WORK-RELATED INJURIES AMONG WORKERS FROM GOVERNMENT FACTORIES IN MYANMAR FROM 2011 TO 2015

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Work-related injuries among workers from government factories in Myanmar from 2011 to 2015

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Public Health

By

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LIST OF ABBREVIATIONS

FGLLID	-	Factories and General Labour Law Inspection Department
HMIS	-	Health Management Information System
IHLCA	-	Integrated Household Living Conditions Assessment
ILO	-	International Labour Organization
MOETI	-	Ministry of Economic, Trade and Industry
MOH	-	Ministry of Health
MOIP	-	Ministry of Immigration and Population
MOL	-	Ministry of Labour
MOLISA	-	Ministry of Labour, Invalids and Social Affairs
NCDs	-	Non Communicable Diseases
WHO	-	World Health Organization

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ABSTRACT

Myanmar's thrive towards socioeconomic developments has been accompanied by a shift in epidemiological transition towards non-communicable diseases, out of which accidents and injuries are one of the major concerns. Among the eight different types of accidents and injuries, which have been recorded by the Health Management and Information System (HMIS), work-related injuries were the second most reported cause of morbidity in Myanmar. But starting from 2012, in the place of occupational injuries, agricultural injuries were substituted and collected. Therefore to know the current situation of work-related (occupational) injuries, this study was done. Government factories were chosen for this study because information about work-related injuries is reported monthly with a defined format. It was the collaborative reporting system from the factories under different Ministries to the Occupational and Environmental Health Division under Ministry of Health and Sports. No similar data is available about work-related injuries in the private sector. In this study, (810) reported work-related injuries during the last five years (2011–2015) were studied about their epidemiological characteristics, distributions and some potential implementation gaps in the prevention of work-related injuries. According to the results, the magnitude of the work-related injuries, during last three years, was descending in general. But due to the data gaps and weaknesses, the estimation of the actual figure was a big challenge. Minor injuries were most frequently reported than severe injuries. Abrasions and cuts are common. These injuries were results from striking against objects and most of them were from the factories under the Ministry of Industry. Most of the injuries injured hands and fingers, and (48%) of the injured workers were between the ages of 20-40 years. The male comprised 70% of the total reported injuries and injuries are found to be the highest in workers who had a working experience of 5 to 14 years. Injuries are less likely to occur in April and November, and more likely to occur in June and August. Highest numbers of the reported work-related injuries occurred at Monday and between 6:00 am to 12 noon which are the busy hours of the day. In addition to these findings, this study can highlight the weaknesses of the current reporting system. But with the limited information, this study was expected to fill an information gap to a certain extent, regarding the work-related injuries in Myanmar. Developed recommendations were also expected to be useful in the further management of work-related accidents and injuries.

Word count - 10477

INTRODUCTION

To earn a living, people in the society engage in various kinds of works every day. The working environment contains a variety of health hazards and most people spend a large proportion of their day in such settings. Consequently, people are injured or killed at the workplace over the world every day. Expediting by the technological progress, accidents represent a major epidemic of non-communicable diseases in the present century and they are no longer considered accidental (Nenonen et al 2015).

Working in the public health sector as an assistant director of the Department of Public Health of the Ministry of Health and Sports, this important public health issue got my attention and led me to a small exploration of facts and data about work-related injuries in Myanmar. Then it was found that injury was the third leading cause of mortality and a first leading cause of morbidity in Myanmar according to the Health in Myanmar Report (2014).

By further exploration, among the eight different types of accidents and injuries which have been recorded and reported by Health Management and Information System (HMIS), work-related injuries were the second most reported cause of morbidity in Myanmar. But starting from 2012, "occupational injuries" which are one of those recording eight different types of accident and injury were replaced with "farm injuries" because of the difficulties to cover all the types of work-related injuries. Therefore I decided to do a study on work-related or occupational injuries in Myanmar in order to know more about them during current years.

Regarding the work-related injuries, I once had an experience of undertaking a small hospital based cross-sectional descriptive study in the year 2012. At that time I found many interesting facts on the epidemiology of work-related injuries. That good experience induced me to carry out another study on work-related injuries in order to know the current situation and to look especially from a wider scope.

This study was done trying to explore the epidemiology of reported work-related injuries occurring among government factory workers in Myanmar during 2011 – 2015. Those injuries are reported monthly from the factories under different Ministries throughout the country to the Ministry of Health and Sports. This study was structured into four chapters; chapter (1) consists of information on Myanmar, the country on which the study was done; chapter (2) states the problem statement, justification, research questions, objectives and methodology of the study; chapter (3) contains the findings of the study like magnitude of the problem, epidemiology of the injuries and their possible related factors; and chapter (4) includes discussions, recommendations and conclusion which are based on the findings from the previous chapter.

