

REVIEW ARTICLE

## The Impact of Insurance on the Reduction or Increasing of Occupational Accidents: A Review

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### ABSTRACT

Despite the safety management and safety measures, occupational accidents in workplaces annually cause occupational deaths and injuries worldwide. The risk transfer is one of the risk control approaches management. In this approach, the total or a part of the accident's losses compensated by a third party (insurance industry). This approach applicable whenever the probability of an accident's occurrence is low but it has severe impact and consequences. In the current study, we reviewed the studies related to insurance and occupational accidents. This study was aimed to find a link between insurance and occupational accidents and to answer the question that whether insurance has an effect on the reduction or increase of accidents or not. According to a study conducted on various papers from various databases, it has been shown that insurance, in addition to compensation, can improve safety and reduce accidents. Also, despite the fact that insurance may have other negative economic effects in organizations, it can reduce both the risk of occupational accidents and financial risks for insurers through an incentive and economic approach.

**KEYWORDS:** *Insurance, Occupational Accidents, Risk Transfer, Workers' Compensation Insurance*

### INTRODUCTION

#### Occupational Accidents:

An occupational accident is an abrupt or unexpected event that causes damage to the worker, the employee, equipment, the environment, people around the event site and the community [1, 2, 3, 4]. European occupational accidents between 2009 and 2010 were 2 to 2.4 million resulted in 4,500 deaths[3]. In 2008, globally 2.3 million deaths occurred due to

occupational injuries (318,000 deaths) and also work-related diseases in which cancer and heart diseases were major work-related diseases[5]. On the other hand, according to ILO reports, 2.3 million workers die every year due to occupational accidents and diseases[6]. Many studies have shown that human error or unsafe behaviors have always played a major

role (80-90%) in the occurrence of accidents [7, 8, 9]. In the late 20th century, instead of individual features, researchers focused more on the design of the work environment and system safety in occurring accidents. In some researches, scholars have shown that demographic features and socio-economic factors affect accidents occurring. For example, workers who are stressed are likely to have cognitive failure and are prone to occupational injury. Also, some scholars argue that gender may affect the occurrence of accidents. In other words, men are more likely to be at risk due to having high-risk occupations than women. As well as obese workers are at a high risk of a variety of occupational injuries than workers who are not obese. These examples illustrate the effect of the worker's desire to create incidents in the workplaces [10, 11].

### **Risk management (hazard response):**

In order to avoid accidents, it is necessary to manage risk or to give a proper response to hazard. General options for risk management or hazard response include risk eliminate, risk reduction, risk transfer, and risk retention. Risk eliminate (Also called risk terminate or avoid) means choosing a path that eliminating risk completely. Risk reduction (Also called risk treat or control) means that in the organization, the control action is taken to limit the risk to reach an acceptable level. Risk transfer is the transfer of hazard or the sharing of a profit or loss associated with a risk with another party (third party) that is particularly good for diminishing financial risks or risks to assets. Risk retain (Also called risk tolerate) means a conscious decision to do nothing about the risk and responsibility for both the decision and its consequences. In this type of risk management approach, the risk may be acceptable and no other action is required or the cost of any action is not cost-benefit [12, 13, 14].

The toleration is the main reaction for risks that have a low probability/low impact on. The treatment is the main reaction for risks that have a high probability /low impact on. The transferring is the main reaction for risks that have a low probability / high impact on, and the termination is the main reaction for risks that have a high probability /high impact on.

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When the probability of a risk occurrence is low but the potential is high, the organization will desire to transfer that risk. This is usually done through insurance and it is often explained as risk financing in other words, Insurance is a prevalent kind of risk transfer [12, 13, 14, 15].

### **Insurance importance:**

The basic principle in insurance is that the contract is closed to pay a certain amount of money in case of the occurrence of defined events[12]. If a person injured related to his/her tasks or a job-related disease, all his medical expenses and possibly some of his lost wages are covered in the USA and Canada by workers' compensation. The workers' compensation (WC) is a system of no-fault laws implemented, state by state, and province by province, about 100 years ago[16]. The occupational accidents and individual deaths impose catastrophic losses on organizations that have led to attention being paid to insurance[17].

An occupational accident should be reported to insurance companies to ensure that the victim receives damages and medical compensation, sick leave, etc. In other words, reporting accidents to the insurers provide a basis for compensation to the victim and for the determination of insurance rates[18]. If the occupational injuries occur, the system will be paid to employees or their survivors, and employers who need to pay at least the salaries of workers who are absent from work or permanent disabilities, and medical and rehabilitation costs[10]. Insurance companies are an element of social security and social justice that have evolved to respond to burden of the risk that incurred by organizations and the community and individuals[19, 20].

