

# DEMOGRAPHIC ANALYSIS OF OCCUPATIONAL ACCIDENT OCCURRENCE IN MANUFACTURING INDUSTRY

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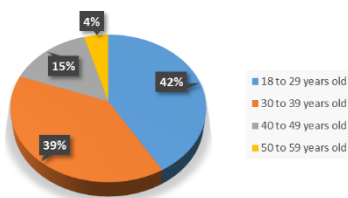
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## Graphical abstract



## Abstract

The objective of this paper is to analyze the demography aspect of occupational accident occurrence in Malaysia for manufacturing industry. High accident rate would give an adverse effect not only to the victims and their family but also to the organization as well. This study analyses various type of occupational accidents which limited to temporary disability with more than one day sick leave and cases recorded range between 2008 and 2013. The data is gathered from six different sectors within manufacturing industry by using local specific approach. Information related to each accident is obtained by checking past occupational accident record and interviewing site safety officer in charge, human resource representative, site supervisor and fellow workers. There are 342 cases in total have been gathered during data collection process before data analysis phase took place. This study provides a better perspective regarding to occupational accident occurrence to interested stakeholder such as enforcement body, occupational health and safety practitioner and company management itself. The findings from this study can be used to draft necessary preventive measures in order to provide safe working environment which can give significant impact through reduction of occupational accidents in the future.

**Keywords:** Occupational accident occurrences, manufacturing industry, accident prevention, local specific, temporary disability

## Abstrak

Objektif kajian ini adalah untuk menganalisis kejadian kemalangan di tempat kerja di Malaysia khususnya dalam industri pembuatan dalam aspek demografi. Kadar kemalangan yang tinggi akan memberikan impak yang negatif kepada mangsa dan juga organisasi. Kes kemalangan di tempat kerja adalah terhad kepada kes hilang upaya sementara sahaja yang mempunyai bilangan cuti sakit lebih daripada sehari dan kes tersebut telah direkodkan antara tahun 2008 dan 2013. Data telah dikumpul daripada enam sektor bertalian dalam industri pembuatan dengan menggunakan kaedah carian data spesifik. Informasi berkaitan kemalangan telah didapati melalui proses semakan terhadap fail kemalangan yang terdahulu. Temuduga juga telah diadakan bersama dengan pegawai kesihatan dan keselamatan pekerjaan syarikat, wakil jabatan sumber manusia, penyelia dan juga rakan sekerja kepada mangsa. Sejumlah 342 kes telah direkodkan sebelum proses analisis dijalankan. Tambahan itu, kajian ini dapat memberikan perspektif yang lebih baik kepada pihak yang berkepentingan. Dapatan kajian ini juga boleh digunakan untuk merangka pelan pencegahan kemalangan bagi menyediakan suasana pekerjaan yang lebih selamat di masa hadapan.

**Kata kunci:** Kemalangan di tempat kerja, industri pembuatan, pencegahan kemalangan, data spesifik, hilang upaya sementara

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## 1.0 INTRODUCTION

Manufacturing industry plays an important role in catalyzing national economic growth. The notable performance from this industry has contributed about 24.6% towards national's Gross Domestic Product (GDP) in 2010. According to Economic Census by Department of Statistics of Malaysia, the gross output from manufacturing industry has shown positive growth with average of 5% annually between 2005 and 2010 [1].

Despite of this positive development, there are several issues that need to be addressed by relevant stakeholders since the existence of these issues could impede the growth of this industry and may give negative impact in the long run in term of financial and human resource aspects. The most impending issue that needs to be addressed is occurrences of occupational accidents. The factors that led to accidents in manufacturing industry are hazardous working environment, insufficient hazard identification, human error and inadequate instructions and guidelines [15].