CHAPTER 1: BACKGROUND INFORMATION OF MYANMAR

1.1 Geography

The Republic of the Union of Myanmar is located in the South East Asia Region, having total area of 676,578 square kilometers and bordered by Bangladash, India, China, Thailand and Laos. It has Nay Pyi Taw council territory and 14 States and Regions, consisting of 74 Districts, 330 Townships and 64,134 Villages. There are mainly 5 distinct geographical feactures; central plain, delta area, coastal area, western hills and eastern plateau which are roughly divided by three main river systems named Ayeyarwady, Sittaung and Thanlwin. It possesses a tropical climate with three distinct seasons; summer, rainy and a cold season (MOIP 2015).

Figure 1 Map of Myanmar showing States and Regions and their capitals

1.2 Demography

According to the 2014 Myanmar Population and Housing Census, the country had a total population of 51,486,253 in 2014 where 51.8% were males and 48.2% were females. Population density was 76 persons per square kilometer. And it had a distribution of 70% rural and 30% urban residency. The country had a population growth rate of 0.89% per annum between 2003 and 2014 (MOIP 2015). Distributions of the age, of the country's population since few past decades, was shown in the following figure of stacked age pyramids in which the growth of the working age group of the country can be noted. In 2014, the working age group i.e. (15-64 years) became 65.6% of the total population (MOIP 2015).

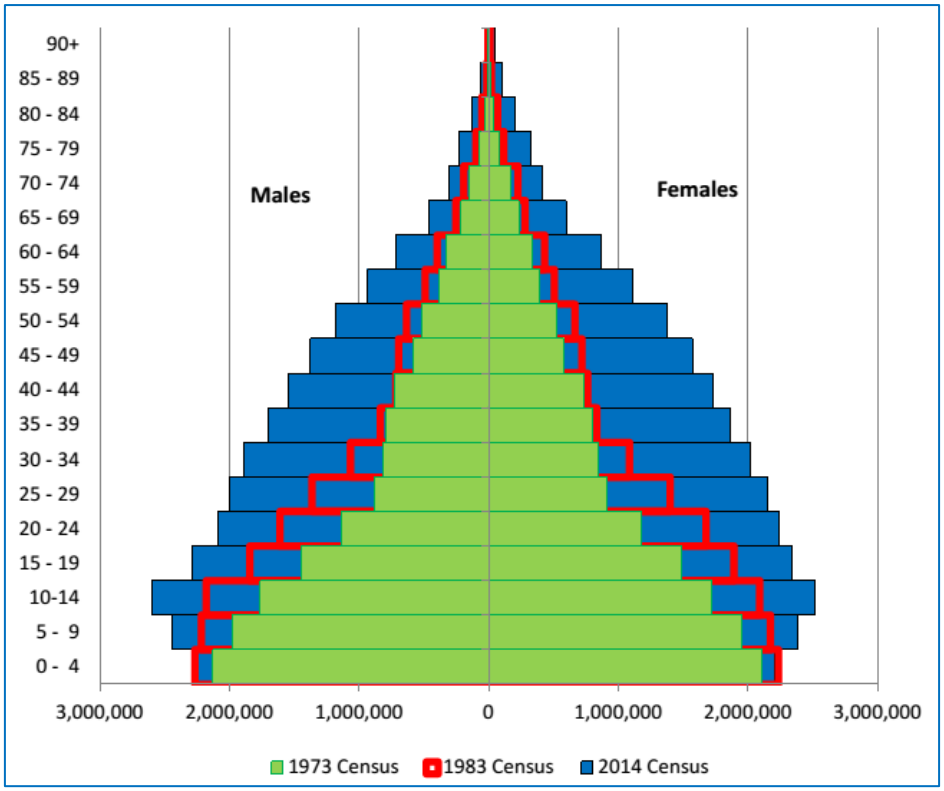


Figure 2 Demographic changes of Myanmar from 1973 to 2014

Source: 2014 Myanmar Population and Housing Census

1.3 Economy

Myanmar has not only abundant natural resources including land, water, forest, coal, mineral and marine resources, natural gas and petroleum but also a young and huge working age group. It possesses unique economic potentials. Myanmar has been rapidly promoting economic liberalization since the political transition in 2011. Relaxation of import and export regulations, establishment of foreign investment law, enforcement on the

labor act, and elimination of foreign exchange rates and shifting to the managed float exchange rate system were done. And Myanmar's real economic growth rate for fiscal year 2013 was increased to 8.3% (MOETI 2015). Due to the market development, job opportunities and the demand of labour were increased. This may result in a high influx of less experienced or poorly trained workers which might be one of the causes of the increasing work-related injuries nowadays.

