A REVIEW OF THE COSTS OF ACCIDENT IN GCC CONSTRUCTION

ABSTRACT:
Construction industry in the Gulf Cooperation Council (GCC) member countries is at peak as the region is in the stage of developing its major infrastructures. The development projects in the GCC have made the region as a major jobs hub for both local and international workforce but at the same time these projects have also resulted into several issues including poor safety performance. This article attempts to estimate the costs of workplace accident in construction using qualitative research approach and considering different parameters. The data from three countries Qatar, Oman and Saudi Arabia was used to estimate the cost of accident in GCC region. The parameters used in these estimates include the i) values of the current projects in the selected countries, ii) average cost of accident in United States of America (USA) and United Kingdom (UK) and iii) compensation cost. The average cost of an accident in USA, UK, Australia (ASU) and South Africa (SA) was used for comparison of the costs of accidents in Qatar, Oman, and Saudi Arabia. The total costs of an accident in Oman are estimated at US$ 415,620 with an economic burden of US$ 205.73 Million/year on Omani economy. In Saudi Arabia, the costs of an accident are estimated at US$ 91,940, while the economic burden of the Saudi economy is estimated at US$ 261.11 Million/year. The findings of this research will be useful to understand the cost implication of accidents in construction, and thus will be helpful to motivate the construction organizations to invest in safety related issues and avoid accidents. One of the main limitations of this research is that the direct costs are calculated from the indirect costs of accidents due to the lack of available data. Further research is needed to estimate the direct costs of accident in the region.

KEY WORDS: accidents, construction, costs of accidents, economic burden, GCC region.

1. INTRODUCTION:
Accidents in construction include not only direct physical injury to persons or damage to property, but also short-term and long-term effects or incidents due to other exposures on sites that affect the workers' health and physical well-being. Costs associated with accidents in the construction industry can be categorized as direct and indirect costs (Umar, 2019). Direct costs tend to be those associated with the treatment of the injury and any unique compensation offered to workers because of being injured and are covered by workmen's compensation insurance premiums. Indirect costs include reduced productivity for both the returned worker(s) and the crew or workforce, clean-up costs, replacement costs, costs resulting from delays, supervision costs, costs related to rescheduling, transportation, and wages paid while the injured is idle (Hinze, 1994). The costs of accidents (direct and indirect) can be substantial. Research conducted in the UK showed that indirect costs are eleven times more than direct costs (Mfi, 2003). The costs of accidents in the USA were determined as 6.5% of the total value of completed work and in the UK, it is approximately 8.5% of the tender value (BRT, 1995; Anderson, 1997). Waehrer et al., (2007) considered that costs of work-related accidents which result into injuries and sickness can be classified into main three categories of a) direct costs, b) indirect costs, and c) quality of life cost.

A research conducted in the UK on cost and benefit analysis revealed that when total costs of accident prevention were compared to the total benefits of accident prevention, the benefits far outweigh the costs of accident prevention by a ratio of approximately 3.1, which means that when contractors, irrespective of their sizes, spend £1.00 on accident prevention, they gain £3.00 (Ikpe et al., 2012). The cost of accidents can be understood by contractors and represents a tangible measure that can be related to project financial accounts and both the income statement and balance sheet of a contractor (Tang et al., 2004; Booth and Panopoulos, 2005, Umar, 2020). Thus, this category of cost is very often at the forefront of considerations of the costs of health and safety.

Top management of small construction organizations are reluctant to spend money on the occupational safety and health. This is due to the facts that accidents normally do not happened in construction projects on regular or daily basis (Agumba and Haupt, 2012; MacEachen et al., 2010). It is therefore essential that the top management should have an awareness of the costs of accidents in their projects. This will help them to change their perception and will make them prepare to spend on the safety and health matters. Hinze (2006) noted that if the actual cost of accidents is well known to the management, they will be able to make effective decision related to the safety and health in their organizations or projects. The cost of accidents will enable top management to consider the safety and health not only a part of workers well-being but also from an economic perspective. The cost of accidents would also be more attractive for owner as there could be great economic benefits for them. In this regard, the relationship between costs of safety and health and its benefits was best projected by Ikpe et al. (2012). The study indicates that if the prevention costs reduce, the costs of accidents will increase. likewise, if the cost of prevention will be more the benefits arising from low number of accidents will more.