There are 128 implications due to an accident have been identified and 70 of it will give direct effect to the business [2]. The implications are shared between employees, business organizations and government agencies. The injured employee need cope with the suffering which includes wage losses and reduction of quality of life. As for business organizations, they need to cover expenses related to the accident such as productivity loss, machine and equipment damage and worker replacement. Besides, the organization could face tarnished reputations, deteriorated employee motivation and morale. Disruptions of manufacturing process may result to inability to meet customer order [3, 4]. In contrast, government agency such as hospital and social security organization are obliged to provide medical treatment and sufficient amount of compensation to the victim. The increased severity of accident will cause more financial burden to the respective agencies.

Therefore, researchers have conducted various studies in order to increase level of awareness on occupational safety among top management and it's subordinate. These studies include accident cost estimation which proved to be a useful tool in giving proper understanding to employers and workers since the accident is expressed in dollar figure [8]. Generally, accident can be categorized into two broad categories which are direct and indirect cost. Most of the time indirect cost is much greater than direct cost and this scenario is depicted as in Iceberg Theory [10].

Meanwhile, there is one research which proposes cost-benefit analysis method [9]. This research attempts to establish relationship between accident cost and investment in occupational safety and health. As a result, employers are aware about possible financial gain when making investment particularly in occupational, safety and health (OSH) aspects. At the end of the day, these completed

researches can be used to encourage top management to invest in prevention program with objective to reduce overall accident rate.

Researchers are confident that proactive preventive measure will certainly reduce the accident rate and overall accident cost rather than reactive measure [5]. Examples of measure that have been proposed are establishment of safe working procedure, adequate staff training, reasonable working hours (including day and night shift) and break schedule [6, 7].

The objective of this study is to analyze the demography aspect of occupational accident occurrence in Malaysia for manufacturing industry. This study is limited to temporary disability cases with one and more than one day of sick leave. First-aid injury (which has no medical leave, MC = 0) cases are excluded. The findings from this study will assist governments and organizations to introduce appropriate preventive measures that minimize accidents and associated losses.

## 2.0 METHODOLOGY

A survey form is developed prior to data collection process and it has been constructed with aim to extract as many information as possible from past accident records. However, only demographic data is required for further analysis. The study covers occupational accident cases which have been reported to the Department of Safety and Health (DOSH) between 2008 and 2013.

Six different sectors within manufacturing industry have been identified for this study are as follows: (a) sawmills and planing (b) manufacture of furniture and fixture (c) industries related to printing and publishing (d) manufacture of plastic products (e) manufacture of electrical and electronic products and (f) iron and steel basic industry. All sectors mentioned cover four main regions in Malaysia which are northern, southern, central and east coast region. Inclusion of those regions would help us in making general conclusion about accident trend for this country especially in manufacturing industry. Majority of the injured workers are male with 325 cases while female only 17 cases. The age of the victims are ranged between 18 to 59 years old.

Local specific approach has been adopted during data collection process. Previous accident record maintained by human resource department is examined in order to extract relevant information regarding to that particular occupational accident. In addition, safety and health officer (SHO), representative from human resource department, site supervisors and their fellow workers has been interviews in order to get a clearer picture about the accident since they appeared at the accident event. Thereafter, these information is recorded on the survey form. It should be noted that the accident data is gathered on case by case basis and each accident shall has its own survey form.

After data collection process is completed, the accident information is analyzed by using several graphical representations such as chart and graph. Therefore, the data is aggregated by using Microsoft Excel program prior to subsequent analysis. The data is analyzed based on general demographic information followed by establishing relationship between accident occurrences with accident scenario and impact of injury (location of body injury and type of accident).

### 3.0 RESULTS AND DISCUSSION

#### 3.1 Occupational Accident Data Overview

There are 342 cases available for analysis and restricted to occupational accident during working hours only. Accident due to commuting and occupational diseases are not included in this study. Eleven manufacturing companies involved in this study with total workforce of 9,325 employees across six sectors. 4,163 number of days of sick leave has been recorded for whole study duration. The lowest number of sick leave is one day while the maximum is 98 days. The average number of sick leave stood at 12 days for each accident case.