There are several types of insurance (include fire insurance, vehicle insurance, etc) [21] that can be provided by the state, community, private for profit entities or a combination of these [20]. Usually, workers exposed to risk of physical health, which increases the likelihood of need for disability insurance[22]. Between 2005 and 2013, injuries, illnesses and occupational deaths have dropped significantly. The deadly incident rate about 20% and non-death accounted for about 30%. In the same period, WC weekly wage also increased in individual states. This synchronization in the above-mentioned tendencies shows that there is a negative relationship

between work-related and death-related injuries and the levels of WC benefits. This seems to be the case because employers increase work environment safety to prevent WC increases, although this can make workers more likely to be exposed to accidents or report more incidents. Some scholars believe that a high level of advantages is associated with more work-related injuries in the workplace, and if the advantages of insurance increase, the interval of finding of a difficult-to-recognize injuries increases, on the other hand, others argue that those with WC payments are more likely to report difficult-to-recognize injuries[10].

### Research questions:

The questions were discussed in this research are the following:

- 1- What are the effects of insurance on organizations and work places? (except compensation for losses arising from events)

- 2- Does insurance have a role in reducing or increasing incidents?
- 3- Does insurance type have a role in preventing and reducing accidents?
- 4- Whether insurance companies have positive effects in preventing accidents?

## METHODS AND MATERIALS

### Search strategy:

The database sources used in the current study included the Web of Science (WOS), Scopus, and Science direct. A literature review was implemented based on the "title, abstract and keyword" field, through Scopus and science direct database and "Topic" of Web of Science database considering "insurance AND accident". A total number of identified articles were 5917 regarding keywords search in the databases. Keywords, databases and the number of articles in each database have been presented in Figure 1.

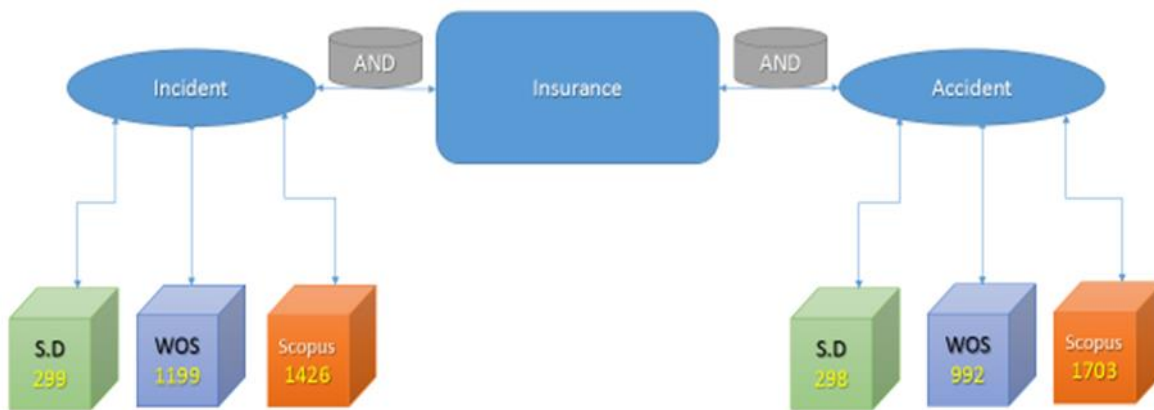


Fig 1. Keywords, databases and number of articles in study's databases

### Inclusion criteria:

The articles were selected based on the following inclusion criteria:

