



**RESEARCH PAPER**

**Slips, Trips and Falls (STFs) as contributors of Injuries and fatalities  
in Construction Industries of Lahore – Pakistan**

Hassan Zahid\*<sup>1</sup> Dr. Mahmood Khalid Qamar <sup>2</sup> Dr. Houda Javed <sup>3</sup>

1. Ph. D Scholar, Department of Environmental Management, National College of Business Administration & Economics, Gulberg III, Lahore, Punjab, Pakistan
2. Professor, Department of Environmental Management, National College of Business Administration & Economics, Gulberg III, Lahore, Punjab, Pakistan
3. Visiting Faculty Member, Department of Environmental Management, National College of Business Administration & Economics, Gulberg III, Lahore, Punjab, Pakistan

**PAPER INFO      ABSTRACT**

**Received:**  
March 03, 2021

**Accepted:**  
June 20, 2021

**Online:**  
June 25, 2021

**Keywords:**  
Construction  
Safety,  
Fatalities,  
Injuries,  
Occupational  
Safety and Health,  
Prevention,  
Protection,  
Slips,  
Trips & Falls,  
Workers

**\*Corresponding  
Author**

hseculturedevelop  
ers@gmail.com

This research aims to identify the self-reported frequency of injuries and fatalities due to Slips, Trips and Falls and to associate with the influencing factors in various construction industries of Lahore. In past few decades, the construction industry has experienced substantial growth globally. In Pakistan, the construction industry is contributing 2.39% to the GDP employing over four million people. However, construction industry is considered to be the hazardous industry. Slips, Trips, Falls (STFs) have been discerned as major source of injury in construction industries. This research is conducted by conducting a questionnaire survey. Data was gathered from 85 workers in construction industries of Lahore, Pakistan. Data was analyzed using the Statistical Package for the Social Sciences (SPSS). The highest number of fatalities was found in Category C4, C5 and C6 of construction industries. Major injuries were found to be Back Injuries / Sprains or Strains / Broken Bones (42.35%). 43.53% of the workers mentioned that there was no usage of fall protection devices at the time of fall. The study recommends that occupational health professionals and policymakers should incorporate the various factors while designing prevention and protection strategies.

**Introduction**

Construction industry is among the notable industries in the matter of its contribution to economic progress (Le, et. al., 2014) as well as Occupational Safety and Health (OSH) of the workers (Suazo & Jeselskis, 1993). Worldwide, it is considered to be one of the most hazardous industries (Teo & Ling, 2006; Choudhry et. al. 2008a). The construction industry is entirely dependent on labours than the

equipment (Yi & Chan, 2014) entailing 2.5 – 10 times more employee for each task (Koehn et. al. 1995).

In numerous countries, the construction industry is infamous for outrageous levels of occupational injuries and illnesses (HSE, 2018a; Bureau of Labour Statistics, 2018). In construction sector, safety statistics specifies elevated injury and fatality rates globally (Teo & Ling, 2006; Choudhry et. al. 2008a). It is conventional to ascertain the appalling incidents in construction industries leading to physical injury, illness or death of employees and public. Such circumstances are not solely confined to developing countries but developed countries as well (World Bank, 2019). With regard to the occurrence of occupational illness and injuries, the situation of developing countries is alarming (Hämäläinen et. al. 2006; Takala et. al. 2014).

Pakistan, being a developing country, has undergone prompt expansion in construction business during past few years with 3 million people with a career in the industry (PBS, 2012). In Pakistan, construction is more worker strenuous in contrast to developed countries (Choudhry et. al. 2008a). The construction industries in Pakistan contribute to 2.5% of Gross Domestic Product, recruit and employ 7.4% and 30% of the total work force directly and indirectly respectively (PBS, 2013). The construction industry is categorized as 1<sup>st</sup> among the service sectors and 3<sup>rd</sup> among all economic sectors corresponding to the percentage of revealed occupational injuries or diseases (PBS, 2012). Construction injuries and fatalities constitute about 15% of total work force injuries and fatalities (PBS, 2012). Notwithstanding with the disturbing statistics, no momentous effort has been laid out to advance the safety conditions of construction workers in Pakistan (Raheem & Hinze, 2012). With respect of Occupational Safety and Health (OSH), the existence of insecure ambience can be observed at numerous construction sites leading to budget overrun, low efficiency and time delays (Farooqui et. al. 2008).

The distinctive situation of business strategies in developing countries is associated with the dearth of proper OSH regulations (Lodi et. al. 2008). The paramount barriers in the implementation of Occupational Safety and Health at workplaces include inadequacy of insight into safety management skill and expertise, owner's apathy and non-existence of regularity body and infringement of workers (Farooqui et. al. 2007; OSHA, 2014). It is commonly observed that safety clauses are assimilated in contractual documents but not stringently imposed (Ali, 2006). In addition, the situation becomes worse owing to not keeping the records of accidents at workplaces. For the development and implementation of OSH standards, inception of national level organization is mandatory (Choudhry et. al. 2008b).

In Pakistan, much heed has not been paid to construction safety, consequently, an elevated accident rate can be observed. The precedence of employees is disposed towards the improvement of quality as well as limiting time and cost (Farooqui et. al. 2008a). For majority of small and medium scale

constructors, safety is contemplated as stumbling block (Hassan, 2012). Workers also evaluate safety as constraint to their productivity (Awan, 2007; Mohamed et. al. 2009). In contractual documents, Pakistan Engineering Council (PEC) has embodied safety clauses, although, they are not complying with modern technological advancement (Larcher&Sohail, 1999; Mohamed, 1999).

