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Investigation of health and safety measures in construction sites in Lebanon and Northern Cyprus

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Abstract

Lebanon and Northern Cyprus are two developing regions where both have been witnessing an increase in population size and medium-rise buildings. Therefore, workers and construction sites increase, which makes workers more vulnerable to various fatal/non-fatal accidents. The effective and efficient management of health and safety is crucial for all projects undertaken under significant risk levels. This study investigates the Occupational Health and Safety regulations and how both countries deal with them to achieve maximum knowledge regarding construction health and safety. The data collected based on personal observations by site visits and conducting brief face-to-face informal interviews. Both oral interviews and observations are informal data collection methods but are suitable for certain kinds of data collection methods or techniques. The most common type of accident is falling from heights, electrical shocks that occur in construction sites of both countries. The findings of this research work proved that accidents could be prevented and even eliminated if all the required safety precautions are implemented. The root causes of the accidents need to be identified, and effective prevention measures should be taken to minimize the frequency and intensity of the accidents. This will surely improve the safety performance of the personnel on construction sites.

1. INTRODUCTION

Construction is the way of planning, designing, and executing buildings. Construction sectors operate, modify, and rehabilitate structures. Constructions exist in various aspects such as residential buildings, bridges, road pavements, excavations, demolitions, and huge-scale painting works (Jha, 2011).

The construction sector is a particularly vital sector for the economy in most countries and is usually recognized as a driver of economic growth in developing countries. Generally, the construction sector accounts for approximately 11% of the Gross Domestic Product (GDP) in many developing countries (Giang and Pheng, 2011). The construction sector has gained a negative reputation for being an extremely risky industry due to the unfortunate rise of accidents and casualty rates that are occurring in construction sites worldwide (Smallwood et al,. 2008). Therefore, construction sites are accepted as high risk working environments. The working status in construction sectors needs physical interference. Most workers in the construction sector work at least 8 hours per day. However, they are usually required to work more hours to accomplish projects on time. Construction jobs are continuously undertaken either indoors or outdoors, underwater or above, at height and underground (Awwad et al., 2014).

The construction industry is one of the largest with respect to the number of workers, the size of the projects completed and the risk of fatal injuries that workers may face. Therefore, the effective and efficient management of health and safety (HS) is crucial for all projects undertaken under significant risk levels. HS regulations must be closely followed to reduce the chance of injury and protect the lives of workers. The first step in maintaining safety in the workplace is prevention. But accidents can occur in any place of employment, so it is vital to have a plan to prevent injuries from happening in the first place. According to the records of injuries that have occurred around the world, it is noted that the primary reasons behind these catastrophic incidents are the non-compliance, mismanagement and irresponsibility of workers, managers, authorities and specialists, which can be linked to the improper management of HS (BLS, 2015). As it is well known; if an accident happens at a working place, it affects the worker and the completion of the project. Moreover, if the completion of the project delays due to an accident, it ends up with an increased cost of the project due to the injuries' workers' compensation costs. The costs of workplace injuries and incidents include both direct and indirect costs. Compensation payments, medical expenses and costs, and costs for legal services are a few of the direct costs. The indirect costs of an accident include the training of replacement employees, accident investigation and implementation of corrective measures, repairs of damaged equipment, lost productivity and any other issues which may directly or indirectly influence the productivity of the workers who has witnessed the accident (Fan et al., 2020). HS in construction is a complex subject, and it is more complicated when it comes to the concept of "Safety attitudes and safety performance" in construction. In the construction sector, various other safety and health issues are considered major concerns due to their significant impacts on the industry worldwide. On the other hand, it has been confirmed that proper investment in construction HS basically maximizes profitability by increasing productivity, enhancing worker motivation, and reducing worker exhaustion (Mohammed, 2003).

This study is vital as it investigates the Occupational Health and Safety (OHS) systems and laws in two countries: taking Lebanon and Northern Cyprus as the area of interest. The main reason for studying these two countries particularly is their similarities in size and culture and the experiences they have had in the past. Both countries have experienced civil war, which left both countries in ruins, and both nations had to rebuild their cities. The construction industry in both countries is always active, developing, and one of the important sectors that populate most workers and needs adaptation to OHS systems. Therefore, this study will evaluate how both countries handle systems and their respective levels of efficiency. Moreover, the dangerous factors, risks and accidents occurring in construction sites in both countries will be highlighted, and the severe consequences that will occur if safety measures are not followed will be emphasized. Construction safety is a key element for project success since it directly and indirectly affects the project's cost, completion time, quality, and reputation of the company. Furthermore, this study is considered to be beneficial for further future studies on HS related issues in the construction industry.