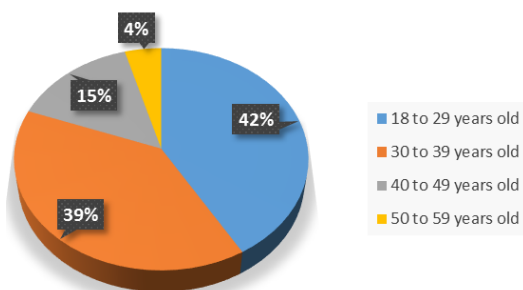
#### 3.2 Gender and Age Group of Injured Worker

According to Table 1, most occupational accident cases happened on male rather than female workers. Only 4.97% of all reported cases involved female workers compared to male which stood at 95.03%. Generally, manufacturing industry is dominated by male workers especially at the production area while female workers may be present in other area such as administration office doing desk job [11].

**Table 1** Frequency of occupational accidents based on gender

Gender	Frequency	Percentage (%)
Male	325	95.03
Female	17	4.97

Based on Figure 1, majority of the victims (42%) were aged between 18 to 29 years old while 50 to 59 age group records least number of reported cases.



**Figure 1** Age group distribution of the injured workers

The average age of a worker involved in an accident is 34.45 years old. In addition, there is decreasing trend of accident rate according to the age group. The accident rate is decreased when the age of worker is increased. This finding shows that younger workers have higher possibilities to involve in occupational accident compared to older workers. This higher risks is due to inadequate knowledge on the job task and lack of awareness about occupational safety. It is related to the fact that younger workers have less experience and training.

Lack of safety culture within organization also contribute to this issue. Besides, this statement is in line with other previous study which found that lack of attention in safety and health aspect in Latin America and Caribbean are due to insufficient awareness regarding to importance of safe and healthy working environment [12]. The author also asserted that there is weakness of responsible parties in promoting and enforcing better working conditions.

#### 3.3 Nationality of Injured Workers

Table 2 shows that 60.23% of the injured workers are Malaysian while the remaining are non-Malaysian. Non-Malaysian workers were come from Indonesia, Bangladesh, Pakistan, Myanmar and Vietnam. In general, Malaysia has diverse workforce especially in manufacturing industry. There are some companies that utilize more foreign workers rather than local due to low labour cost.

**Table 2** Frequency of occupational accidents based on nationality

Nationality	Frequency	Percentage
Malaysian	206	60.23
Non-Malaysian	136	39.77

#### 3.4 Race or Ethnicity of Injured Workers

The results in Figure 2 shows that Malay ethnic made up about 42% of total cases and followed by "Others" ethnicity, Indian and Chinese. Non-Malaysian victims are classified under "Others" race category. Since majority of the employees who work at manufacturing industry especially at production site are Malay, we would expect most of the accident cases come from this ethnic. This finding is parallel with the annual report released by Social Security Organization (SOCSO) [13].

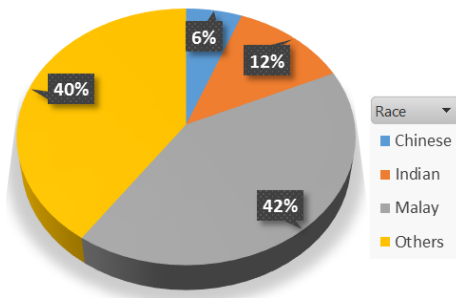


Figure 2 Distribution of race of the injured workers

### 3.5 Occupational Accident Based on Type of Industry

Based on Figure 3, the distribution of reported case is quite level from one sector to another except for manufacture of plastic products and printing sectors. Iron and steel basic industries claimed highest percentage and closely followed by manufacture of radio, television, communication equipment and electrical appliances (23.68% and 23.10% respectively). Printing and publishing shows least percentage of reported case within the study period.