There is a dearth of authentic published information with reference to the number of injuries and fatalities in construction sector of Pakistan. It is for the reason that owners and stakeholders are hesitant outright to share the real record of accidents. In construction industries, the paramount obstacles encompass lack of a safe regulatory body, paucity of safety knowledge and awareness, incognizance with foremost safety practices, deficiency of safety dedication by contractors and owners and insufficiency of safety training. In view of the fact that there is absence of safety statistics, construction projects have never been analyzed in relation to the strengths and weaknesses of safe practices versus safe performance. In light of the facts and situation, the challenge in the country is to boost safety situation. In this regard, various areas inclusive of safety in contracts, safety meetings and trainings, worker's involvement, best safety practices, equipment safety, safety legislation and enforcement and so on may be given proper consideration (Choudhry & Zahoor, 2016).

This research was conducted to explore the prevalence and predisposing factors affecting occupational injuries specifically Slips, Trips and Falls in construction industries of Pakistan. With this intention, a questionnaire survey was conducted at construction industries of Lahore.

### **Literature Review**

In Pakistan, the construction industry involves intensive work out by the manpower, little usage of machines and weaker implementation of safety regulations. With regard to Pakistani construction industry, people are of the opinion that the foundation of current occupational and health circumstances is shattered and scantily enforced. Moreover, in any industry, there exists a strong correlation between good health and safety conditions and good and safe practices. In Factories Act of 1934, regulations require the employer to endure fundamental rules for the sake of handling the organization in a secure environment. It is regrettable that the fundamental regulations in the Factories Act are not pertained to the construction industry by law. In spite of being a significant contributor to national economy and accomplished swift growth in past few years, government is not taking crucial steps to manage the safety and health hazards for construction employees (Ali et. al. 2007). Surprisingly, in the Labor Policy of 2010, the government is ineffectual to approve and validate any legislation regarding safety of construction workers. The policy states: "In order to guard against occupational hazards and to provide safe working conditions for those employed in this vital sector of the economy, the Government shall enact suitable legislation to ensure the health and

safety of construction workers and to provide benefits available to other formal sector workers" (Labor Policy, 2010).

In order to carry out projects without injuries and reductions of workplace risks, there is a requirement of the implementation of health, safety and environmental management system at workplace (Choudhry et. al. 2008b). It is noteworthy that variations exist with regard to construction safety in developed and developing countries, which include the existence of legislation and its efficacious execution as well as hazard analysis and comprehension. In developed world, the legislations and acts related to safety are put into practice effectively. In addition, safety officers are entrusted with the promotion of workplace hazard awareness with the aid of safety trainings (Choudhry et. al. 2008a). However, in developing countries like Pakistan, safety legislations hardly exist and the established legislations are insufficient, worthless or obsolete. Furthermore, the regulatory authority is generally frail in implementing safety regulations functionally. The situation becomes worse because either the hazards are workplace are not examined under any circumstances or they are discerned as being tolerable risk for the safety of workers (Ali, 2006).

In respect of safety performance of large and small contractors, a notable difference can be observed. Majority of the large firms in Category C-A as categorized by PEC i.e., category of contractors with no financial limit have definite safety policies. The workers are also provided with the training and perpetuated safety personnel at workplaces. In comparison to this, small contractors do not incorporate safety in their plan. Consequently, on many constructions projects by small contractors, life-threatening conditions exist and workers are at stake (Choudhry et. al. 2008b).

At many workplaces, no training programs exist for workers; induction training for new workers and safety meetings are not organized. Besides, insufficient medical facilities, poor sanitation and housekeeping can be observed on isolated projects (Choudhry et. al. 2008b).

The construction industry is considered to be hazardous industry. With regard to occupational health and safety, the execution is very below par. The situation in developing countries is surprisingly unsatisfactory (Kanchana et. al. 2015). For preferable strategy and usage of resources, incorporation between safety and quality should be attained (Pheng & Shiua, 2000). A study conducted by Koehn and Datta (2003) concluded that with safety rules and regulations, issues like low-grade quality work, insecure working environment and insufficient environmental control can be controlled, meanwhile, cost can be reduced and efficiency can be improved. Safe work practices fluctuate with construction sites owing to distinctive safety characteristics. Larger construction projects are better systematized, though, small to medium organizations do not have appropriate safety program to administer safety criteria (Wilson & Koehn, 2000).

With the technological advancements, productivity in the industry has been influenced positively; nevertheless, more laborious and insecure working environment has been established (Farooqui et. al. 2007). Every construction workers is apparently infirm for work leading to minor health issues and injuries after performing tasks on a construction site (Ho et. al. 2000).

The customary cause of deaths and injuries at construction sites is falling from heights (EU OSHA, 2003). In all sectors, slips, trips and falls are considered as substantial causes of accidents. In case of falling from heights, the principal causes encompass working on a platform or scaffold in the absence of guard rails, or in the absence of properly attached safety harness as well as brittle ladders and roofs that are imperfectly preserved, placed and fixed (EU OSHA, 2011). In Iranian construction workers (47.2%), falls or slips were two predominant type of accidents (Amiri et. al. 2014).

A study conducted on Slips, Trips and Falls (STF) at surface mines reported non-fatal STF incidents at Stone, Sand and Gravel (SSG) mines. Over 3 years period, 1,339 incidents i.e., 22% of all reported non-fatal injuries or 446 incidents per annum on average basis were observed. Most frequently, mobile equipment operators, mechanics, utility men and laborers were involved in non-fatal STF accidents. Running, walking, machine maintenance, getting machine on/off, repair and handling materials and supplies deemed for more than 80% of activities being executed at incidence time (Nasarwanji et. al. 2019).

