

Workplace fatalities in Brunei Darussalam

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Abstract: In 2012, there were about 2.3 million deaths worldwide attributed to work. The highest workplace fatality rate (WFR) was reported on construction sites due to high risk activities. Globally, fall from height is the leading cause of fatal injuries for construction workers. The objectives are to determine Brunei Darussalam's demographic distribution of occupational fatality; identify causal agents and industry where occupational fatalities commonly occur; and determine WFR by year. This cross-sectional study retrospectively reviewed records of occupational fatality which were notified to the Occupational Health Division, Ministry of Health, from January 2012 until December 2016. Notified occupational fatalities in Brunei over a five-year period was 50. Most of the cases were in 31–40 age group. 38% of fatality cases occurred in Indonesian workers. 60% were from the Construction industry. 38% were due to fall from height. WFR averaged 5.28 and the highest industry-specific fatality rate was seen in the Construction industry, ranging from 27.94 to 56.45 per 100,000 workers. WFR for Brunei Darussalam from 2012 to 2016 was similar to that of Malaysia, but higher than Singapore and the UK. Industry-specific fatality rate for the Construction and Manufacturing industries were higher than those of Singapore and the UK.

Key words: Occupational fatality, Industry, Construction, Brunei Darussalam

Introduction

Occupational injury is defined as any personal injury, disease or death resulting from a workplace accident. Workplace accident is an occurrence arising out of or in the course of work which can result in fatal occupational injury or non-fatal occupational injury¹. Occupational fatality also includes death caused by an accident at work, on the way to or from work, or during other work or movements directly or indirectly related to the occupation¹. The Occupational Safety and Health Administration (OSHA) defines a work environment to be primarily composed of the employer's premises and location where employees are

engaged in work-related activities or present as a condition of their employment. This includes not only physical locations, but also the equipment or materials used by the employee during the course of his or her work². OSHA regulations stipulate that all occupational fatalities, including those due to medical conditions, must be notified to the relevant authority within a specific period of time³.

Estimates from the International Labour Organization (ILO) and World Bank Group data in 2013 show that 2.34 million occupational fatalities occur each year in a global workforce of 3.3 billion⁴. This translates to 71 fatalities per 100,000 workers per year⁴. This is a significant increase from 1994 when the average global fatal occupational accident rate was 14.0 per 100,000 workers and the number of fatal occupational accidents was 335,000⁵. In 2006, fatal occupational accident rate in Finland was 2.9 per 100,000, 0.8 per 100,000 in the United Kingdom, 5.2 per 100,000 in the United States, 9.8 per 100,000 in Singa-

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pore, 18.3 per 100,000 in Malaysia, and 10.5 per 100,000 in China⁶). In 2014, the World Health Organization (WHO) calculated estimates for occupational injuries, illnesses and burden of work-related mortality based on WHO regions. Total work-related mortality in high-income areas was 321,077, whereas 380,843 was estimated in the African region, 138,557 in the American region, 135,076 in the Eastern Mediterranean region, 214,557 in the European region, 606,451 in South East Asia region, and 546,588 in the Western Pacific region⁷).

Deaths due to occupational injuries in all countries also result in high economic and social costs⁷). Globally, the economic costs of work-related injury and illnesses, and workplace fatalities range from 1.8–6% of country GDP, averaged out as 4%⁷). For the year 2005–2006, the economic loss from work-related injuries in the United States amounted to US\$250 billion (1.8% of GDP), whereas in Australia it was AU\$57.5 billion (5.9% of GDP)⁷). The ILO has estimated that US\$2.8 trillion is lost due to direct and indirect costs from occupational accidents and diseases, fatalities, workers' compensation, interruption of production, and medical expenses⁷).

Certain industries are associated with a higher risk of occupational injuries and fatalities. Construction is considered the most dangerous land based work sector. Common safety hazards on construction sites are falls from height, heavy vehicle crashes, excavation-related accidents, electrocution, operation of heavy machinery or tools, failure of temporary structures, and being struck by falling or moving objects. Fall from height is the leading cause of accidents and injuries in the construction industry⁸). In developing countries, construction activities such as building of roads, factories and housing infrastructure, combined with untrained workers can lead to an increase in accidents and fatalities⁷). The UK National Safety Council (2013) reported that the highest industrial fatality rate was from construction sites, and the rate of fatal injuries in this industry was at least two times higher than in the manufacturing industry⁹). As such, construction is globally perceived as an accident-prone industry due to its hazardous and high-risk activities^{10, 11}). Other factors contributing to occupational injuries and fatalities include individual characteristics (age, gender, work experience), environment (weather condition, on-site working conditions), equipment (faulty equipment, lack of proper maintenance, nature of the work), and management (failure to provide safety equipment, lack of proper supervision, lack of standard operating procedure)¹²). The high risk nature of certain occupations e.g. construction sector, combined

with high concentration of migrant workers in high risk occupations, unskilled workers, lack of effective safety training programs, and lack of enforcement of laws to ensure safe workplaces all contribute to an increase in fatal occupational injuries¹³).