1.1 The status of HS in the construction sector in Lebanon

Lebanon is classified as a developing country as it is still recovering from 15 years of civil war (1975-1990). According to the resources, approximately 11,000 people remain internally displaced within Lebanon due to the destruction of a Palestinian refugee camp as of 2019, increasing due to the disasters happened recently (CIA World Factbook, 2020). Since the end of the war 1990, Lebanon has undergone a re-constructive process, and Beirut seems to be entirely restructured according to International Standards. The infrastructure, housing facilities and many other structures was demolished as a result of the civil war. Therefore, as soon as the war got closer to end, Lebanese people needed to rebuild the country's damaged infrastructure, including all public facilities required to serve the community to get back their living standards. After that, extreme growth in the construction sector was witnessed. However, OHS has not been given sufficient attention in this dangerous and dynamic sector (Choudhry et al., 2007).

The research findings showed an ongoing attempt by major large-scale Lebanese companies to resolve safety concerns in their governmental legalization based on international safety standards (Occupational Safety and Health Administration). It was also found out that workers are training continuously; inspectors and employees are being hired for safety on-site to verify that people are properly enforced; rules and safety signs are being displayed in workplaces. Moreover, every attempt was undertaken to assure that the accidents and their causes are being recorded and accidents occur in the Lebanese construction industry are under inspection. Even though those construction companies have shown an interest in safety practices, they have only allocated minimal budgets to safety matters in their construction projects. Moreover, most small and medium-sized construction companies did not enforce any safety systems on their worksites, did not employ safety personnel, provided no training and did not use warning signs. These companies only demonstrate the will to enforce safety rules if they are obliged by the authorities. This act emphasizes the importance of the public health sector's role and all other related departments in increasing awareness about safety across all industries via monitoring staff who are responsible for ensuring that safety systems are implemented in worksites, continually investigating workers, recording work-related injuries, and establishing a system of penalties for violations that would encourage contractors to adhere to the safety laws (Awwad et al., 2014). The social security law is funded by National Social Security Fund (NSSF) under the Labour Ministry. This is intended to cover insurance costs as a result of occupational accidents and diseases. However, this aspect of the law has yet to be implemented. On-site accident insurance is only covered by private companies. OHS inspectors are mainly engineers and physicians. They usually travel abroad to receive special courses about training in order to apply it in Lebanon. Although safety equipment is available, its usage is rare and complicated. In regard to public safety, there is a significant lack of coordination or cooperation between governmental departments. No official data was obtained for Lebanon related to the number of injuries and fatal and/or non-fatal accidents in Lebanon.

1.2 The status of HS in the construction sector in Northern Cyprus

In 1992, the Northern Cyprus Parliament enacted laws with 94 articles published in official newspapers. The new OHS regulations were established with the cooperation of the EU and have been implemented since April 2009 (Khameneh, 2011).

The overall number of accidents in the industrial and construction sector between 2007 and 2019 is illustrated in Figure 1, which is based on monthly reports obtained from the Department of Labor in Northern Cyprus. According to these reports, the majority of accidents occurred in 2007. Furthermore, between 2007 and 2019, 1985 accidents occurred in 16 different industrial sectors, whereas 649 accidents occurred in the construction sector only (TRNC Ministry of Labour and Social Security, 2021).