There have been several research studies around the world in which an attempt is made to estimate the costs of accident in construction; however, there is no study on the costs of accident in construction in any of the GCC country (Umar, 2017). In this article an attempt is made to estimate the costs considering the three GCC countries including Qatar, Oman, and Saudi Arabia.

2. COSTS OF ACCIDENT IN CONSTRUCTION:

A research study funded by Centre to Protect Workers' Right (CPWR) in the USA reported that the average cost of fatal or non-fatal injury arising from accident in construction is US$ 27,000. This cost in almost double than the average cost of fatal or non-fatal injury in other industries which stood at US$ 15,000 (Waehrer et al., 2007). The statistics published by the National Institute of Occupational Safety and Health (NIOSH) in USA indicates that the average cost of an accident which results into the death of a worker is US$ 867,000 (NIOSH, 2006). This cost, however, do not include the cost of quality-of-life losses. The average cost of a fatal accident in the construction industry of USA estimated by Waehrer et al. (2007) stand at US$ 1.0 Million, which is comparatively more than the estimate made by the NIOSH. Overall, if the cost of the quality-of-life losses is also added with the average cost of a fatal accident in construction, then the total average cost will stand at US$ 4.0 Million (Waehrer et al., 2007). In other words, the cost of the quality-of-life losses resulted from a fatal accident in the USA is equal to US$ 3.0 Million. In terms of direct costs of non-fatal accidents in the USA construction industry, which required medical treatment, was estimated at $777 (Miller et al., 2002; Waehrer et al., 2007). This however does not include the cost of work or productivity which stood at US$ 618 (Miller et al., 2002). Thus, the direct cost of non-fatal construction accidents required medical treatment with cost of work or productivity can be estimated at US$ 1,395 (777+618 = 1,395). Similarly, the direct cost of a fatal accident which requires medical treatment in the construction industry of USA cost around US$18,300 (Miller et al., 2002; Waehrer et al., 2007). This can be translated to an average direct cost of accident, either fatal or non-fatal, which is equal to US$ 9,850.

A research study on the cost of accidents carried out in SA considering a total of 100 different types of accidents including 14 fatal accidents, estimated the total cost, including direct and indirect, of all these accidents at US$ 2.37 Million (Haupt and Pillay, 2016). The direct cost of all these accidents was estimated at US$ 0.726 Million, while the indirect cost of accidents stood at US$ 1.64 Million, double than the direct cost. This can be translated that one accident in SA either fatal or non-fatal cost around US$ 23,700. The direct cost of one accident is SA can be therefore US$ 7260, while the indirect cost will be US$ 16,400. The cost of one accident either fatal or non-fatal estimated in the USA (~US$ 27,000) and in SA (~23,700) are comparable as the difference between both the estimates stand at 12.30%.

Similarly, the HSE (UK) report published in 2011, on the cost of accidents, which considered the 2006 – 2007 available data, established the direct cost of a total of 1,385,232 accidents and illness was US$ 21223.21 Million (HSE, 2011). The direct costs of one accident (fatal or non-fatal) in the UK will therefore cost US$ 15,300 if all the accidents including fatal, non-fatal with major or minor injuries and illness are considered. This direct cost of one accident in the UK (~US$ 15,300) is double the direct cost of an accident in SA (~US$ 7,260). This may be due the fact the direct costs of one accident in UK also include the cost of illness; however, the direct costs of an accident in SA do not include this. If the direct cost of an accident in UK is calculated based on the fatalities and injuries accidents only, then this will be equal to US$ 10,370, which represents a difference of 30% between the UK and SA accident costs. The UK direct costs of an accident (~US$ 10,370) is closer to the direct cost of accident in the USA (~US$ 9,850), the difference is only 5%. If the average costs of the accidents which involve fatalities or major injuries are considered, the cost per accident in UK will stand at US$ 24,000.