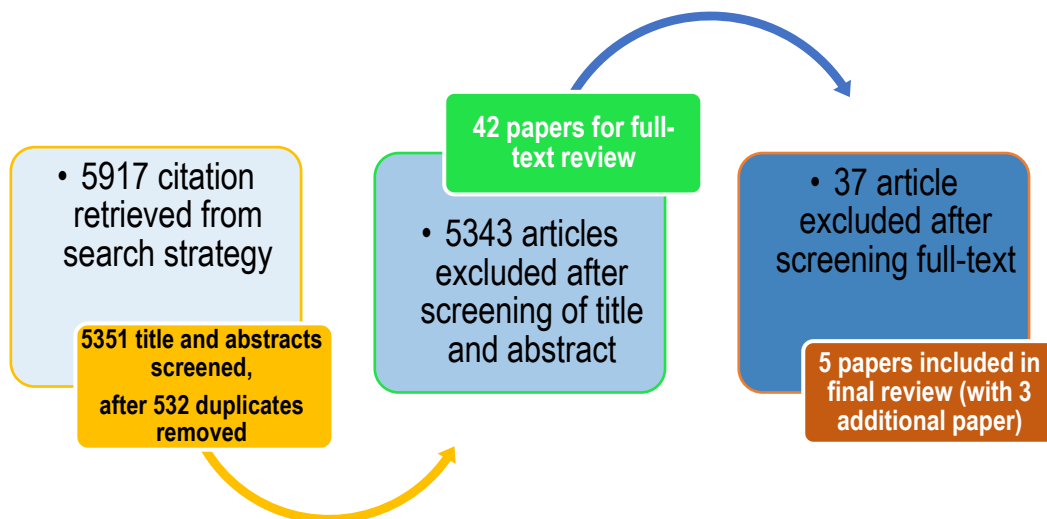
1. The article had implied the occupational and industrial accident and safety and also insurance markets (articles on road traffic accidents and medical areas were excluded)

2. The article was published in a refereed journal.
3. The article was only a research type.
4. The article was limited to those published from 2000 to 2018.
5. The paper was written in English language.
6. The paper was available online and in the form of full-text.

### Search steps:

Search was done in four steps:

1. Duplicate articles were removed. The number of remainder articles reached to 5385.
2. The remainder articles were reviewed for title, abstract, and keyword. Any article that its abstract was not available or not well-written, the full-text of article should be reviewed completely (in the third step)
3. Full-text articles were reviewed.
4. Finally, manual search for additional relevant articles was done. The reference lists (bibliographic references) of all retrieved research articles and articles that cite these and further relevant articles were assessed and evaluated. The papers review process and the number of final papers has been shown in Figure 2.



*Fig 2.* Flowchart of study selection procedure

## RESULTS

This part of article mainly describes and defines the details of the articles. First, articles were categorized by the publisher journal and then, in

addition to the description of each article, they were categorized as each kind of insurance, year, and

country. A total of 8 remaining papers were selected for review (see Table 1).

*Table 1. A summary of Studies and their details*

Study	Year	Area of study	Insurance type	Object	Results
Kamardeen Imriyas et al	2008	Australia	Workers' compensation insurance (WCI)	Develop an effective WCI premium-rating model	Insurance as an incentive to control accidents
Kamardeen Imriyas	2009	Australia	Workers' compensation insurance (WCI)	Develop an effective WCI premium-rating model	Insurance as an incentive to control accidents
Kili C. Wang	2009	Taiwan	Fire Insurance	Examining the relationships among market insurance, self-protection, and risk probability	Purchasing market insurance led to self-protection and Consequently reduce fire accidents
Eirik BJORHEIM Abrahamsen et al.	2010	Norway	Insurance market	Consequences relation to insurance and mandatory safety requirements	Effective in reducing overinvestment in safety measures
Eirik BJORHEIM Abrahamsen et al.	2011	Norway	Insurance market	Consequences relation to insurance and mandatory safety requirements	Effective in reducing overinvestment in safety measures
Ilsoon shin et al.	2011	Korea	Private insurance	Comparison of private insurance with social insurance in relation to accident reduction	Use of a private insurance system is found to lower the occupational accidents
Haitao Yin et al	2011	United States (Chicago)	Private insurance	Examination of whether risk-based pricing promotes risk-reducing effort.	Reduce Environmental accident
Pu-yan Nie et al.	2017	China	Key person insurance	Capture the two opposite effects of key person insurance	Leads to a decrease in employee salaries although reduces the risk in the organization

In Table 2, the article journals and their indexes have been presented. In the current review study, most of the selected articles were in Q<sub>1</sub> and published in ISI

and Scopus. Five of the journals publisher is Elsevier and three journals are from other publishers.