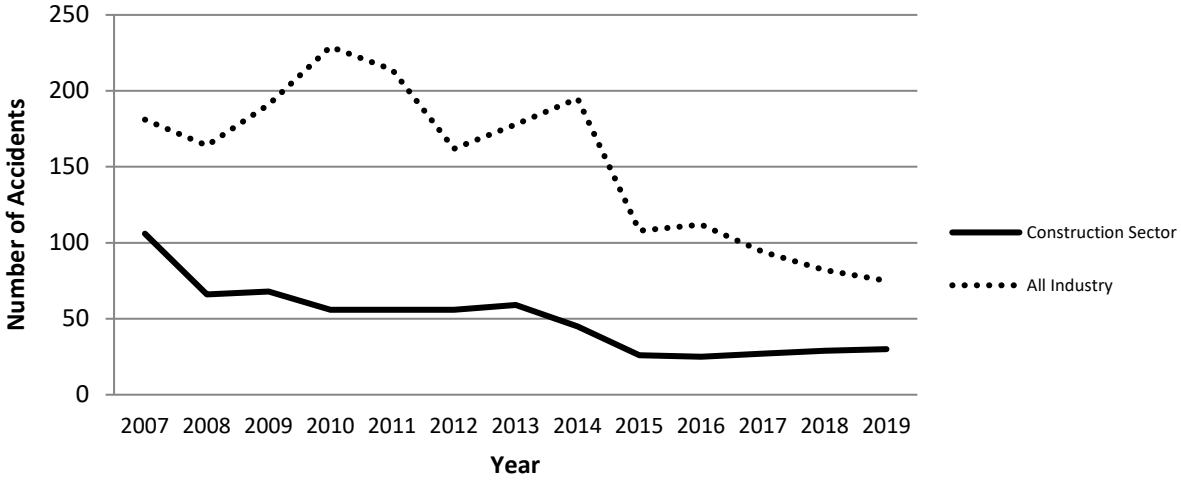

Figure 1. Number of accidents in both the construction sector and other industries from 2007 to 2019 (TRNC Ministry of Labour and Social Security, 2021)

Figure 1 indicates a significant decrease in the number of accidents in the construction sector after 2015. This could be linked to a possible drop in construction activities plus the appearance of some limited health and safety regulations undertaken in the last five years (TRNC Ministry of Labour and Social Security, 2021).

According to data provided by the Ministry of Labour, the accident rates in all sectors were very high in Northern Cyprus, where 50% of these accidents occurred in the construction sector. Between 2011 and 2016, approximately 1,242 occupational accidents occurred in all sectors, and 268 (21%) of these were in the construction sector. Furthermore, 43 occupational fatalities were recorded, and 20 of these occurred in the construction industry, which is approximately 47%. Social sensitivity and awareness are important in order to prevent occupational accidents. It is noted that even though there are insufficient officers at the Labour Department, continuous inspections have been conducted in construction sectors with no efficient or effective results.

1.3 Factors leading to construction accidents

The construction industry is more sensitive than other industries as a result of its uniqueness and significant complexities. Moreover, construction sites are considered to be dynamic and volatile (Alshemimry, 2016). If HS in construction sites are not under control, this will lead to unmanaged adverse conditions that may cause extreme injuries and potentially death (Lingard, 2013). Insufficient protection, the collapse of scaffolding and incorrect utilization of tools are all considered potential hazards. Also, accidents involving falling are the most frequent. This often occurs when the worker slips or steps backwards onto an unprotected open-sided slab while concentrating on his/her job. The absence of personal protection equipment (PPE) and uncovered holes is considered unsafe construction conditions. These conditions violate workplace safety standards. Moreover, falling from ladders is often caused by imbalance, cluttered surroundings and the excessive weight of the worker (Jha, 2011). Workers are expected to work at great heights with heavy machinery and mostly with dangerous building materials.

The major causes of accidents such as falling from a height, being hit by a moving vehicle, and falling objects are: (1) inappropriate methods used to move materials; (2) insufficient instructions and training by management given to workers; (3) absence of cooperation among workers; (4) absence of housekeeping standards; (5) management failure in securing safety measures at heights; (6) inadequate project planning that leads to insufficient materials storage; (7) improper provision of instructions regarding working at heights; (8) lack of caution signs; (9) absence of planning and supervision; and (10) absence of barriers (Essays, UK, 2013). On a construction site, workers are commonly expected to work at great heights. Scaffolding should be stable and safe. Qualified inspectors should regularly inspect scaffolding to see that it is stable and safe and ensure that scaffolding is securely installed.

