and Public Health*, 2017. 6(4).
- [26] Jasani, P.K., et al., A study of morbidity profile amongst construction workers at selected construction sites in Surendranagar city. *International Journal of Medical Science and Public Health*, 2017. 6(2).
- [27] Alazab, R.M., Work-related diseases and occupational injuries among workers in the construction industry. *African newsletter on occupational health and safety*, 2004. 14(2): p. 37-42.
- [28] Stocks, S., et al., Occupation and work-related ill-health in UK construction workers. *Occupational medicine*, 2011. 61(6): p. 407-415.
- [29] Boschman, J.S., et al., Musculoskeletal disorders among construction workers: a one-year follow-up study. *BMC musculoskeletal disorders*, 2012. 13(1): p. 1.
- [30] Ajslev, J.Z.N., R. Persson, and L.L. Andersen, Contradictory individualized self-blaming: a cross-sectional study of associations between expectations to managers, coworkers, one-self and risk factors for musculoskeletal disorders among construction workers. *BMC Musculoskeletal Disorders*, 2017. 18(1): p. 13.
- [31] Bhuiyan, M.S.I., et al., Pattern of occupational skin diseases among construction workers in Dhaka city. *Bangladesh Medical Journal*, 2016. 44(1): p. 11-15.
- [32] Sultana, N., J. Ferdousi, and M. Shahidullah, Health Problems among Women Building Construction Workers. *Journal of Bangladesh Society of Physiologist*, 2015. 9(1): p. 31-36.
- [33] Chakraborty, T., et al., Occupational stress, musculoskeletal disorders and other factors affecting the quality of life in Indian construction workers. *International Journal of Construction Management*, 2017: p. 1-7.