A study of fatal injuries in Nigerian factories

Afamdi O. Ezenwa

Department of Community Health, Faculty of Medicine, University of Benin, Benin City, Edo State, Nigeria

A study of the pattern of occupational injury mortality rates by industry and cause of death was undertaken to indicate the high-risk types of industry and the major causes of death, which could subsequently be used in developing cost-effective strategies for prevention. This is the first such study of accidental mortality factors in Nigerian factories. This paper reports the outcome of the study of mortality in Nigerian factories over a 10 year period (1987–1996). Between 1987 and 1996, a total of 3183 injuries were reported, of which 71 (2.2%) were fatal. The annual case fatality rate ranged from 0.94 per 100 injured workers in 1990 to 5.41 in 1994, with an overall fatality rate of 2.23 per 100 injured workers. Of the 71 deaths, 12 (16.9%) were associated with power-driven machinery. Ten (14.1%) deaths were associated with explosions, while people falling accounted for nine (12.6%) of the deaths. Eleven deaths (15.4%) occurred in the chemical/pharmaceuticals industry, nine (12.6%) occurred in the basic metal industry and seven (9.8%) occurred in the food, beverage and tobacco industry. There were seven (9.8%) deaths in the textile manufacturing industry. The highest case fatality rate per injured worker (16.6%) occurred in the coal–petroleum industry, followed by 5.9% in the wood and wood products industry. A rate of 5.8% occurred in the non-metallic manufacturing industry. The case fatality rates in Nigerian factories are compared with those of other predominantly African countries. Accident prevention programmes tailored to the work activities and specific causal factors in the high-risk types of industries are recommended following a detailed study of work situations and risk factors in these types of industries. Accident prevention programmes, including the use of protective equipment, safety education, machine guarding, a work permit system, effective supervision at work sites and the enforcement of factory laws and regulations, are recommended to improve accidental injury and death in the factories.

Key words: Accidental deaths; Nigerian factories.

Introduction

A study of reported accident experiences and safety management practices in Nigerian factories showed that there were reported cases of fatal injuries over the years [1]. Notwithstanding the economic, emotional and other forms of loss associated with fatal occupational injuries, there has not been any study on the nature and extent of fatal injuries in Nigerian factories.

A study of the pattern of occupational injury mortality rates by industry and cause of death could indicate the types of industry and areas in which deaths were most common, and so identify those to which preventive efforts would be best directed. The study reported here investigated the nature and extent of reported fatal injuries in Nigerian factories between 1987 and 1996. It also examined the fatalities by cause and type of industry over the 10 year period.

Materials and methods

The Factories Act makes it mandatory for every factory in Nigeria to report occupational accidents to the Factory Inspectorate Department of the Federal Ministry of Labour and Productivity. Statutory accident notification forms are submitted by factories to the factory inspectorate whenever there is a fatal injury or an accident (injury)
causing the worker to be absent from work for ≥3 days. These data on fatal and occupational injuries were collected from the factory inspectorate’s records for each year of the study period. They were analysed to determine the annual incidence and prevalence of fatal and non-fatal injuries over 10 years. The reported causes of injury and the type of industry were also ascertained.

Annual case fatality rates were determined by calculating the number of cases of death per 100 injured workers in a given year. For example, in 1987 there were 478 injured workers, of whom 16 died. The case fatality rate was determined as: 16/478 × 100. This gave a case fatality rate of 3.35%. Information on the number of workers in each sector was not available, so a rate per worker could not be estimated.

**Results**

Table 1 shows the annual distribution of injured workers and the corresponding number of deaths for the 10 year study period (1987–1996). During this period, there were 3183 reported injured workers, of which 71 (2.2%) were fatal. The table also shows that the annual case fatality rates ranged from 0.9% in 1990 to 5.4% in 1994, with an annual case fatality rate of 2.2%.

The annual distribution of deaths showed a very high incidence in 1987 (16 deaths) and in 1994 (12 deaths). Further investigation of the causes of these deaths showed that the high incidence of death in 1987 was due mostly to ‘other machinery driven by power’ (five deaths) and ‘explosion’ (five deaths). Five other causal factors accounted for the other six deaths that occurred during the year.

In 1994, of the 12 deaths, ‘people falling’ accounted for four (33.3%), while four other factors accounted for the other eight (66.6%).