Construction activities are unique since they occur in different applications based on the type of construction project. Nonetheless, recent studies have revealed that the majority of construction accidents can be narrowed down to three major sources: (1) failure to identify unsafe conditions before or after work starts; (2) performing construction activities even though conditions may be unsafe; (3) Not following or ignoring safety rules (Baumgartner, 2017). Scaffolding is a type of construction equipment used frequently on site. However, this equipment contributes too many fatal/non-fatal injuries. There are several reasons behind these incidences, such as weak planking, weak joint attachments which lead to collapse, proximity to power lines that leads to electric shock, changes in environmental conditions such as very high temperatures and extreme winds and finally, the absence of fall protection equipment (Chopra and Nocerino, 2018). Table 1 below briefly summarizes and provides some of the root causes of accidents by illustrating a list of developing countries and the cause of poor safety performance of safety in each of them.

Table 1. Sources of poor performance of construction safety in developing countries (Awwad et al., 2014)

Poor safety performance caused by	Reported in
Extensive subcontracting	Hong Kong, Kuwait, Uganda
Absence of adequate safety training	China, Saudi Arabia, South Africa
Absence of safety officers on site	China, Saudi Arabia, Uganda
Ineffective laws and lack of enforcement	Honduras, India, Malawi, Jordan
Extensive use of foreign workers	Kuwait
Lack of workers' self-protection and awareness	Pakistan, China, Jordan
Uncooperative clients and inadequate work procedures	Botswana, Egypt, Nigeria, South Africa
Poor accident record keeping	Kuwait
Lack of management commitment to safety budget allocation	Kuwait, South Africa, Malawi

A comparison has been provided in Table 2 between the safety performance in developed and developing countries based on several previous studies. This table aims to demonstrate how different types of countries deal with safety measures, which plays a vital role in either creating or preventing potential accidents.

Table 2. Comparison of construction safety behaviour between developing and developed countries.

Safety performance	Developing countries	Developed countries
Workers training and awareness	Workers don't know their rights, misunderstand the need for safety, and are provided with little or zero training (Zhou and Zhang, 2009)	Proper training for all workers and higher competence (Zhou and Zhang, 2009)
Top management and commitment	Top management is not cooperative and not supportive (Wong and So, 2002)	Regular supervision by top management, allocate proper budget for safety (Brabazon et al., 2000)
Safety Regulations	Safety laws do not exist or are enforced with limited standards (Recarte Suazo and Jaselskis, 1993)	Safety laws are enabled, implemented and monitored (Hinze et al., 2013)

2. MATERIALS AND METHODS

To achieve the aims of this study and to understand the present situation of HS, data collection was separately undertaken in both Northern Cyprus and Lebanon. Construction sites in several locations were personally evaluated in both countries. These procedures are achieved through several site visits and by conducting brief face-to-face informal interviews. The data collected based on personal observations include all types of mistakes undertaken by workers and engineers on the construction site regarding to HS. Both oral interviews and observations are informal data collection methods, but are suitable for certain kinds of data collection methods or techniques. Finally, all of these steps mentioned can be beneficial for answering all of the questions

regarding the views of workers, managers and existing OHS systems in both countries. The questions asked during the face-to-face interviews can be listed as below:

1) Are you aware of any construction HS regulations?
2) Do you take all necessary precautions to protect yourself by means of HS on the worksite?
3) Are you aware of the importance of HS rules which can minimize or prevent injuries and fatalities happening on the construction site?
4) What would be the benefits if all HS measures are undertaken at the construction site?
5) Have you ever been trained regarding HS?
6) Does this company apply safety practices? If yes, please list them.
7) Are you aware of PPE? If yes and provided, have you ever used them?
8) Have you ever witnessed any incident happened on site due to lack of HS precautions?
9) Do you believe that if necessary HS measures are undertaken, you will feel safer at the site?
10) Have you ever witnessed an officer inspect the construction site regarding HS precautions?

The type of response received on each question was a "Yes" or "No" and additional information was provided by the interviewees, where applicable (i.e. question no. 6 and 7).

2.1 Construction site visits

Forty different construction sites in several regions were visited in Lebanon and Northern Cyprus, respectively. Each visited site has been listed as a small, medium-scaled construction company. These construction types can be differentiated by recognizing the size of the project and the number of engineers and workers involved. During the site visits in both countries, photos were taken at each site. It was observed that most of the sites that visited had no supervisors or foremen present. Furthermore, it was essential to record some notes by personally evaluating and monitoring the existing situation in each site visited.