Statistics published by the "Safe Work Australia" indicates that in 2012-2013, work related accidents which resulted injuries and illness put a burden of US$ 44.02 billion on Australian economy. This is a huge amount which is equal to 4.10% of the total Australian GDP (SWA, 2018). The statistics further reveal that most of the cost (~95%) was borne by the workers and society. To be more specific, the workers bear 77%, society bear 18% and employers bear 5% of the total costs of accidents in AUS. Accidents which result into injuries are accounted for US$ 19.95 billion (~45%) of the total cost. Roughly, the direct cost of an accident in AUS is estimated at US$ 27,100, which is almost the same as the direct cost of accident in USA (~US$ 27,000).

The statistics related to the costs of accidents quoted from USA, UK, SA and AUS show that the costs of accidents in these countries are not the same, but in the range of US$ 23,700 ~US$ 27,100 which gives an average value of the costs of accident (~US$ 25,450). This average cost of an accident (~US$ 25,450) is used in this research for further analysis.

3. COST OF ACCIDENTS IN GCC:

The Cost of Accidents in GCC construction estimated in this research is based on several assumptions and co-relations as there is a lack of availability of the raw data. For example, there is no organization in any of the GCC country like the organizations available in the USA (for instance OSHA), UK (for Instance HSE) or AUS (for instance Safe Work Australia). The cost of accidents is estimated from the available data considering three countries from the GCC including Qatar, Oman, and Saudi Arabia. These countries were selected because relevant data required were only available (publicly) in these countries. The parameters used for cost estimation include values of projects, average percentage of accidents costs (7.5% of the project value), and compensation costs of accident (indirect cost). The direct cost of an accident in this research is calculated from the indirect cost. The total cost is then calculated by adding direct and indirect costs.

3.1 Cost of Accidents in Qatar:

The cost of accidents in Qatar is calculated based on the value of construction projects in 2018. The data published by a unique conference series related to the projects in Qatar "Project Qatar" shows that the value of Qatar major construction projects stood at US$ 117.44 Billion (PQ, 2018). Since such costs of accidents is not established in any of the countries in GCC, therefore the costs of accidents in Qatar construction projects in estimated based on the current projects' values and average costs of accidents established in the USA and UK (BRT, 1995; Anderson, 1997). The average ratio of the costs of accidents in both the countries is equal to 7.5% (6.5+8.5/2 = 7.5%). Based on this rule, the total costs of accidents in the Qatar construction industry will be US$ 8,808 Million.

Likewise, one of the main projects which has attracted the attention of the local and international organizations not only because the next football world cup will be held here but also because of the workers deaths in this project. Some of the reports show the number of construction workers that died in this project has already reached 1,200. Several estimates predicting the number of deaths will reach to 4000 by the end of 2022 when the project will be completed (SM, 2018; ITUC, 2014; Ganji, 2016). If the costs of these accidents are estimated on the assumption that a fatality costs in UK and Qatar are the same (~US$ 1,870,437), 1,200 fatalities will result into a total cost of US$ 2,245 Million. Similarly, if the death toll will be reached to 4,000 deaths by the end of this project, this will put a burden of US$ 7,482 Million. Of course, this should be considered that this estimate presents the costs of fatalities arising from accidents in one construction project. This reflects that the actual burden on Qatari economy from the costs of accidents in construction will be much more than the one quoted here.