A research involved 3,983,881 non fatal accidents at worksite during 2005 incorporating more than 3 work day's absence. The substantial category constituting to 14.4% was found to be 'slipping-stumbling and falling - fall of person - on the same level'. Moreover, 4.4% was documented as 'treading badly, twisting log or ankle, slipping without falling' (European Commission, 2008)

In United States, it was found that among 1,162,210 non-fatal occupational accidents and diseases at private and governmental companies documented in 2013, fall from the same level accounted for 17.4%, consequently, a median 10 lost work days. Furthermore, 4.4% of recorded were slips or trips without fall, nonetheless, accompanied by an injury and median 11 lost work days (BLS, 2014). Therefore, the findings specify that Slips, Trips, Falls on the same Level (STFL) represent 1 in 5 of documented non-fatal occupational accidents. There is paucity of valid data for occupational injury internationally. The data designates that work related injury rates are extensive in countries beyond those having established market economies (Hämäläinen et. al. 2006).

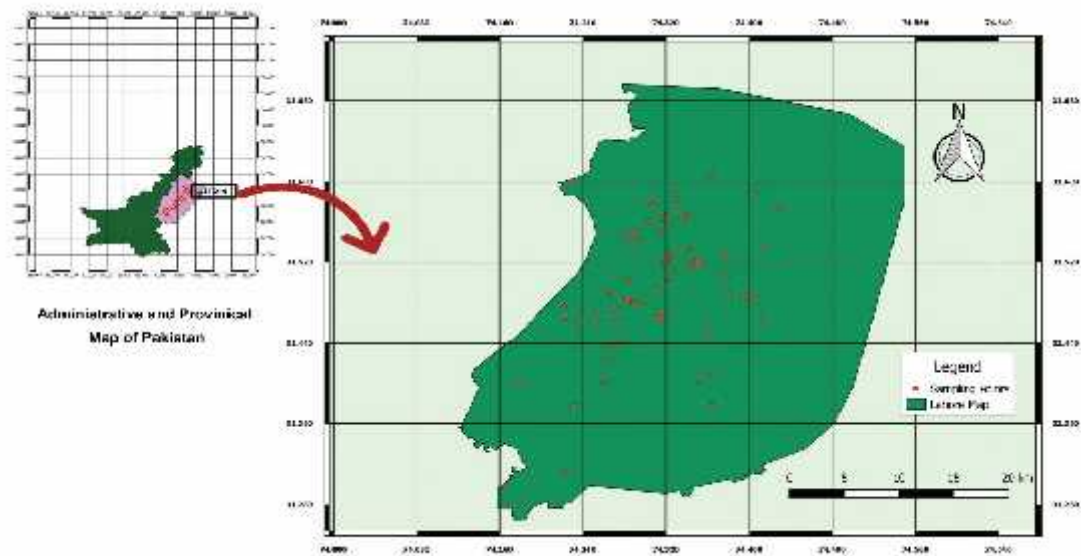
In developed countries, a decline can be observed with reference to the number of occupational injuries, although, an elevation can be seen for injuries from STFL. In study conducted between 1987 and 2011, at companies within French general social security system, investigation disclosed a gross curtailment of 13.6 accidents per 1000 employees (CNAMTS 1988; 2012)

In case of injuries in falls on the same level, the extremities comprising of toes, feet and knees were most influenced body parts accounting 30.7%. The second most harmed part was the trunk comprising of shoulder and back with 25.6%. About 21.8% of overall injuries can be observed in workers with multiple injured body parts. (Yeoh, et. al. 2013)

## Material and Methods

### Sampling Areas

The sampling areas of the current study are outlined in Figure 1



**Figure 1:** Sampling Points

### Sample Size and Sampling Method

According to financial limit and investment, Pakistan Engineering Council (PEC) categorized the construction industries in 6 groups ranging from C1 to C6. To conduct this research, the data was gathered from construction industries of Lahore (n=85) in various categories as specified by PEC. Random sampling technique was adopted to gather the data from construction industries so that sample can be a good representative of the population (Wu et. al. 2008, Zahoor et. al. 2016).

A quantitative research approach i.e., questionnaire survey was adopted to outlook the stakeholders of construction industries. The questionnaire survey was carried out in Lahore, a mega-city of Pakistan. In order to gather the data, site visits were conducted with the intention to inform the stakeholders and workers about the purpose of the study.

## Questionnaire Design

An extensive literature was accomplished to design the questionnaire. The questionnaire was designed in 2 parts. Part 1 of the questionnaire comprised of basic background information including age in years, gender, qualification, job title, work experience etc. Part 2 of the questionnaire focused specifically on the Slips, Trips and Falls in construction industries. The participants were asked about the policy, communication, personal protection, training, site inspection, injuries and illnesses, safety promotion, documentation and identification of the causes of STF accidents. The centre of attention of current research paper is predominantly injuries and illness owing to the insufficient data availability specifically concerning Slips, Trips and Fall accidents in construction industries of Lahore.

## Statistical Analysis

The statistical analysis and graphical representation of the gathered data was performed using Statistical Package for the Social Sciences [IBM SPSS Statistics (Version 20)]. For nominal variables, Chi-Square test was performed to compute the level of significance. The p-value < 0.05 was contemplated to be significant.

## Results and Discussion

The data was gathered from 85 participants from different categories of construction industries as specified by PEC according to financial limit. The details concerning the number of respondents from each category of construction industry is tabulated in Table 1.