2.2. Analyses and data interpretation

For proper visualization of this study, three main groups have been established: Workers and Accidents, the existence of HS measures and rules and workers' attitudes. According to these groups, a comparison will be conducted between Lebanon and Northern Cyprus. Moreover, photographic images are considered supportive observations. These photos are displayed in collage form to provide a clearer and more organized visualization. There is no computer software interference for analyzing the data collected. The data collected was analyzed manually by classifying answers under different categories.

3. RESULTS AND DISCUSSION

The results and analyses of the observations made during the site visits and informal oral interviews with workers and engineers are provided below. The data collected from Lebanon are given first, and then the results collected from Northern Cyprus will be given consecutively. The following approach was used to determine the sample size.

This calculator uses Formula 1 for the sample size

$$n = \frac{N \times X}{X + N - 1} \quad (1)$$

Where,

$$X = \frac{\left(\frac{Z_a}{2}\right)^2 \times p \times (1-p)}{MOE^2} \quad (2)$$

and $\left(\frac{Z_a}{2}\right)$ is the critical value of the Normal distribution at $\left(\frac{a}{2}\right)$ (e.g. for a confidence level of 95%, α is 0.05 and the critical value is 1.96), MOE is the margin of error, p is the sample proportion, and N is the population size. Note that a Finite Population Correction (FPC) has been applied to the sample size formula. Daniel (1999) explains how the FPC is used to adjust a variance estimate when sampling without replacement. In total, 100 construction sites were visited both in North Cyprus and Lebanon to gather the required data for the research study.

3.1 Results of the interviews undertaken with workers and engineers in Lebanon

The data collected are categorized under three main topics: HS Measures, rules and workers attitudes, and workers and accidents. Accordingly, it was observed that HS rules do exist in Lebanon, but due to the governmental instability and corruption, there is no possibility of implementing the existing HR rules. Not any construction projects follow any of the HS rules except the projects undertaken and controlled by foreign investors. Most workers are not aware of the HS rules and have never been trained regarding OHS. This supports the idea that if workers are not educated and trained about HS rules, they can request for necessary precautions to be taken to work in a safer environment. It is also understood that most of the accidents that occurred are incidents which may have a high possibility of prevention if all necessary HS measures are taken. This is also supported by the findings of Nawi et al. (2016). Therefore, it is once again supported that if HS measures are taken, a high percentage of the accidents occurring at construction sites can be controlled or prevented even before happening. The data collected via personal observations and answers to informal oral interviews are categorized, and the most common answers are listed in Table 3.

3.2 Results of the interviews undertaken with workers and engineers in Northern Cyprus

The data collected from construction sites in Northern Cyprus showed that HS regulations exist, and most companies intend to follow HS rules. The workers, engineers and managers of the construction projects in Northern Cyprus have given answers which support this belief. However, when personal observations made it was observed that some limited HS measures exist in the construction site, they are not very effectively and efficiently followed up by workers and engineers in charge. This shows that there is a lack of enforcement by the authorities; hence, they do follow only HS measures that do not cost them a lot and the rest are not applied at all. This, of course, ends up with accidents and sometimes fatalities as not all the required HS measures are taken in order to provide the necessary HS precautions, especially for the workers who work under high-risk conditions. The data collected from the construction sites in Northern Cyprus is also categorized under three main classes and the main common answers collected are listed in Table 3.

Table 3. Data Collected via Personal Observations and Informal Oral Interviews in Lebanon and Northern Cyprus

	Lebanon	**Northern Cyprus**
HS Measures	HS rules exist but are not implemented and not organized due to governmental corruption and ignorance.	Most of the medium and large construction companies usually follow HS rules and regulations, but not completely.
	No supervisory visits and lack of financial support for security measures.	Small construction companies do not follow most of the HS rules, but they show a willingness to adopt such rules if they are enforced by the authorities.
	Small, medium and most of the large construction companies do not follow most of the HS rules.	Reasonable budget regarding financing the security measures.
	Foreign construction investors strictly adhere to HS Rules.	Supervisory visits are often conducted monthly in medium and large construction companies.
Rules and Workers Attitudes	Most workers are not aware of HS measures and rules.	Most workers are aware of construction HS and they have a certain level of awareness of its importance.
	The other workers are familiar with such rules but they ignore them.	Small construction companies ignore HS because their managers and owners consider their profits a higher priority than HS.
	Most workers do not care about HS rules and regulations since their salary is their only priority and concern.	
Workers and Accidents	The major serious accidents that most frequently occur on construction sites are falling from roofs, falling from scaffolding and electrical shocks.	The major serious accidents that frequently occur in construction sites are falling from height and electrical shock.
	Minor construction accidents include cuts and stepping on nails	Minor construction accidents include cuts and stepping on nails.
	If workers are injured, their construction companies cover their hospital and medical fees, or the companies themselves already have contracts with insurance companies.	
	Most of these accidents occur due to workers being distracted while performing construction activities.	