Brunei Darussalam is a sultanate country located on the northwest coast of Borneo Island in South East Asia, with a land area of approximately 6,000 sq. km and a total population of 417,200¹⁴). It has 161 km of coastline next to the South China Sea, and shares a 381 km border with East Malaysia. The country comprises four districts i.e Brunei-Muara, Tutong, Belait and Temburong. About 97% of the population live in the Belait, Tutong, and Brunei-Muara districts, while only about 10,000 people live in the Temburong district¹⁴). Brunei Darussalam's total employed workforce is 189,573¹⁵), of which 27.5% are migrant workers. Employment is heavily concentrated in the services sector (77.7%), particularly in wholesale and retail trade (11.3%) and public administration (26.2%). The construction industry makes up the second highest number of workforce (7.4%) in the country¹⁵). In Brunei Darussalam, the average working hours per week is 46.8 h¹⁵).

To date, there have been few epidemiological studies in the region of South East Asia on occupational fatalities. This study therefore aims to determine the prevalence of occupational fatality and the main causal agents in Brunei Darussalam, and to translate findings into practicable policies and guidelines to improve the national standards of workplace health and safety.

Subjects and Methods

This cross-sectional study retrospectively reviewed occupational fatality records over a 5-yr period, the records of which were derived from notifications to the Occupational Health Division, Ministry of Health. Notifications of occupational fatalities involving workers of age less than 15 yr were excluded from the study. The relevant information extracted from the reporting form included demographic characteristics of the worker (age, gender, nationality), type of occupation, type of industry, and confirmed or probable causal agent that led to the fatality. Industries were classified using the International Standard Industrial Classification (ISIC) of All Economic Activities¹⁶).

Workplace fatality rate (WFR) is used to compare the risk of workplace deaths among working groups. For this study, WFR was calculated using estimates of the employed workforce (age 15 yr and above) data for the years 2012 until 2016 based on the employed workforce

Table 1. Occupational fatality and fatality rate by year

Yr	No. of fatality	No. of workers*	Fatality Rate (per 100,000)
2012	08	185,668*	4.31
2013	10	187,621*	5.33
2014	12	189,573*	6.33
2015	09	191,526*	4.70
2016	11	193,479*	5.69

*Estimates based on the employed workforce data for 2011 and 2014 published in Brunei Darussalam Key Indicators, Release 2, 2015 by Department of Economic Planning and Development.

data published for the years 2011 and 2014 in the Brunei Darussalam Key Indicators by Department of Economic Planning and Development¹⁷⁾, and by using the following calculations¹⁸⁾.

$$\text{Fatality Rate} = (N / W) \times 100,000$$

N = Number of fatalities aged 15 yr and above

W = Average number of employed workforce above 15 yr

$$\text{Fatality Rate for particular work sector} = (N / W) \times 100,000$$

N = Number of fatalities aged 15 yr and above in a particular industry

W = Average number of employed workforce above 15 yr in the same industry

Statistical analysis was done using SPSS Version 21. The study was given prior approval by the Medical and Health Research Ethics Committee (MHREC), Ministry of Health, Brunei Darussalam.

Results

A total of 50 notifications of fatal incidents at the workplace in Brunei Darussalam was received over a 5-yr period from January 2012 until December 2016. All 50 notified cases met the study criterion. The annual fatality trend showed that the highest number of fatality was recorded as 12 cases in 2014 and the lowest was 8 cases in 2016. The national workforce was recorded by the Department of Economic Planning and Development, Prime Minister's Office as 189,573 employees in 2014 and 183,715 employees in 2011¹⁴⁾, and this reference was used to calculate the workplace fatality rate per 100,000 workers. Based on the workforce data for years 2011 and 2014¹⁴⁾, estimates of employed workforce in the years 2012, 2013, 2015 and 2016 was extrapolated by computing the rate of rise in employed workforce i.e. 1.05% per yr (Table 1). Table 1

Table 2. Demographic characteristics

Age* (yr)	Number (%)
<20	02 (4.1)
20–30	09 (18.4)
31–40	16 (32.6)
41–50	14 (28.6)
≥51	08 (16.3)
Gender	Number (%)
Male	48 (96)
Female	02 (4)
Nationality	Number (%)
Indonesian	19 (38)
Bangladeshi	09 (18)
Bruneian	08 (16)
Filipino	03 (6)
Indian	03 (6)
Malaysian	03 (6)
Thai	03 (6)
Vietnamese	01 (2)
British	01 (2)

*Age record was not available for one fatality case.

shows the workplace fatality rates in Brunei Darussalam from 2012 to 2016. The workplace fatality rate ranged from 4.31 to 6.33 per 100,000 workers.