**Table 1**  
**No. of Respondents in each category of construction industry**

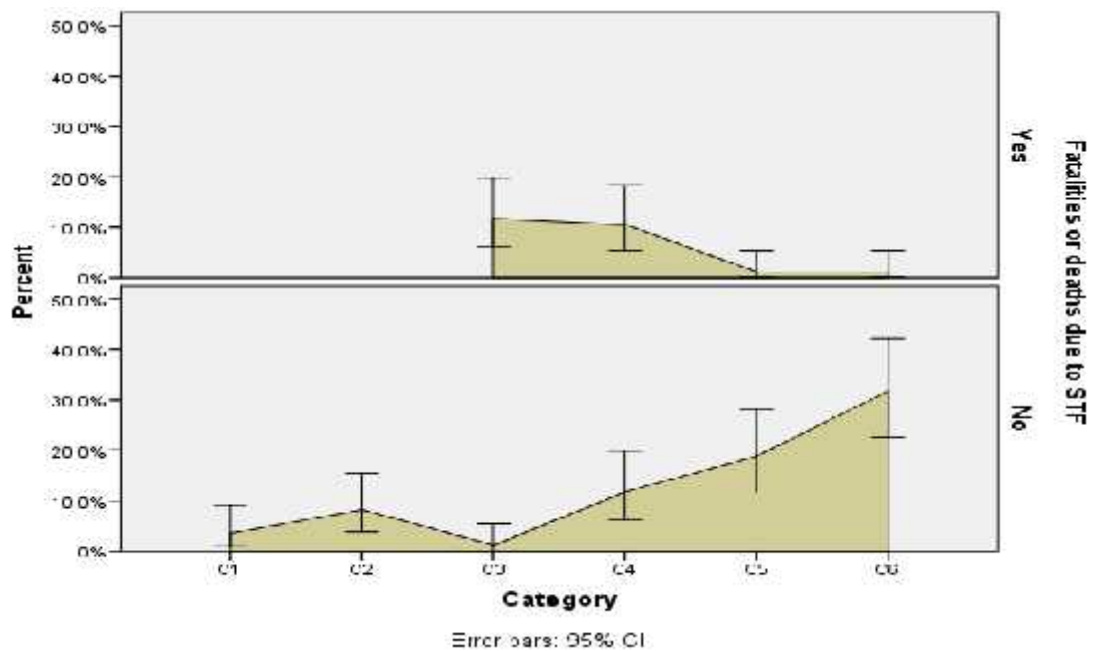
Categories of PEC	Financial Limit	No. of Respondents (%)
C1	1000 Million	3 (3.53)
C2	500 Million	7 (8.24)
C3	250 Million	11 (12.94)
C4	100 Million	19 (22.35)
C5	30 Million	17 (20.00)
C6	15 Million	28 (32.94)
<b>Total</b>	-	85 (100)

The baseline attributes of workers against each category of construction industries of Lahore are outlined in Table 2. All the respondents were males. Collectively, the average age of the respondents from all construction industries of Lahore was found to be  $37.93 \pm 11.30$  years. The average work experience of respondents was calculated to be  $12.58 \pm 9.12$  years.

**Table 2**  
**Baseline attributes of workers in construction industries of Lahore**

Categories	Factors	
	Age in Years(Mean $\pm$ SD)	Work Experience in Years (Mean $\pm$ SD)
C1	32.00 $\pm$ 9.54	10.67 $\pm$ 9.50
C2	35.71 $\pm$ 14.18	15.93 $\pm$ 13.27
C3	39.00 $\pm$ 12.69	11.64 $\pm$ 9.12
C4	35.21 $\pm$ 11.71	9.74 $\pm$ 8.61
C5	40.06 $\pm$ 11.66	14.41 $\pm$ 10.03
C6	39.25 $\pm$ 9.94	13.14 $\pm$ 7.84
<b>Total</b>	37.93 $\pm$ 11.30	12.58 $\pm$ 9.12
<b>P-value</b>	0.642 <sup>b</sup>	0.578 <sup>b</sup>

In Part 2 of the questionnaire, the interviewee were asked about the injuries and illnesses ascribable to work in construction industries. With regard to fatalities and deaths due to Slips, Trips and Falls at construction industries, the category-wise response of the workers is plotted in Figure 2. Majority of the workers in all construction industries reported that no fatality or death have been observed at jobsite. The response of the workers varied with the categories of the construction industries significantly ( $p < 0.001$ ).