3.3 Construction sites observations

As can be seen in Figures 2-11, the main concern regarding HS in construction sites located in the Northern part of Cyprus and Lebanon is the lack of PPE. It is apparent that there are no regulations that enforce managers and foremen to make workers use PPE while working under risky conditions. This may be linked to the fact that most of the injuries and fatal incidents might be prevented if the authorities enforced the use of PPE.

Figure 2. Workers undergoing construction activities without PPE

Figure 3. Disastrous form of scaffolding and absence of PPE

Figure 4. Messy surroundings and improper waste disposal

Figure 5. Poor edge protection

Figure 6. Better form of scaffolding system compared to Lebanon case

Figure 7. Presence of warning signs and barriers

Figure 8. Workers wearing proper PPE but the way of working is not adequate

Figure 9. Proper edge protection

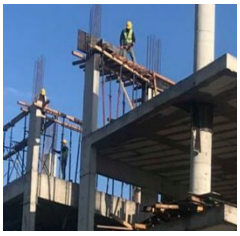

Figure 10. Working on a roof without adequate height protection

Figure 10. A worker performing plastering without any PPE in a small construction company

The pictures represented in Figures 2-5 were taken in Lebanon and the pictures represented in Figures 6-11 were taken in the Northern part of Cyprus. In Figure 6, better form of scaffolding was observed when compared to applications in Lebanon, it is still not the most appropriate, since although the scaffolds are better assembled than in Lebanon, there are missing boards and bracing, along with handrails and skirting boards on the inside of the scaffolding and in the final sections. In Figure 8, although the workers are wearing the appropriate personal protective equipment, the way of working

is not adequate since they have external work platforms (such as perimeter scaffolding) that prevent workers from climbing by the frame. Even though personal protective equipment is provided to the workers, it is worth noting that protection should not be limited to personal protective equipment. Still, it should be rather collective protection and have adequate auxiliary means, such as working platforms and/or nets which should always take priority over Personal Fall Protection Equipment.

3.4 Analysis of the data collected via interview and observation in Northern Cyprus and Lebanon

Even though Lebanon and Northern Cyprus are both developing countries located in the Mediterranean region and both are influenced by foreign HS rules and regulations, the situation regarding HS measures in construction sites is significantly different.

These differences are mentioned below as follows:

- Northern Cyprus construction companies are more aware regarding HS as a result of which they make efforts and show willingness toward them, unlike Lebanon, where the situation is chaotic due to governmental corruption, mismanagement and disorganization.
- In Northern Cyprus, supervisory visits are performed continuously in most of the medium and large construction companies, whereas in Lebanon, no supervisory visits are done. Supervisory visits are only conducted in large and foreign construction companies.
- Workers inside small, medium and semi-large Lebanese construction companies show no compliance with HS measures due to a lack of knowledge, lack of expertise, misunderstanding and ignorance. In Northern Cyprus, workers in medium and large construction companies mostly follow the HS measures, and they are aware of the seriousness of such measures.
- Small construction companies in Northern Cyprus are slightly better regarding HS measures such as setting up warning signs, barriers and suitable forms of scaffolding. Conversely, small Lebanese construction companies make no efforts in relation to the above.

In general, it was observed that since engineers are well educated, they are aware of the necessary precautions that could be taken to provide a safer environment for themselves and the workers. On the other hand, workers are not well aware of what precautions could be taken to protect themselves from possible accidents, but they are aware that HS precautions could be protected. Therefore, this implies workers' training regarding the importance of HS and all possible safety measures that could be taken to protect themselves under a risky working environment. This will surely allow them to ask for the required precautions to be taken in order to work in a safer working environment.