Table 2 presents the demographic characteristics of notified fatal cases. Cases recorded during the 5-yr period ranged from age 19 to 56 yr. Most fatalities occurred in workers in the 31–40 age group (16, 33%), whilst the least number was recorded in those aged <20 yr and ≥51 yr. There was a high proportion of male fatal cases (48) compared to females (2). The majority of occupational fatal cases were observed to be of Indonesian nationality (19, 38%), followed by Bangladeshi (9, 18%), Bruneian (8, 16%), and Filipino, Indian, Thai and Malaysian (3, 6% respectively). Vietnamese and British nationality made up the least number (1, 2% respectively). Most of the fatalities occurred in migrant workers (84%).

Construction industry topped the commonest workplace for occupational fatalities (30, 60%) over the period of 5 years, and this was followed by Mining and Quarrying (7, 14%), and Manufacturing (6, 12%) (Table 3). Table 4 illustrates that falls were identified as the leading cause of occupational fatality in 38% of notified cases (19). This was followed by Struck by Object (9, 18%), and Fire/Inhalation of Smoke (6, 12%). There were few reported cases (5, 10%) of workplace fatal incidents which were investigated and concluded to be attributed to underlying medical conditions.

Table 3. Occupational fatality by industry

Type of industry	Number (%)
Construction	30 (60)
Mining and quarrying	07 (14)
Manufacturing	06 (12)
Transportation and storage	02 (4)
Wholesale and retail trade	01 (2)
Accommodation and food service activities	01 (2)
Agriculture	01 (2)
Other service activities	02 (4)

Table 4. Occupational fatality by causal agent

Causal agent	Number (%)
Falls	19 (38)
Struck by object	09 (18)
Fire/Inhalation of Smoke	06 (12)
Caught between object	04 (8)
Electrocution	03 (6)
Land slide	03 (6)
Poisoning	01 (2)
Others (medical conditions)	05 (10)

Table 5. Workplace Fatality Rate (WFR) by industry (per 100,000 workers)*

	2012	2013	2014	2015	2016
	WFR (No)	WFR (No)	WFR (No)	WFR (No)	WFR (No)
Construction	36.39 (5)	43.22 (6)	49.90 (7)	56.45 (8)	27.94 (4)
Mining & quarrying	0 (0)	0 (0)	9.42 (1)	0 (0)	55.38 (6)
Manufacturing	0 (0)	28.05 (2)	41.64 (3)	0 (0)	13.60 (1)

*Workplace fatality rates were calculated using estimates of employed workforce in a particular industry, based on employed workforce data published for the year 2011 and 2014 in Brunei Darussalam Key Indicators 2015, Release 2 by Department of Economic Planning and Development.

Table 5 shows the annual industry-specific workplace fatality rates for three major industries in Brunei Darussalam. Fatality rate in the Construction industry was highest ranging from 27.94 to 56.45 per 100,000 workers over the 5-yr period, followed by Manufacturing industry (13.60 to 41.64 per 100,000 workers), and Mining and Quarrying industry (9.42 to 55.38 per 100,000 workers). Industry-specific fatality rates in Mining and Quarrying ranged from 0 to 55.38 per 100,000 workers, and Manufacturing ranged from 0 to 41.64 per 100,000 workers. Both industries show a large variability during the study period, and this is mainly attributed to less number of or no fatal cases in these industries. The majority of fatal cases occurred in the Construction industry (60%), hence the industry-specific fatality rate is consistently high throughout the study period.

Figure 1 represents the trend of occupational fatalities over the 5-yr period. There was a rise in number of fatalities from 2012 to 2014, followed by a reduction in 2015. An increase in 2016 was observed and this was attributed to five fatalities (10%) due to underlying medical illnesses.

Discussion

On comparing the above findings with other studies in reviewed literature, the leading age group for fatal cases in this study was 31–40 yr, and this was noted to be

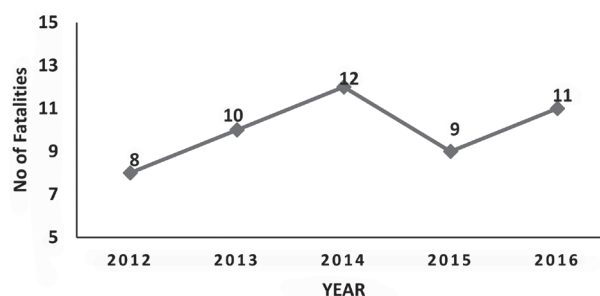


Fig. 1. Annual trend of workplace fatality cases.

higher than the leading age group as well as average age for occupational fatality in similar studies carried out in Iran and Jordan^{19, 20}. In terms of gender, the findings of a major proportion of occupational fatality among males (48, 96%) in this study is consistent with findings of other studies conducted in Jordan and Mexico where the proportion of males in occupational fatalities was 98.8%²⁰ and 96.23%²¹ respectively.