Table 2 shows the number of deaths and the associated causal factors. Of the 71 deaths, 12 (16.9%) were associated with ‘other machinery driven by power’. This was followed by 10 (14.1%) deaths associated with ‘explosions’, while ‘people falling’ accounted for nine (12.6%) of the deaths.

Table 2 also shows the case fatality rate by causal factor. The highest case fatality rate was associated with ‘vehicle accidents’ (8.9%), followed by 7.3% associated with ‘explosions’ and 6.6% with ‘gassing and poisoning’.

Table 3 shows the number of deaths by type of industry. Of the 71 deaths, 11 (15.4%) occurred in the chemical/pharmaceuticals industry, nine (12.7%) occurred in the basic metal industry, eight (11.3%) occurred in the coal–petroleum industry, while seven (9.8%) occurred in the food, beverage and tobacco industry. The textile manufacturing industry accounted for seven (9.8%) of the deaths.

The highest case fatality rate (16.7%) occurred in the coal–petroleum industry, followed by 5.9% in the wood and wood products industry. The manufacturing non-metallics industry accounted for 5.8%.

**Discussion**

The present study shows that between 1987 and 1996 there were 3183 reported injured workers and 71 fatal injuries, resulting in a case fatality rate of 2.2 per 100 injured workers. The severity of the injury suffered is one of the factors contributing to this figure, as well as the adequacy of the response.

A study of accident trends and preventive strategies in
Kenya reported that of the 1648 accidents, 18 were fatal, resulting in a case fatality rate of 1.1% [2]. In Botswana, of the 289 injuries recorded between 1992 and 1994, there were 11 (3.8%) deaths [3].

A study of reported occupational accidents and injuries in the manufacturing industries in Egypt observed a total of 123 injuries with 64 deaths, resulting in a case fatality rate of 52.03% [4]. In Swaziland, with a labour force of ~100 000, ~1000 injuries and 30 fatalities occur annually, resulting in a case fatality rate of 3.0% [5].

Observations on the global strategy on occupational health for all reported that there are 125 000 000 accidents and 220 000 deaths, resulting in a case fatality rate of 0.18% [6].

The observations for the different countries and the world as a whole are summarized in Table 4. These observations from various countries are based on injuries reported to their factory inspectorates, as is the case in Nigeria.

The statistics on injury and death experiences in Nigeria probably represent only the tip of the iceberg compared with the real situation. Poor monitoring and enforcement lead to under-reporting of accidents. There are several problems confronting compliance monitoring and enforcement in Nigerian factories. A study of reported accident experiences and safety management practices in Nigerian factories showed that the compliance monitoring and enforcement of the factory inspectorate are limited by the small number of safety inspectors, inadequate supply of technical equipment and limited transport facilities [1]. The study showed that between 1987 and 1994 there was an annual average of 4923 registered factories, with an annual average of 55.75 factory inspectors, i.e. one factory inspector per 88.3 registered factories.

Case histories of some of the accidents are presented below to provide further insight into the contributory factors.

1. A worker was crushed to death by the reversing vehicle that he was directing. The victim slipped and fell, but the driver of the lorry was unaware of this and continued his backward movement.
2. A fatal accident occurred when a contractor to the factory was crushed to death by a forklift truck, the high load being carried preventing the driver from seeing what was in front of him.
3. In a cement factory, a worker was reported to be scraping raw materials from the crusher belt when he slipped and fell into the moving rollers of the limestone crusher.
4. A sawmill worker, in an attempt to stop a rolling log of wood, was crushed against another log on a bandsaw rail. He died a few hours later from the multiple injuries he received.
5. A 25-year-old carpenter was assigned to remove asbestos roofing sheets from a 10-m-high factory roof without the provision and use of the necessary duckboards. He crashed through the fragile roofing material and fell to his death when he stepped on one of the asbestos roofing sheets.
6. An electric welder was attempting to get out from a water tank that he was welding. He removed one of the protective rubber gloves that he was wearing while he was still in the tank and received an electric shock. In his attempt to jump out of the tank, his hand made further contact with the metal part of the tank on which he had placed the electrodes.
7. Some workers, including a tally clerk, were detailed to stock door frames in bundles of 84 pieces. After having stocked three rows of the door frame bundles, the tally clerk and a motor boy started to clear the area around the rows for the forklift driver to start the next row. As the forklift driver moved towards them with a bundle of door frames, he saw one of the rows bending and the bundles sliding against one another. He shouted for the tally clerk and his motor boy to run away from the area. The motor boy was able to run away, but before the tally clerk could escape, the sliding bundles fell on him and pinned him down. He had a compound fracture of the skull with multiple other injuries, and later died on his way to hospital.