**Table 2.** the article journals of and their details

Journal	SJR	Quartile	Indexed in
Reliability Engineering and System Safety	1.665	Q <sub>1</sub>	ISI, Scopus
Journal of Law & Economics	1.585	Q <sub>1</sub>	ISI, Scopus
Expert Systems with Applications	1.271	Q <sub>1</sub>	ISI, Scopus
Safety Science	1.113	Q <sub>1</sub>	ISI, Scopus
Construction engineering and management	1.022	Q <sub>1</sub>	ISI, Scopus
Economic Modelling	0.966	Q <sub>1</sub>	ISI, Scopus
Safety and Health at Work	0.461	Q <sub>2</sub>	ISI, Scopus
Geneva Risk and Insurance Review	0.392	Q <sub>3</sub>	ISI, Scopus

## DISCUSSION

### Types of insurance and mechanisms:

The compensation of workers' insurance is mostly related to construction projects defined in the earlier section. Other types of insurance available to contractors in the construction sector are workers' compensation insurance (WCI), general liability insurance, contractors' all risk insurance, motor insurance, and marine transport insurance. Considering the nature of high-risk tasks in construction sectors and the high rate of death injury, employee compensation insurance compared to other types has relatively more importance. On the contrary, this kind of insurance is critical for insurers because they may have financial risks for them. On the other hand, one of the mechanisms used to improve workers' compensation insurance is a fuzzy expert system that reduces the financial risk to insurers through the premium rating [23, 24, 25]. Social insurance or public and private insurance are known as two different insurance types. There is also an insurance called key person insurance or key man insurance [10, 26]. There is also a commercial fire insurance which is a significant line in asset and accident insurance [26].

### Insurance advantages:

In two studies, investment in safety measures and their relationship with insurance has been discussed. A key element in determining whether or not to carry out risk transfer is the cost-benefit analysis. Theoretically, the expected benefits, in most cases, affect the investment in safety measures. If we ignore the need for insurance as a risk transfer, investing in safety measures is excessive (overinvestment), which, according to the cost-benefit analysis, and as-low-as reasonably practicable (ALARP) principle there is no proportionality between the costs used to reduce risk and the impact of risk reduction measures [27, 28].

Based on the workers' compensation insurance (WCI) policy, a higher premium rate may be determined by insurance if the contractors were unable to meet safety management measures. This process will be a beneficial approach to both contractor and the insurer, as it will reduce both construction accidents and financial risks for insurers [23, 24]. Another study investigated the importance of private insurance and coverage of compensation scheme. This means that private insurance and high coverage of compensation

scheme have a positive relationship with the reduction of occupational accidents in comparison with public insurance and low coverage of compensation scheme [10].

In addition to occupational accidents, insurance also affects environmental accidents. The results of a study showed that after Michigan disaster the private-market adopted environmental liability insurance, accidental releases and leakages from underground storage reservoirs also reduced by more than 20% from neighboring countries [29]. The abstracts of insurance and occupational incidents previously described in detail (refer to Table 2).

Insurance disadvantages:

It can be concluded that in spite of the insurance compensates for the losses in event, role, and importance of insurance in organizations has both positive and negative effects. It means that insurance can play a positive and negative role simultaneously for organizations. According to the microeconomic analysis conducted in the organization, it was shown that if the organization has a long-term insurance company, its organization and employees' salaries will decrease on the other hand it will reduce the risk in the organization [17]. The outcomes of a study also pointed out that if insurance to be mandatory by government organizations, investment in safety measures reduced (underinvestment) [30].

### **Answer to research's questions:**

Regarding the effects of insurance companies in the workplaces and industrial environments, the question arises whether insurance has other effects compared to compensation and risk transfer process or not. Although there are not many studies in this area it can be said that the benefits of insurance in industrial and occupational events do not only result in compensation it can contribute to the reduction of accidents. For example, the incentive mechanism for contractors during a tender process through insurance improves safety management. The type of insurance can also be an important factor. The results of a study showed that private insurance has a more preventive effect than public insurance [30]. In order to answer the question of whether insurance could have a negative effect or not, it can be said that the disadvantages of insurance can be related to the economic and investment issues and the profits of the

organization but it is useful and effective in the field of occupational safety and incidents [27]. In Table 2 each article was discussed in detail.

## **CONCLUSION**

In the present study, we discussed one of the most important approaches in risk management which transfer the risk to a third party to compensate for losses caused by accidents. This review included eight studies investigating the correlation between insurance markets and the occurrence of occupational accidents and injuries. Insurers may affect both positively and negatively but they mostly impact is mostly positive. Accordingly, among the studies, there was no inconsistency and all agreed on reducing incidents by insurance markets. Altogether, insurance companies have a positive impact on the safety of industrial projects. They can play an essential role in reducing incidents through a motivational approach that benefits industries and contractors as well as insurance companies. It is recommended that future research could more consider the contribution of insurance and how it affects the reduction of accidents (direct effects and indirect effects).



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