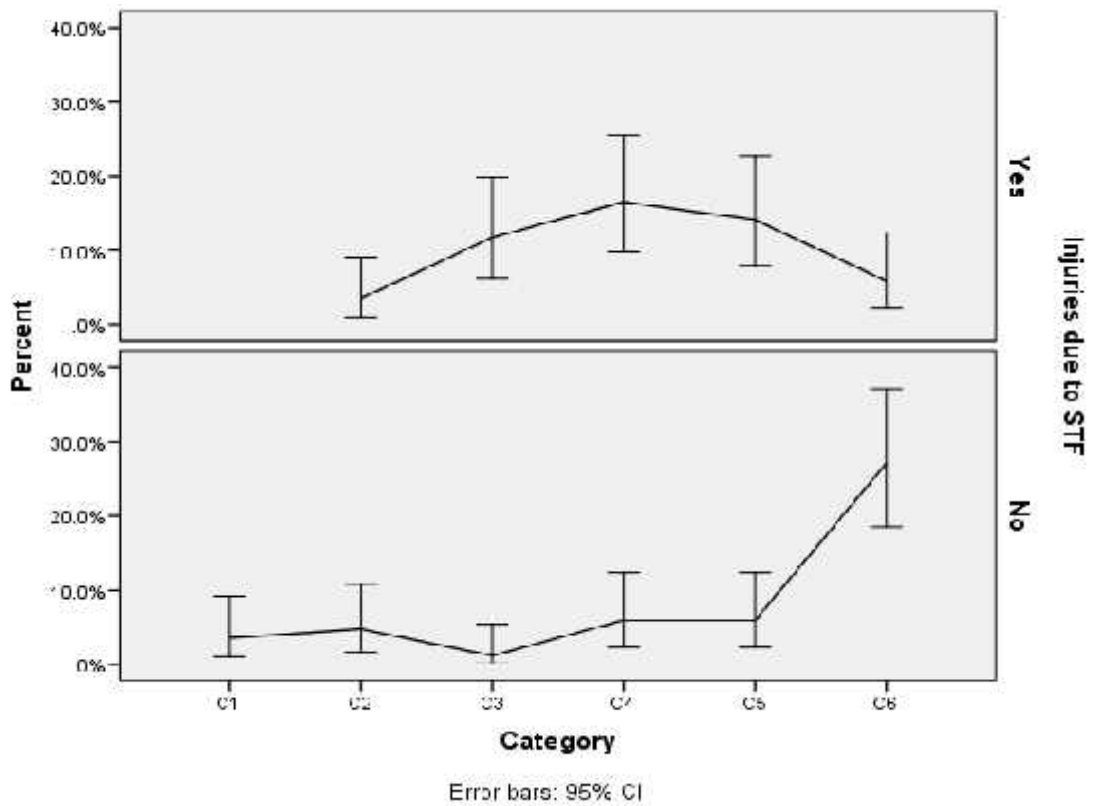


**Figure 2:** Response of workers on the fatalities or deaths due to Slips, Trips and Fall

With regard to injuries due to Slips, Trips and Falls at construction industries, the category-wise response of the workers is plotted in Figure 3. A mixed response by the workers in all construction industries can be observed with reference to



reported injuries. The figure indicated the percentage of workers with the specific responses. The response of the workers varied with the categories of the construction industries significantly ( $p < 0.001$ ).



**Figure 3:**Response of workers towards injuries due to Slips, Trips, Fall

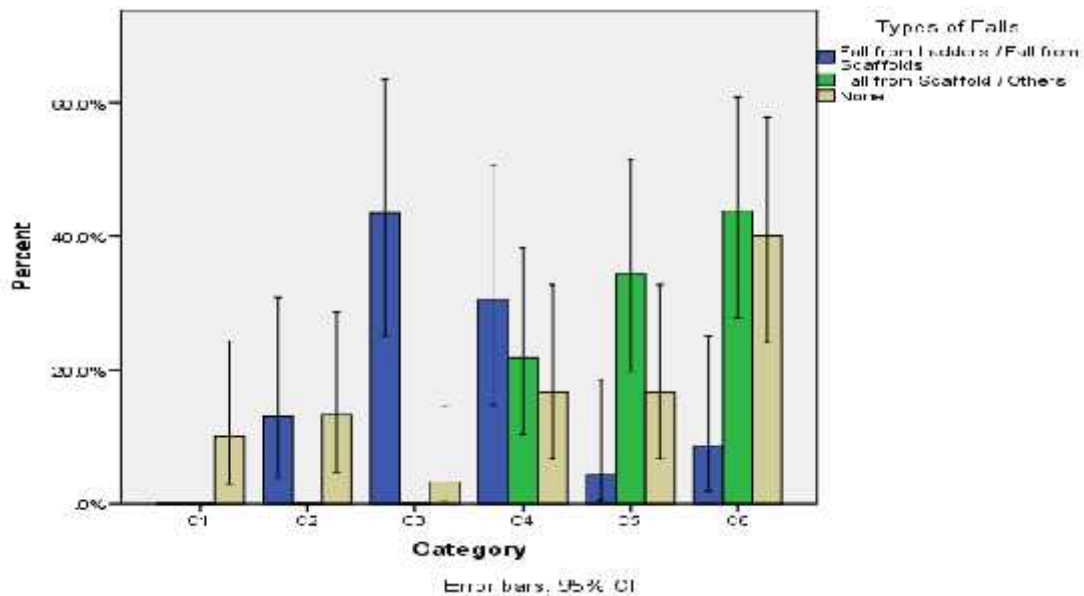
The respondents were interrogated about the major injuries at construction sites due to Slips, Trips and Fall. The responses of the workers are tabulated in Table 3.

**Table 3**  
**Major injuries as observed by workers**

Type of Injuries	Categories					
	C1	C2	C3	C4	C5	C6
Back Injuries/Sprains or Strains/Broken Bones	3	5	10	15	2	1
Cuts / Other Back Injuries	0	2	1	0	0	13
Broken Bones / Cuts	0	0	0	3	14	3
Back Injuries / Strains	0	0	0	1	1	11