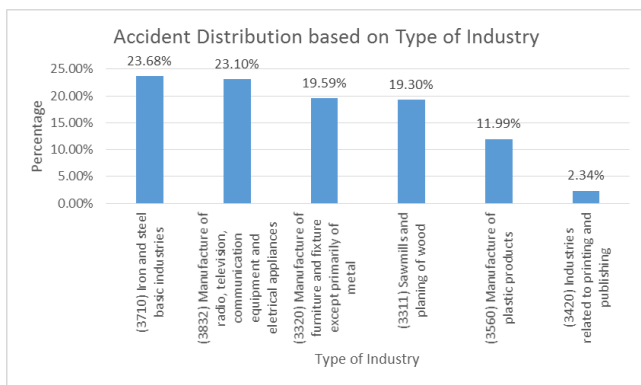


Figure 3 Occupational accident based on type of industry

### 3.6 Number of Workers Based on Type of Industry

In this study, only six sectors are involved and it is comprised of nine different companies in total. From six sectors, four of them utilize more local labour than foreign labour. Only two sectors which are iron and steel basics and electrical appliances employ more foreign labour. Besides, those two sectors also have the highest number of employees due to size of their business and both of them supply their products for domestic and foreign market. Detail on number of workers for each sector can be referred as in Figure 4.

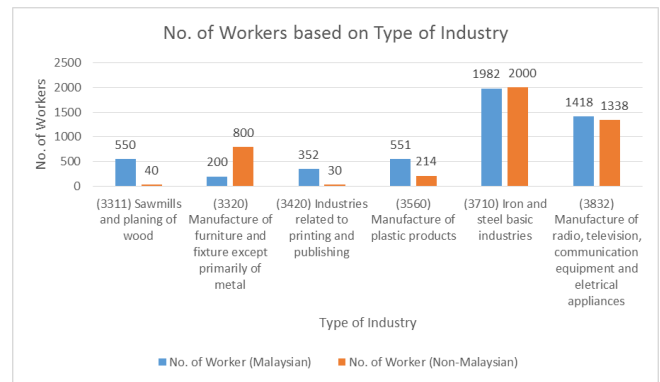


Figure 4 No. of workers based on type of industry

### 3.7 Reported Case Based on Year

The number of reported occupational accident case has an increasing trend for the past six years as shown in Figure 5. There is also a steep increase in term of number of cases between year 2009 and 2010 for about 14% before grew more stable from year 2011 to 2013. Considering this worrying trend government agency should enforce stricter safety regulations at the workplace in order to curb this trend.

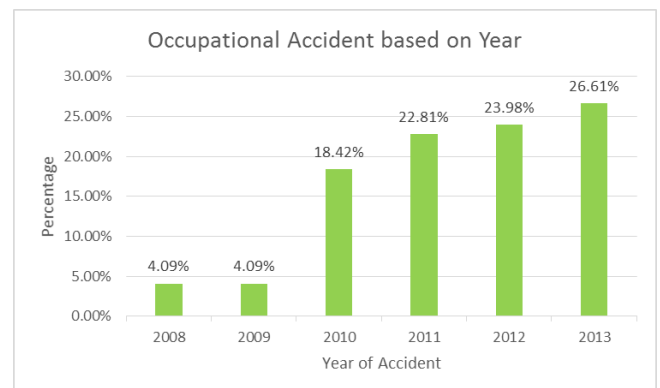


Figure 5 Occupational accident based on year

### 3.8 Occupational Accidents Based on Location Where Accident Occurs

Based on Table 3, more than 90% of the accident cases happened at the production area. This is not uncommon since most of workers spend their working hours at the production area compared to other places. Thus, workers are likely prone to injury while working due to presence of machines and equipment at that area. Based on this study accidents which occur outside production area include staircase, toilet, store and warehouse.