Before any construction projects are initiated in both countries, they establish contracts with insurance companies such as insurance against fire and different types of injuries. These insurance companies cover the hospital and medical fees of any workers in case of any construction accidents. Moreover, the small construction companies in Lebanon HS measures mainly do not exist, whereas in Northern Cyprus, only a few companies do follow the requirements of HS procedures.

Falls from height and electrical shock are the most frequent catastrophic construction accidents that occur in both countries. The statistics provided by the local authorities of Northern Cyprus showed that at least 30% of the accidents happening due to falls from height and electrical shocks. Also, minor accidents such as cuts and stepping on nails (which is representing less than 1% of the occurred accidents) have similar frequencies in both countries. These accidents are all happening due to the lack of attention from workers while performing their construction activities Unfortunately, this conclusion was derived based on data we have collected via personal observations and informal interviews with the workers. However, no such data is officially available from the authorities of Lebanon therefore, there is no possibility of giving exact numbers and do a comparison between the two countries based on the statistical data since such exact

data is not reachable for Lebanon. On the other hand, some limited official data is available for North Cyprus, as mentioned earlier (TRNC Ministry of Labour and Social Security, 2021).

Based on the interviews and personal observations conducted in both countries, it is found that Lebanese construction sites have significant deficiencies regarding HS measures. Even though HS rules and measures exist in Lebanon, it was discovered that the overall situation in the country is chaotic. The reasons behind this are governmental corruption and the general disregard of such measures as a result of the greed of construction companies. In other words: there is no PPE, no supervisory visits, no first aid, no safety training and no warning signs or barriers. On the other hand, Lebanon has made a positive step regarding construction accidents as companies are obliged to make agreements with insurance companies in case of injured workers in order to cover their hospital and medical fees with paid recovery days.

Although there are major deficiencies regarding construction HS in Northern Cyprus, they show a certain level of willingness toward implementing HS measures and rules. These are observed in three-quarters of all construction companies. These deficiencies include the lack of suitable fall protection in small, medium and large construction companies and the absence of PPE in small construction companies.

According to the above-mentioned findings, it can be evaluated that in Northern Cyprus there is communication between government departments and construction companies but not a full way, while in Lebanon, lack of such communications was revealed. Governments and construction companies themselves, whether they are honourable or corrupted, play a significant role in determining whether HS measures are effective or not.

The findings of this research work are consistent with all other research works undertaken in different regions of the world. Accordingly, the same attitudes exist regarding to HS in construction sites. It is agreed that not all necessary precautions are taken in order to provide a better and safer working environment for the personnel of the construction site. This is especially valid for developing and not developed countries of the world, whereas a better approach and applications regarding to HS exist in developed countries (Abdul-Rashid et al, 2007; Durdyev et al., 2017: Sarkam et al., 2018; Sawache et al., 1999; Wang and Soo, 2019).

3.5 Data discussion

The most ignored factor in Pakistan is OHS training along without including safety contract documents in construction projects (Zahoor et al., 2016). This situation presents exactly in most Lebanese construction companies as revealed from the obtained results by which it is an essential step to initiate a good OHS system. It is because of government corruption and the greediness of the most Lebanese construction companies.

Although government corruption is a problem in and of itself, it has also had negative economic consequences; it has been suggested that it is the primary cause of Lebanon's economic decline. Owing to these conditions, citizens of Lebanon have become increasingly critical of the quality of life in Lebanon, with many directly blaming politicians. In 2018, Lebanon's economic growth was just 0.2 percent, with a 30 percent unemployment rate for youth. As a result of these conditions, citizens of Lebanon have become increasingly critical of the quality of life in Lebanon (Eloubeidi, 2020). Unfortunately, the economic difficulties caused by the government corruption put workers safety to be subordinated by investors who aim to make money first.

Two external factors influence the physiological conditions of the construction labourer along with their safety awareness, especially in South China;(1) social impact by which it has a tendency to allow labourers to recognize safety awareness and its benefits ;(2) physical working condition played a major role in being a negative impact (Fung et al., 2016). Same as in Lebanon and North Cyprus, these two factors dramatically affect construction workers mentally and physically. Overall, they need a good education and

awareness regarding HS and how authorities and responsible managements should provide a good or safe working environment, especially in Lebanon.