<b>Total</b>	3	7	11	19	17	28
<b>P-value</b>	0.000***					

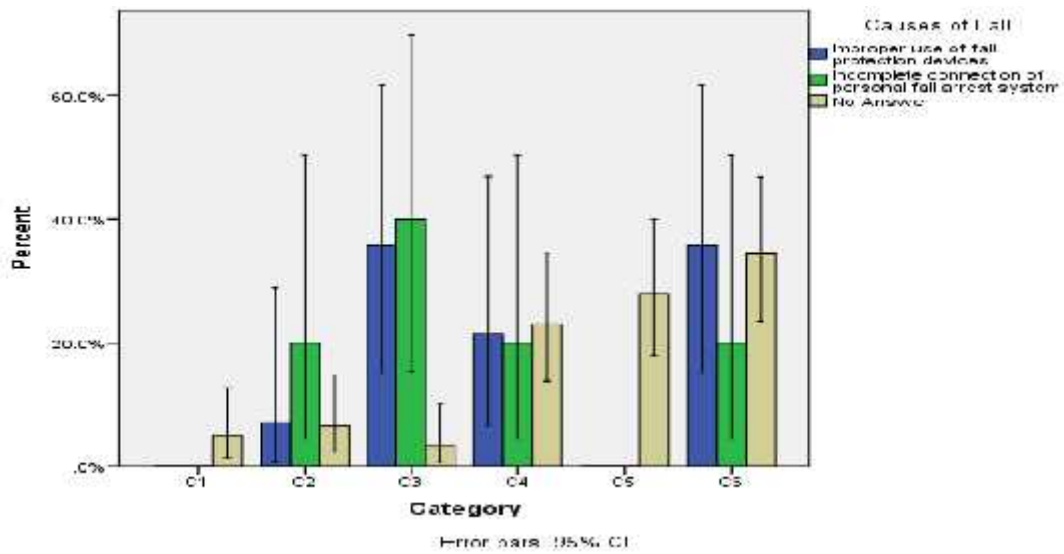
Falls are the paramount cause of serious injuries (48%) and deaths (30%) among all accidents in construction industries (Hu et. al. 2011). Different types of falls can be experienced at the workplace. Workers reported various types of fall at job site. The response of workers in terms of percentage is plotted in Figure 4. The association between the response of workers and categories of construction industries was calculated to be highly significant ( $p < 0.001$ ). A study conducted in Hong Kong reported the accident types in construction industries. The results indicated that fall of person from height had a mortality rate of 11.959/100,000 workers which was found to be highest compared with all other accident types (Shafique and Rafiq, 2019).



**Figure 4:**Types of Falls at construction sites as responded by workers

The workers were asked about the usage of fall protection devices at the time of incident. Collectively, in all construction industries, 28.24% of the workers mentioned that at the time of incident, workers were using fall protection devices. 43.53% of the workers mentioned that there was no usage of fall protection devices at the time of incidence. 28.24% were reluctant to provide any answer in reference to this question. Among different categories of construction industries, the response of the workers was computed to be statistically significant ( $p < 0.001$ ).

Various causes of fall were reported by the workers (Figure 5). According to 16.47% of the workers, the leading cause of the fall is Improper use of fall protection devices. 11.76% reported incomplete connection of personal fall arrest system as the main cause of fall. 71.76% of the workers gave no answer to this question. The p-value was calculated to be 0.004 indicating a significant difference with categories of construction industries.



**Figure 5:** Causes of Fall as identified by workers in various categories of construction industries

The number of injuries in each construction industry is plotted in the Figure 6. It can be observed that maximum number of injuries was reported in construction industries lying in C3 and C6 categories. A study conducted on labor safety in construction sites concluded that major cause for the accidents at construction is due to injuries. In small and large construction sites, more number of accidents were observed due to body injuries accounting to 44.1% and 26.4% respectively (Kanchana et. al. 2015)

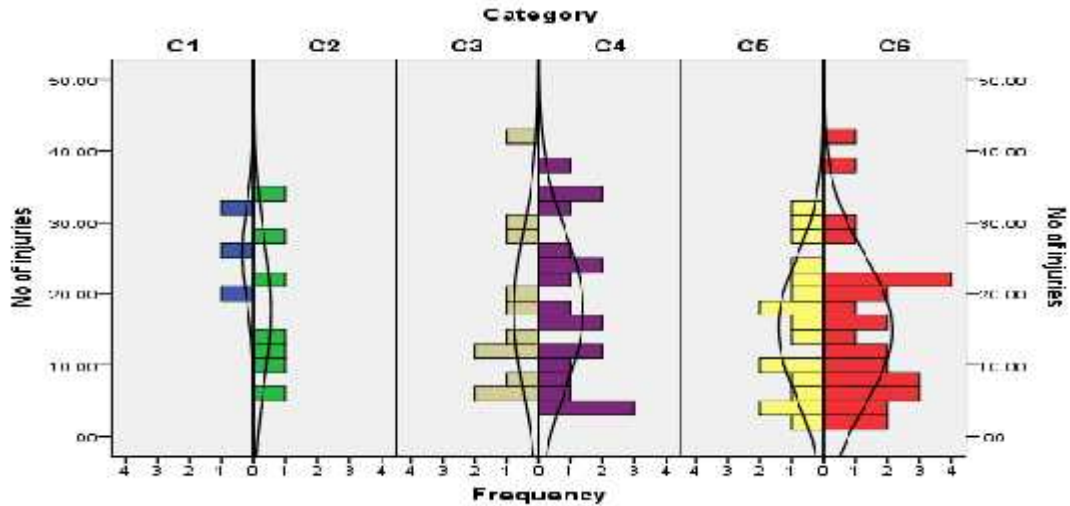


Figure 6: Number of Injuries in various categories of Construction Industry

## Conclusion

The construction industry is considered one of the dangerous industries owing to the number of injuries and deaths at worksite. There is a dearth of proper system of record keeping. The implementation of proper safety management system is of paramount importance to deal with the injuries and fatalities at site. The current research work focused on the injuries, illnesses and fatalities at construction sites due to Slips, Trips and Fall. The workers were interrogated about the injuries and illnesses due to Slips, Trips and Fall. Additionally, the main types and causes of fall are identified. The number in injuries in each construction industry under various categories are reported. The findings of this research give an insight to the practical knowledge and addresses the weaknesses in order to make work place safer.