**Table 3** Frequency of occupational accidents based on location of accident

Location of accident	Frequency	Percentage
Production area	313	91.52
Non production area	29	8.48

**3.9 Distribution of Accident Based on Cause of Accident**

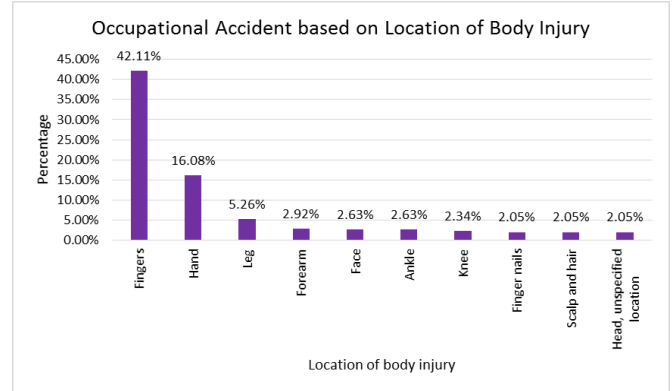
Table 4 shows Distributions of occupational accidents based on cause of accident. The highest number of accident recorded is due to striking against moving object with 81 cases. Then it is followed by caught between moving object (67 cases), caught in an object (56 cases), struck by falling object during handling (24 cases) and struck by moving objects (17 cases). These top five cause of accident contributed about 72% of total case recorded.

**Table 4** Distributions of occupational accidents based on cause of accident

Cause of Accident	Frequency	%
Striking against moving objects	81	23.68
Caught between moving objects (except flying or falling objects)	67	19.59
Caught in an object	56	16.37
Struck by falling objects during handling	24	7.02
Struck by moving objects (including flying fragments, particles)excluding falling objects	17	4.97
Fall of the person on the same level	16	4.68
Striking against stationary objects	16	4.68
Falls of persons from height	14	4.09
Contact with hot substances or objects	13	3.80
Other type of accident, not elsewhere classified	8	2.34
Struck by falling objects, not elsewhere classified	5	1.46
Overexertion in pushing or pulling objects	4	1.17

**3.10 Distribution of Accident Based on Location of Body Injury**

The study shows fingers (42%), hand (16%), leg (5.3%), forearm (2.9%) and face (2.6%) contributes 68.8% of overall cases based on location of body injury as shown in Figure 6.

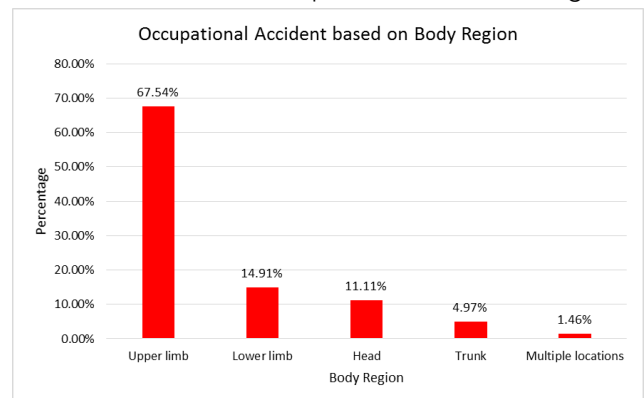


**Figure 6** Occupational accident based on location of body injury

**3.11 Distribution of Accident Based on Location of Injury of Body Region**

According to Figure 7, upper limb injury accounted about 68% of total accident cases and followed by lower limb (14.91%), head (11.11%), trunk (4.97%) and multiple locations (1.46%) respectively.

Majority of the cases happened at upper limb area because most of production process is being handled by our hands. Hence would directly involve hand, fingers and forearm simultaneously. In United States (U.S) hand and fingers injury is ranked just after back strain and sprain which contributed to loss of workdays. It is estimated about 110,000 lost time hand injury cases have been recorded annually in U.S [14]. Therefore, company management can take several precautions in order to prevent the occurrence of this kind of injury in the future which will translate into reduction of number of reported case in the long run.



**Figure 7** Occupational accident based on location of injury of body region



### 3.12 Distribution of Accident Based on Type of Injury

Figure 8 shows distribution of reported case based on type of injury. The result of study reveals that other wound (38.8%), superficial injuries (17.5%), fractures (12.3%), contusions and crushing (7.9%) and amputations and enucleations (6%) contributed 80% of total number of cases.