In the third estimate the statistics published by the General Retirement and Social Insurance Authority (GRSIA) of Qatar for the year 2017 were used. These statistics show that there were 75 deaths and one disability caused by work related accidents in 2017. This is important to note that GRSIA only register Qatri or GCC citizens into its insurance system. The total expenditures (benefits) caused by these deaths (~USD 4.31 Million) and disability (~1.37 Million) were US$ 5.68 Million (GRSIA, 2017). The average indirect costs of one accident result into death or disability is therefore equal to US$ 74,737. To determine the direct costs of these accidents, the equation developed by Haupt and Pillay (2016) were used. The assumption here is that the direct costs of an accident is half of the indirect costs. The total costs of an accident are calculated using equation No.1, which is equal to US$ 205,526. The costs of accident in Qatar (~US$ 205,526) are almost nine times more than the average costs of an accident in USA, UK, AUS and SA (US$ 25,450).

$$TCA = DC + 2.25\ IDC$$ .....Equation No.1

Where;

TCA = Total Costs of an Accident

DC = Direct Costs of an Accident (~US$ 37,368)

IDC = Indirect Costs of an accident (~US$ 74,737)

3.2 Cost of Accidents in Oman:

The cost of accidents in Oman is calculated on two different parameters. The first parameter is the same as used Qatar, the construction projects values. The second parameter used to estimate the cost of accidents in construction in Oman is based on the raw data obtained from the Public Authority of Social Insurance (PASI). The construction projects data for the year 2015-2016 shows that the total value of different types of development projects was US$ 163,568 Million (Umar, 2017). If it is assumed that that the cost of accidents in USA, UK (= 7.5% of the project value) and Oman are comparable and the average values of the costs of accidents from USA and UK is applied in Oman, the total costs of accidents will be US$ 12,268 Million.

The second estimate is based on the data obtained from the PASI in Oman which registered only Omani citizen in the system. The data shows that a total of 495 cases of work-related injuries were disbursed. The total number of active insurees by the end of 2017 was 233,859 (PASI, 2017). The costs of these accidents are calculated based on the average cost (~US$ 25,450) of an accident derived from the average

costs of accidents in USA, UK, AUS and SA which is estimated at US$ 12.59 Million. The amount of compensation disbursed by the PASI in 2017 against these cases (~495) is equal to US$ 8.16 Million or US$ 151,135 per injury. This can be classified as indirect cost of the injury as this amount do not include the direct costs such medical treatment etc. The comparison of this indirect cost of injury in Oman (~US$ 151,135/injury) with indirect of accident in SA (~US$ 16,400), reflect that the indirect cost of an injury in Oman is almost 10 times more than the cost of an injury in SA. To determine the direct costs of these accidents, the equation developed by Haupt and Pillay (2016) were used (equation No.1). The assumption here is that the direct costs of an accident is half of the indirect costs. Thus, for the calculation of the total costs of an accident in Oman, the direct costs are considered as US$ 75,567 per injury (151,135/2 = 75,567). The total cost of an accident in Oman is thus estimated at US$ 415,620, which is 16 times more than the average costs of an accident in USA, UK, SA and AUS (~US$ 25,450). The total costs of an accident in Oman result into an economic burden of US$ 205.73 Million per year on Omani economy.

3.3 Cost of Accidents in Saudi Arabia:

The costs of accidents in Saudi Arabia are calculated based on two methods, which are a) the values of the total projects in different sectors in Saudi Arabia and using a cost of accidents ratio which is 7.5% of the value of the projects; and b) the number of different types of accidents using an average obtained from a reliable source and using the average costs of an accidents determine from the costs of accidents in USA, UK, SA, and ASU. The values of the different types of projects during 2015 to 2018 was obtained from the Venture Onsite website, which is of the leading organization tracking the construction projects across the Middle East and Africa region for more than 15 years (Venture Onsite, 2018). To determine the costs of accidents in the development projects in Saudi Arabia, the average percentage (~7.5%) as the costs of accidents is used. Since, in this method the costs are dependent of the value of the projects, therefore as the value of the projects reduce the costs of accidents reduced as well. For instance, the costs of accidents in 2018 are less than the costs of accidents in 2015. This do not represent that the safety performance in 2018 has been improved compared to 2015. But the fact is that the projects values are less in 2018 than in 2015. This was due to economic conditions of the country which is heavily reliant on the oil and gas earning. The dip in petroleum prices has also affected the development projects not only in Saudi Arabia but across the GCC.