## Recommendations

- Occupational Health and Safety Management System will help us to identify problems, decide what to do, act on decision made and check that the steps taken have been effective.
- Each Construction Industry should engage a competent resource who should have a deep insight in developing the OHS Management System with respect

to Slips, Trips and Falls (STFs) and then on board all the concerned departments so that it is implemented in true letter and spirit

- Hierarchy of Controls (Elimination, Substitution, Engineering Controls, Administrative Controls and Personal Protective Equipment) should be adopted in designing the work place to avoid any un foreseen event
- In line with The Punjab Occupational Health and Safety Act 2019, rules and guidelines to be developed to reduce Slips, Trips & Falls (STFs) Injuries & fatalities specifically for Construction Industries.
- Injuries & Fatalities Data Collection at Industry level should be implemented and then uploaded to National Occupational Health & Safety Portal, from where strategies to prevent and protect workers can be made and then implemented
- Awareness Campaigns specifically on Occupational Slips, Trips & Falls (STFs) for Construction Industries to be launched at National Level involving different stakeholders
- Prevention & Protection Model to be developed to reduce Slips, Trips and Falls (STFs) for Construction Industries which should be in line with Industry best practices, ISO Standards, International Labour Organization and various other national and international bodies.

## References

- Ali, T. H. (2006). Influence of national culture on construction safety climate in Pakistan. Ph.D. dissertation, School of Engineering, Faculty of Engineering and Information Technology, Griffith Univ., Gold Coast Campus, Australia.
- Ali, T., Stewart, R., & Qureshi, S. (2007). Evaluating risk management practices in the Pakistani construction industry: the current state of play. In: Proc. of the Fourth International Conference on Construction in the 21st Century (CITC-IV) "Accelerating Innovation in Engineering, Management and Technology" July 11-13, 2007, Gold Coast, Australia, pp. 149-156
- Amiri, M., Ardeshir, A., Fazel Zarandi, M.H. (2014). Risk-based Analysis of Construction Accidents in Iran During 2007-2011-Meta Analyze Study. *Iranian Journal of Public Health*, 43, 507.
- Awan, T. (2007). Occupational health and safety in Pakistan. Pakistan Institute of Labour Education and Research (PILER), Islamabad.
- Bureau of Labour Statistics (2014). Economic News Release: Table 5. Number, Incidence Rate, and Median Days Away from Work for Nonfatal Occupational Injuries and Illnesses Involving Days Away from Work by Injury or Illness Characteristics and Ownership, 2013. <http://www.bls.gov/news.release/osh2 t05.htm>.
- Bureau of Labor Statistics (2018), Census of fatal occupational injuries charts, 1992-2017 (final data). Available online at [www.bls.gov/iif/oshcfoi1.htm](http://www.bls.gov/iif/oshcfoi1.htm)
- Choudhry, R. M., Fang, D. P., & Ahmed, S. M. (2008a). Safety management in construction: Best practices in Hong Kong. *Journal of Professional Issues in Engineering Education and Practice*, 134(1), 20-32.
- Choudhry, R. M., Fang, D. P., & Rowlinson, S. (2008b). Challenging and enforcing safety management in developing countries: A strategy. *International Journal of Construction Management*, 8(1), 87-101.
- Choudhry, R. M. & Zahoor, H. (2016). Strengths and weaknesses of safety practices to improve safety performance in construction projects in Pakistan. *Journal of Professional Issues in Engineering Education and Practice*, 142(4): 04016011.
- CNAMTS. 1988. Statistiques Nationales Des Accidents Du Travail, Des Accidents De Trajet Et Des Maladies Professionnelles. National Statistics of Occupational Accidents, Commuting Accidents and Occupational Diseases. Paris: CNAMTS.

- CNAMTS. 2012. *Statistiques Nationales Des Accidents Du Travail, Des Accidents De Trajet Et Des Maladies Professionnelles. National Statistics of Occupational Accidents, Commuting Accidents and Occupational Diseases.* Paris: CNAMTS.
- European Commission. (2008). *Causes and Circumstances of Accidents at Work in the EU.* Luxembourg: Office for Official Publications of the European Communities.
- EU-OSHA–European Agency for Safety and Health at Work, *Accident Prevention in the Construction Sector*, 2003.
- Farooqui, R. U. Ahmed, S. M. & Panthi, K. (2007). Developing safety culture in Pakistan construction industry—an assessment of perceptions and practices among construction contractors, in *Proceedings of the 4th International Conference on Construction in the 21st Century: Accelerating Innovation in Engineering, Management and Technology (CIIC '07)*, pp. 420–437, Gold Coast, Australia.
- Farooqui, R. U., Ahmed, S. M., & Lodi, S. H. (2008). Assessment of Pakistani construction industry - current performance and the way forward. *Journal for the Advancement of Performance Information and Value*. 1,51-72.
- Farooqui, R. U., Arif, F. & R. S.F.A. (2008a). Safety performance in construction industry of Pakistan. in *1st International Conference on Construction in Developing Countries (ICCIDC-I)*, Karachi. pp. 74–87.
- Hämäläinen, P., Takala, J. & Saarela, K. L. (2006). Global estimates of occupational accidents. *Safety Science*, 44(2), 137–156.
- Hassan, S. A. (2012). *Health, Safety & Environmental Practices in the Construction Sector of Pakistan.* MS dissertation, Uppsala University.
- Ho, D. C. P., Ahmed, S. M., Kwan, J. C. & Ming, F. Y. W. (2000). Site safety management in Hong Kong. *Journal of Management in Engineering*, 16(6), 34–42.
- HSE (2018a), *Construction statistics in Great Britain, 2018.* HSE. Available online at [www.hse.gov.uk/statistics/industry/construction.pdf](http://www.hse.gov.uk/statistics/industry/construction.pdf)
- Hu, K., Rahmandad, H., Smith-Jackson, T., & Winchester, W. (2011). Factors influencing the risk of falls in the construction industry: A review of the evidence. *Construction Management and Economics*, 29, 397–416.
- Innovative Solutions to Safety and Health Risks in the Construction, Health Care and HORECA Sectors, European Agency for Safety and Health at Work (EU-OSHA), Bilbao, Spain, 2011.