Poor communication between departments is the top reason for construction accidents in Malaysia. The outcome of the deep case study revealed that the companies' noticeable attempt to ensure HS communication arrangement at the level of grouping and operating (Siew, 2015). Speaking to communication, this reminds us that in Lebanon, there is very poor communication between departments, according to the results obtained in this study. This situation happened because of the government corruption itself combined with the greediness of most Lebanese construction companies. Meanwhile, in North Cyprus, communication was available but not fully, but it had a positive step toward HS improvement.

The designer and the contractor showed a good contribution to share their responsibility for securing safe construction sites in a harmonized regulation in South Australia. However, it is very complicated when it comes to designer's responsibility since they cannot wholly design for safety. Moreover, safety design was significantly depending on the construction industry (Bong et al., 2015). According to the outcomes of the study regarding construction safety responsibilities in Lebanon, it is found that a complete absence of safety officers and supervisory visits is mainly due to a lack of safety staff and safety training. However, in North Cyprus, a good efforts and carefulness were shown regarding educational and safety staff.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

According to previous studies, as well as the interviews and observations (site visits) made in this study, it is recognized that the global construction industry is one of the most sophisticated and hazardous industrial sectors due to the fact that unfortunate incidents continue to occur on construction sites, especially in developing countries such as Lebanon and Northern Cyprus. OHS plays a significant role in controlling such hazards, but its usage varies from country to country. The most common type of accident is falling from heights, electrical shocks that occur in construction sites of both countries. Only very large construction companies and foreign ones in Lebanon are strictly following HS measures. Companies in both countries make contracts with insurance companies in order to cover hospital and medical fees for construction workers in case of accidents which are the responsibility of the employers according to the laws. Therefore, the findings of this research work proved that accidents could be prevented and even eliminated if all the required safety precautions are implemented. The root causes of the accidents need to be identified, and effective preventions measures should be taken to minimize the frequency and intensity of the accidents happen. This will surely improve the safety performance of the personnel on construction sites.

4.2 Recommendations for Lebanon

Since construction OHS in Lebanon is highly chaotic, significant efforts should be made in order to develop OHS in Lebanon, especially for construction workers, companies and the public. The recommendations below should be implemented in order to establish a safer and better working environment:

- Reassign new professional staff, members and managers in construction companies and governmental departments.
- There must be cooperation between the Ministry of Labour and companies to strictly implement the OHS rules and measures, ensure strict commitment to regular inspections and that companies are equipped with essential tools for worker's needs.
- Enforce new HS rules and regulations that ensure a better working environment.
- Maximize the number of inspectors and provide them with intensive training in order to ensure that the safety of construction sites and workers' basic rights are maintained.
- Enhance the communications, relations and cooperation in the labour management field.

- Conduct media campaigns to raise public awareness and HS education.
- Provide vital education to the younger generations regarding OHS so that they are more aware of the risks surrounding construction workers.
- Conduct regular technical consultative meetings to enhance work processes, management issues and reporting mechanisms.
- Ensure those who violate the HS rules and measures are penalized.
- Obligate workers to use PPE before entering a worksite, which should be the minimum requirement.
- Ensure that intensive OHS training courses are provided for construction workers and that first aid equipment is widely available.

4.3 Recommendations for Northern Cyprus

According to this study, the situation regarding construction OHS in Northern Cyprus is much better than that in Lebanon, although there are still lots of deficiencies. Recommendations have been made in order to enhance the construction OHS in Northern Cyprus significantly. These recommendations are as follows:

- Government and the relevant authorities should strictly monitor the practices of small construction companies
- Strictly enforce the use of PPE, first aid and edge protection in small construction companies.
- Conduct frequent strict supervisory visits, especially in small construction companies.
- Strict provisions of fall protection equipment in all construction companies and perform comprehensive training programs on how to use such equipment.
- Provide more educational programs regarding HS and raise public awareness via the media.
- Provision of more professional HR staff to take care of small construction companies.

4.4 Recommendations for future studies

- Estimation of costs incurred as a result of accidents such as hospital and medical expenses, on site losses and then conduct economic analysis to determine whether the safety measures were utilized or not in the construction sites.
- To improve the quality of this study, it is important to gather more data, conduct more construction site visits and perform more interviews with a greater amount of respondents. However, this would require a longer time frame and a vaster scope than is permitted by the present study.

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