In the second method of estimating the costs of accidents in Saudi Arabia, the raw data was obtained from General Organization for Social Insurance (GOSI), Saudi Arabia. The only accidents resulting injuries, data which is available on the website was for the third quarter of 2018. Since the data for the whole year was not available; the numbers of different types of accidents were multiply by 4 considering that GOSI divide one year into four quarters and assuming that the numbers of accidents in other quarters of 2018 were the same (GOSI, 2018). The total number of accidents resulting into injuries or deaths in 2018 was estimated at 31,104. The average costs of one accident determined from the data obtained from USA, UK, SA and AUS was US$ 25,450. Thus, the total costs of these accidents will result a burden of US$ 791.59 Million to the Saudi economy. If the costs of these accidents are estimated based on average costs of accident in Oman (~US$ 415,620), this will result into a total cost of US$ 12927.44 Million.

Likewise, the statistics published by the GOSI shows that in the third quarter of 2018, a total of US$ 13.44 Million were disbursed against the disabilities or deaths caused by accidents at workplace (GOSI, 2018). The total number of disabilities (~386) and deaths (~16) in the same period were 402. Thus, the indirect costs per accident which result into a disability or death can be therefore estimated at US$ 33,433. Although, this cost as an indirect cost is comparatively low than the indirect cost of accident in Oman (~US$ 151,135), however it is still double of the indirect cost of accident in SA (~US$ 16,400). The total cost of an accident in Saudi Arabia is estimated using equation No.1, assuming that the direct costs of accidents is half of the indirect costs. Thus, for this calculation the direct costs of accident are assumed as

US$ 16,716. The total costs of an accident in Saudi Arabia are thus estimated at US$ 91,940. If the rate of disabilities and deaths arising from accidents in other quarters of the year will be the same, then the total number of such accidents could be 1,608 (= 4 x 402). The total burden of these accidents on Saudi economy will be therefore US$ 147.84 Million per year. This is important to note that this amount could be more than what is estimated here as there are still cases (~3,372) in the same quarter which are still under treatment. Overall, the disabilities and deaths in the same quarter represent 9.12% of the total treated cases. If the same percentage of disabilities and deaths is applied on cases which are still under treatment, there will be a further of 308 cases which could end with disabilities and deaths. The total economic burden on the economy in one year from all these accidents will reach to US$ 261.11 Million.

4. DISCUSSION:

The improved safety performance could not be achieved until there is some investment on it. Owners or management of the construction organizations remain reluctant to spend money on safety as they ignored or do not know the consequences even the financial. One of the main factors which could motivate the owner and the management of the construction organizations to spend on the safety and health related issue, that they know the costs of accidents. When the top management or the owner will have a clear idea of the costs of accidents, they will be then prepared to spend on the preventive measure. The matter is not only associated with organizations but there is also a need of awareness at government level as how much their country economy is affected by such costs which can be prevented by a small investment. One of the main factors which can help to reduce the costs of accidents in construction is to reduce the number of accidents. The reduction of accidents in construction required many steps such as training and education, compliance with PPE, accidents investigations, management commitment, inspections and supervision, and compliance with regulations. In most cases, the decision makers avoid these steps simply to control their expenditure, assuming that the accidents normally do not happens on regular basis. It can be true that the accidents may not happens regularly, however, when they happen, the cost is normally high that the cost of prevention, and this is the fact which top management negate. This is also related to the awareness of the costs of accidents – in other words, when the top management will have less awareness of the costs of accidents, they will be reluctant to spend on the matters associated with safety. This article therefore estimated the costs of accidents arising from workplace which could be useful to reflect the importance of investment to improve safety related issues in the GCC region. The GCC construction market is grooming and provides jobs to millions of peoples both locally and internationally. The rapid growth of the construction industry in GCC region have also resulted several issues including poor safety performance. In such a situation the estimate of the costs of accidents in this region may be helpful to motivate both the government and construction organizations working in this region to improve their safety performance. The estimates of the costs of accidents produced in this paper, is however, based on several assumptions due to the lack of data associated with the accidents in the region. Construction accidents can be classified in different way, for instance, based on the type of injury. Clearly, some injuries may only require first aid and other would need hospitalization for treatment. Local regulations, cost of treatment, country law, and organizations procedure are the possible factors that can influence the costs of accidents in construction. Thus, it is important that such parameters should be considered when a true cost of accident in construction is required to be estimated. Since, the cost of accident estimated in this paper used some data from related to cost from other countries, therefore, the estimates produced here should be considered with a caution to avoid any misinterpretation.