- Kanchana, S., Sivaprakash, P., & Joseph, S. (2015). Studies on labour safety in construction sites. *The Scientific World Journal*, 2015,1-6.
- Koehn, E. E., Kothari, R. K., & Pan, C. S. (1995). Safety in developing countries: professional and bureaucratic problems. *Journal of Construction Engineering and Management*, 121,261-265.
- Koehn, E. E. & Datta, N. K. (2003). Quality, environmental, and health and safety management systems for construction engineering. *Journal of Construction Engineering and Management*, 129(5),562-569.
- Labor Policy of Pakistan, 2010. <http://www.eobi.gov.pk/announcement/labour+policy+2010.pdf>
- Larcher, P. & Sohail, M. (1999). Review of Safety in Construction and Operation for the WS & S Sector - Part I Task No 166, London.
- Le, Y., Shan, M., & Chan, A. P. C. (2014). Overview of corruption research in construction. *Journal of Management in Engineering*, 30,1-7.
- Lodi, S. H., Farooqui, R. U., & Ahmed, S. M. (2008). Development of a strategic model for improvement of construction project management education, research, and practice in Pakistan. 3rd Annual Report. Washington (DC): The National Academies. Available at: <http://goo.gl/7lxZQC>
- Mohamed, S. (1999). Empirical investigation of construction safety management activities and performance in Australia. *Safety Science*, 33,129- 142.
- Mohamed, S., Ali, T. H., & Tam, W. Y. V. (2009). National culture and safe work behaviour of construction workers in Pakistan. *Safety Science*, 47(1),29-35.
- Nasarwanji, M. F., Mayton, A. G. & Pollard, J. (2019). Why slips, trips and falls are still a problem: A hazard assessment at surface mines. *Proceedings of the Human Factors and Ergonomics Society 2019 Annual Meeting*. 1856-1860
- Occupational Safety & Health Administration (OSHA). (2014). Occupational Safety & Health Administration Regulations (Standards 29 CFR). Washington (DC): UD Department of Labor. Available at: <https://goo.gl/W9pi5z>
- PBS. (Pakistan Bureau Statistics). (2012). "Labor force statistics." (<http://www.pbs.gov.pk/content/labour-force-statistics>) (Dec. 20, 2012).
- PBS, "Pakistan Bureau of Statistics - Labour Force Statistics (2012-2013)." <http://goo.gl/A1CIKP>, Islamabad, 2013



- Pheng, L. S. & S. C. Shiua, S. C. (2000). The maintenance of construction safety: riding on ISO 9000 quality management systems. *Journal of Quality in Maintenance Engineering*, 6(1),28–44.
- Raheem, A. A. & Hinze, J. W. (2012). Reasons for the poor implementation of worker safety in the construction industry of Pakistan: A contractor’s prospective. CIB W099 International Conference “Modeling and Building Health and Safety”, 10-11 September, Singapore, pp. 54–63.
- Shafique, M. & Rafiq, M. (2019). An overview of construction occupational accidents in Hong Kong: A recent trend and future perspectives. *Applied Sciences*, 9: 2069.
- Suazo, G. A. R., & Jeselskis, E. J. (1993). Comparison of construction safety codes in United States and Honduras. *Journal of Construction Engineering and Management*, 119,560-572.
- Takala, J., Hämäläinen, P., Saarela, K. L., Yun, L. Y., Manickam, K., Jin, T. W., Heng, P., Tjong, C., Kheng, L. G, Lim, S. & Lin, G. S. (2014). Global estimates of the burden of injury and illness at work in 2012, *Journal of Occupational and Environmental Hygiene*, 11(5), 326–337.
- Teo, E. A. L. & Ling, F. Y. Y. (2006). Developing a model to measure the effectiveness of safety management systems of construction sites. *Building and Environment*, 41(11),1584–1592.
- Wilson, Jr. J. M. & E. Koehn, E. (2000). Safety management: problems encountered and recommended solutions. *Journal of Construction Engineering and Management*, 126(1),77–79.
- World Bank (2019), World Bank analytical classification. Available online at <http://databank.worldbank.org/data/download/site-content/OGHIST.xls>
- Wu, T. C., Chen, C. H., & Li, C. C. (2008). A correlation among safety leadership, safety climate and safety performance. *Journal of Loss Prevention in The Process Industries*, 21:307-318.
- Yeoh, H. T., Lockart, T. E., & Wu, X.(2013). Non-fatal Occupational Falls on the Same Level. *Ergonomics*, 56 (2): 153–165.
- Yi, W., & Chan, A. P. C. (2014). Critical review of labor productivity research in construction journals. *Journal of Management in Engineering*, 30,214-225.
- Zahoor, H., Chan, A. P., Masood, R., Choudhry, R. M., Javed, A. A. & Utama, W. P. (2016). Occupational safety and health performance in the Pakistani construction industry: stakeholder’s perspective. *International Journal of Construction Management*, 2016: 1-11.