There are indications that smaller employers experience more fatal and non-fatal injuries at work. An analysis of occupational injuries in Alberta showed that smaller employers generally have a higher injury risk than larger employers [9]. A study of the trends in fatal occupational injuries and industrial restructuring in North Carolina in the USA observed that manufacturing industries that declined in employment experienced a 9.6% average annual increase in fatal injury rates, while manufacturing industries that grew in employment during the same period experienced a 6.8% average annual decrease in fatal injury rates [10].

The authors attributed the increasing fatality rates in the declining manufacturing industries to increased labour competition and lower profit margins, which are likely to lower investments in capital and safety equipment by some employers as well as production pressure.

In Nigeria, the factory inspectorate has repeatedly reported an increase in the numbers of small-scale enterprises with standards of safety and health far below what is acceptable. The reports also stated that where the hard economic conditions had not forced any enterprises to close down, they had led many to economize on safety measures [11–13]. To economize on safety measures, management resorts to:

- reduction of or failure to provide personal protective equipment; and
- reduction of or lack of safety training for the workers.

The present study showed that of the 71 fatal injuries, 12 (16.9%) were associated with ‘other machinery driven by power’, 10 (14.1%) were associated with ‘explosions’ and nine (12.7%) were associated with ‘people falling’. In the Kisumu and Siaya districts of Kenya, 21% of the occupational accidents were caused by machinery in motion [14]. The National Traumatic Occupational Fatalities Surveillance System identified machinery-related incidents as the second leading cause of traumatic occupational fatalities in the USA between 1980 and 1989 [15]. These observations, along with those from the present study, indicate the high risk of work with machinery in industrial operations.

These data suggest that there is the need for an in-depth study of the circumstances leading to the high incidence of accidents and deaths associated with ‘other machinery driven by power’. There is also a need for a detailed study of these accidents to try to elucidate which work situations confer high risk. The observations additionally indicate the need for interventional studies of machinery-related accidents. In some instances, changes in material, tools or equipment could reduce the incidence of fatal or serious injury [16].

This study has also shown the types of industry that are at high risk of fatal injuries. Between 1976 and 1990, there were 1598 cases of reported injured workers in the petroleum industry, with 230 fatalities [8]. This represents a case fatality rate of 14.4% in the petroleum industry in Nigeria.

The case fatality rate in the petroleum industry is significantly higher than the average rate in Nigerian factories. This is similar to the observations in some other countries. Non-fatal work-related injury rates are 49% higher among oil and gas field workers than among workers in all US industries combined [7]. The injuries were also more severe (the rate of lost workdays in the oil and field services industry is 2.8 times that of all US industries combined). Of the 5251 reported injuries among oil and gas field workers, 5218 (99.4%) were non-fatal while 33 (0.6%) were fatal work-related injuries [7]. There is a need for further research to identify which factors are important in determining why accident rates vary between industries. Preventive action requires a full understanding of the events leading to an accident in the high-risk industries. It may be that these types of industry need to consider introducing special accident prevention programming tailored to their work activities and the specific causal factors of accidents. The programmes should be integrated progressively into the activities of the organization. Aside from specialized measures, there should also be a programme to promote (and awareness of) safety among management and staff. There should be a rational organization of the programme to improve the quality of working life.

A general programme should include:

- informing personnel about accident risks (information being presented in a clear, convincing manner), ensuring adequate training of personnel and using supervisors to lead by example; and
- the effective use of personal protection, offering motives for safe behaviour, effective supervision at work sites and establishment of a work permit system.

An assessment of safety management practices in
Nigerian factories showed the need for major improvements in the resources, and methods of compliance monitoring and enforcement [12]. Measures such as effective compliance monitoring and enforcement by factory inspectors should also improve fatal and non-fatal accident rates in Nigerian factories.

Acknowledgements

The author expresses his gratitude to the staff of the Factory Inspectorate Department of the Federal Ministry of Labour and Productivity for providing the records and reports used for this study. This study was conducted with financial assistance from Safety Sciences Nigeria Limited, an organization devoted to corporate loss control and the associated human resource development.

References