This study showed that 84% of occupational fatalities occurred among migrant workers (which make up 27.5% of the total workforce). In Brunei Darussalam, migrant workers are typically engaged in labour intensive and manual work. Factors such as unfamiliarity with the national health and safety standards; language barrier; cultural differences on perception and barriers relating to

workplace health and safety; lack of adaptability to new work environment, are contributors to an increased risk for occupational fatalities. In the United States, it was noted that there was 20% higher rate of fatal injuries occurring among Hispanics/Latinos, whereas in Spain, foreign workers were found to have 80.2% higher rate for fatal injuries than local workers in 2003¹³).

The findings of occupational fatality being of highest proportion (30, 60%) in the Construction industry is consistent with other studies in Jordan (62.7%)²⁰ and Iran (44.3%)¹⁹). A similar result was also found in the United Kingdom whereby the construction sector was the leading contributor of fatal occupational injuries from 2000–2014⁹) due to a wide range of complex construction work activities to which workers are exposed²²).

In this study, fall from height was the leading cause of death amongst the cases of occupational fatalities (19, 38%), and this result is comparable to a similar study in Jordan (44.3%)²⁰). Other studies have showed lower prevalence^{23, 24}). Nevertheless, there was consistent correlation among these studies which showed that fall from height was the commonest workplace accident resulting in occupational fatality.

Workplace fatality rate is used to compare the risk of workplace deaths among working groups and is calculated using estimates of employed workers from current population survey¹⁸). On comparing our rates with the rates of other countries, Brunei Darussalam's average industrial fatality rate of 5.28 (per 100,000 workers) for 2012–2016 was considerably higher than the average industrial fatality rate in Singapore (2.32 per 100,000 workers for 2006–2015)²⁵) and the United Kingdom (0.52 per 100,000 workers for 2011–2016)²⁶) but similar to the average occupational fatality rate in Malaysia (4.63 per 100,000 workers for 2014–2016)²⁷). The average construction industry fatality rate in Brunei Darussalam for years 2012–2016 was 40.78 (per 100,000 workers) which is significantly higher than the average construction industry fatality rate of 6.00 (per 100,000 workers) in Singapore (year 2012–2015)²⁵) and average construction industry fatality rate of 2.15 (per 100,000 workers) in the UK (year 2011–2015)²⁶). Similarly, the average manufacturing industry fatality rate in Brunei Darussalam for years 2012–2016 was 16.65 (per 100,000 workers). On comparison, this is higher than the average manufacturing industry fatality rate of 2.28 (per 100,000 workers) in Singapore (year 2011–2015)²⁵) and the average manufacturing industry fatality rate of 0.74 (per 100,000 workers) in the UK (year 2011–2015)²⁶).

Study Limitations

This was a record-based study and included only notified or reported cases of occupational fatalities to the Occupational Health Division, Ministry of Health Brunei Darussalam. It is acknowledged that whilst almost all cases of occupational injuries resulting in immediate death are notified to the authority, most cases of occupational injuries requiring hospital admission and treatment do not. In such instance, there may have been cases where workers eventually succumb to death due to severe injury, and go unreported as an occupational fatality.

Conclusion

Brunei's average occupational fatality stands at 10 cases per year, with more than 96% of them being males. 60% of the fatalities were from the Construction industry, and fall from height was the main causal agent. There are similar patterns to occupational fatality rates in Malaysia; however, our results are significantly higher than other regional countries such as Singapore. Industry-specific fatality rates for Construction and Manufacturing industries are also higher than the respective rates in Singapore and the United Kingdom.

The findings of this study provide evidence for strengthening workplace health and safety measures in the country, particularly for the Construction industry. Measures such as implementation of legislations (Workplace Safety and Health Order 2009, and subsidiary regulations), appointments of authorized officers to assist in the enforcement of WSHO 2009, penalties for those who fail to comply with WSHO 2009, as well as joint multidisciplinary team workplace investigations²⁸) are currently active actions being undertaken by relevant authorities. However, there is still lack of enforcement on notification or reporting of workplace accidents and fatalities, or dangerous occurrences at the workplace. Other supportive measures include strengthening of medical surveillance programs, regular health and safety training for workers, strict supervision of work activities, safety tool box discussions at the workplace, and provision of and proper usage of appropriate personal protective equipment; these can help in further reducing the number of occupational fatalities in Brunei Darussalam. In addition, effective communication particularly to migrant workers in Brunei Darussalam needs to be strengthened to overcome language barriers and cultural differences relating to health and safety at the workplace.

Workplace fatality rates can also be used as a national key predictor indicator to strengthen national implementation of workplace safety and health measures in Brunei Darussalam.

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