5. CONCLUSION:

Three countries among the GCC including Qatar, Oman and Saudi Arabia were selected to estimate the costs of accident. Different parameters were used to estimate these costs in this region. The average values of the cost of accidents based on the projects values in USA and UK is calculated as 7.5%. First the

costs of accidents in Qatar, Oman and Saudi Arabia are calculated based on this value (~7.5%) and the current projects in these countries. The results show that the costs of accidents on this principle is US$ 8,808 Million in Qatar, US$ 12,268 Million in Oman and US$ 3005.10 Million in Saudi Arabia. In the second method, the costs of accidents are calculated on the amount paid against injuries, disabilities and deaths in Oman and Saudi Arabia. There were 75 deaths and one disability caused by work-related accidents in Qatar. The total expenditures of benefits caused by these deaths (~USD 4.31 Million) and disability (~1.37 Million), was US$ 5.68 Million which were translated into a total cost of accident in Qatar as US$ 205,526. The amount of compensation disbursed by the PASI in 2017 against these cases (~495) is equal to US$ 8.16 Million or US$ 151,135 per injury, which is considered as indirect costs of accident in Oman. The total costs of an accident in Qatar and Oman are then calculated considering the relationship between the direct and indirect cost of an accident. Based on this relationship the estimated costs of an accident in Qatar stand at US$ 205,526; while in Oman it is standing at US$ 415,620. The costs of accidents in Qatar (~US$ 205,526) and in Oman (~US$ 415,620) are nine times and 16 times more than the average costs of an accident in USA, UK, SA and AUS (~US$ 25,450) respectively. This translates into an economic burden of US$ 205.73 Million per year on Omani economy. The available statistics related to compensation against injuries, disabilities and deaths published by the government agency in Saudi Arabia, show that in the third quarter of 2018, a total of US$ 13.44 Million against the disabilities or deaths caused by accidents at workplace. The total number of disabilities (~386) and deaths (~16) in the same period were 402. Thus, the indirect costs per accident which result into a disability or death can be therefore estimated at US$ 33,433. The total costs of an accident in Saudi Arabia are estimated at US$ 91,940. The economic burden of these accidents on Saudi economy is calculated using ratio analysis between the amounts disbursed in one quarter and the number of disabilities and death in the same quarter. This method was applied as the data for remaining quarters was not available. The total number of the accidents resulting into disabilities and deaths are therefore estimated at 2,840 per year. The total costs of these accidents (2840 x 91840 = 261.10 Million) put an economic burden of US$ 261.10 Million per year on Saudi economy. The results presented in this paper are based on some assumptions and corelation. Different countries have different systems of health care for their residents and citizens. In relation to GCC region, the government health care system is not free for expatriates, therefore construction workers in this region rely on private medical insurance. Even in some cases, such insurance is also not mandatory. Access to such data either through insurance companies or construction organizations is not available. Lack of relevant and current data related to direct and indirect costs was therefore one of the main limitations of this research. The availability of such data to establish direct and indirect cost will be helpful to derive on a more realistic costs of accident in the GCC construction. Governments of different GCC countries can play their role to ensure different data related to costs of accidents are publicly available. This will not only excel the research in the area of cost of accidents, but the results will be also more reliable and accurate.

Conflict of interest:

The Authors declare no conflict of interest.

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