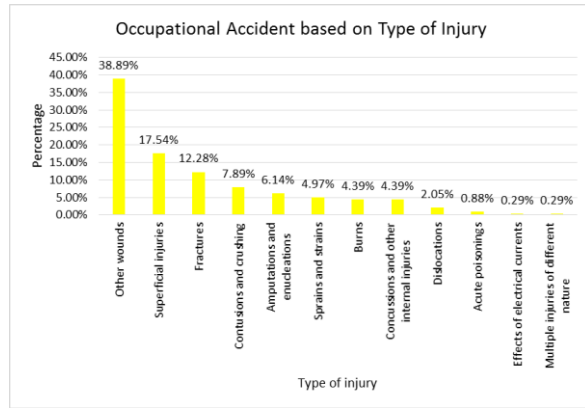


Figure 8 Occupational accident based on type of injury

Since other wounds category recorded the highest case, DOSH should propose further refinement on other wounds classification in order to assist OSH practitioner in identifying the exact type of injury sustains by the victim.

### 3.13 Distribution of Accident Based on Average Number of Medical Leave (MC)

Average number of medical leave due to occupational accident is range between one day and up to 99 days. By referring to Figure 9, almost 80% of cases recorded require less than two weeks of medical leave. This result is quite logical since all reported accident are classified with temporary disability (minor injury) and may require short period of medical attention or hospitalization.

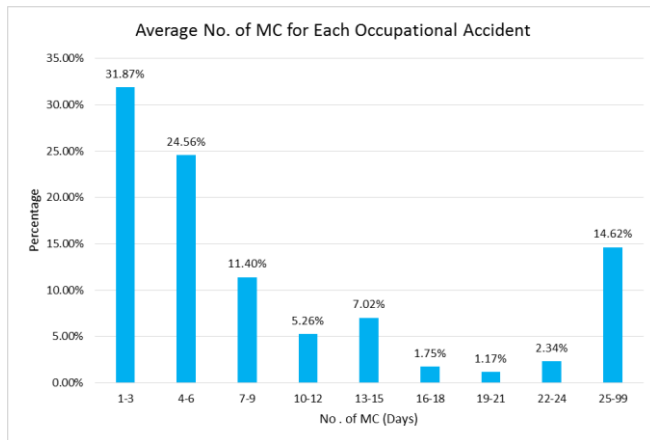


Figure 9 Occupational accident based on average number of MC

## 4.0 CONCLUSION

This paper attempts to analyze the occurrence of occupational accidents in manufacturing industry which focusing on demographic aspect of recorded cases. Frequent accidents which were caused by striking against moving objects or caught in between moving objects need serious attention from company management and enforcement authority since the occurrences of these accidents can lead to serious injury such as amputations, enucleation and crushing. In other hand, upper limbs body region such as hand, fingers, fingernails and forearm also are prone to injury. Machines, equipment or work-in-progress product are normally being handle by upper body part. Thus, risk mitigation should be planned in order to curb upper limb body injury by reducing direct contact between human body and machines.

Application of automation might be the right answer to solve this issue. Besides, installation of proper machine guarding and sensors also can be considered. Workplace, machines, equipment, staircase and other areas should be kept tidy and cleaned from any obstruction. Adequate lighting especially at hazardous area is important to ensure high visibility of the workers during execution of their work tasks. Necessary safety signage could also be placed at appropriate area in order to give early warning to the workers. In addition, current standard operating procedure (SOP) should be reviewed in order to find any possible point of failure. Thus, job hazard assessment can be used to solve this issue.

The entire company's organization from top level to general workers must work hand in hand and demonstrate better engagement especially on safety aspect at the workplace to ensure accident risks are kept at minimum. Government agencies also should play their role to instill acceptable level of awareness to the business entities by imposing more stringent safety regulations.

Better awareness would encourage top management of the company to invest more on preventive program. They have to realize that any occupational accident happened at their premise shall give inevitable consequences in term of monetary, reputation and productivity. Therefore, analysis provided in this paper could help relevant stakeholders to address more important safety issues in manufacturing industry effectively and finally provides safer working conditions to the employees

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