1.4 Labour force, employment and industrial sector

According to the 2014 Myanmar Population and Housing Census, the labour force participation rate, which means proportion of the population in the labour force among the population aged between 15 and 64 years, was (67.0%). The proportion of males was much higher (85.2%) than that of females (50.5%). The employment-to-population ratio, which is defined as the ratio of the total labour force currently employed to the total working age population was also (0.64). The ratio was higher for males (0.82) than females which was (0.48). This ratio had a huge variation among states and regions (MOIP 2015).

As a country, with a vision of building a modern developed industrialized nation, four economic objectives are laid down together with the long-term industrial development goals. To achieve the economic objectives and goals; together with the adoption of a market oriented economy, the country's economic policies are sustaining agriculture towards industrialization and all-round development of other sectors of the economy in all states and regions, resulting in development of the industrial sector (Aung and Kudo 2012).

1.5 Occupational safety and health in Myanmar

In Myanmar there are many focal points in various organizations that are responsible for the protection of the occupation of safety and health of workers and improvement of working conditions. They are Factories and General Labour Laws Inspection Department under Ministry of Labour, Department of industrial supervisory and inspection under Ministry of Industry, Planning and Inspection Department under Ministry of Mines, Occupational and Environmental Health Division under Ministry of Health and Sports and Myanmar Agriculture Service under Ministry of Agriculture and Irrigation (FGLLID 2014). All of them have the same objective of protection of the safety and health and promotion of working conditions, but they carry out their works differently according to their strategic directions.

The Occupational and Environmental Health Division under the Ministry of Health and Sports undertakes the prevention of work-related diseases, injuries, health problems and the promotion of health among workers in various sectors. This is done through surveillance of workers and their working environments, informative education and training in occupational health principles to employers and in safety practices and first aid treatments to workers (MOH 2014).

In addition to that, as described in (Section - 53) of The Factories Act (1951), the manager of every factory is obliged to report any work-related accident happening in their factories and industrial establishments. So they report occurred occupational diseases and injuries on a monthly basis to respective focal units through the collaborative reporting system.

CHAPTER 2: PROBLEM STATEMENT, JUSTIFICATION, RESEARCH QUESTIONS, OBJECTIVES AND METHODOLOGY

2.1 Problem statement

Non communicable diseases (NCDs) are becoming the leading cause of death and disability worldwide. Accidents and injuries, one kind of NCDs, constitute a veritable epidemic and are rapidly increasing as a cause of death in absolute numbers and in terms of proportion (Park 2009 and 2015, WHO 2012).

Globally, on average 153 workers suffer work-related accidents and 1 worker dies in every 15 seconds. At this rate approximately 6300 workers die every day due to the work-related accidents and injuries. The estimation was done by the World Health Organization (WHO) in 2011 and they mentioned that 2.3 million workers die due to the work-related accident and 317 million accidents happen in the workplaces annually. Comparing this statistics to their previous estimation done in 2003, which was 271 million injuries and 2 million deaths, work-related injuries are gradually increasing throughout the world as well as the deaths caused by them.

Many of these injuries result in extended absences from work and the estimated economic loss caused by work-related injuries and disease was equivalent to 4% of the world's gross national product (WHO 2003). Work-related injury and illness can also result in disability, lost wages and sometimes change in the quality of life for the worker and their family. More than 90% of this injury burden is borne by men and more than half of the global burden occurs among men working in the WHO South-East Asia and Western Pacific regions. In men aged 15–59 years, 8% of the total burden of unintentional injury is attributable to work-related injuries in high-income countries, and 18% in low- and middle-income countries (WHO 2010).

Injuries are found to be a leading contributor to death, hospitalization and disability all over the world and it was more noticeable in the South East Asia Region. Nearly 1.5 million deaths, 20-30 million hospitalizations and more than 50 million emergency room registrations are due to injuries in the Region (WHO 2011). Park (2015) also mentioned in his textbook that there are approximately 580 million workers in the South East Asia Region and among them are an estimated 120 million work-related injuries and 200,000 work-related deaths taking place every year. Largely this happens because most of the countries in the region have such common features as a high proportion of manual workers in labour force and unsafe man-machine contacts in workplaces.

Myanmar's thrive towards socioeconomic developments has been accompanied by a shift in epidemiological transition towards non-

communicable diseases, out of which accidents and injuries are one of the major concerns. During 2012, injury has become the third leading cause of mortality and the first leading cause of morbidity in Myanmar (MOH 2014). Among the different types of accident and injury, which have been collected into the Health Management and Information System (HMIS), during the year 2013, work-related injuries were the second most reported cause of morbidity in Myanmar (MOH 2013).

2.2 Justification

Work-related accidents affect all populations, regardless of age, sex, income, or geographical region and nowadays it becomes a major public health problem due to its high magnitude and increasing trend. So the epidemiology of the occurring work-related injuries needs to be studied because injury itself results from an interaction of agent, host and environment just like other diseases. The distribution of cases of injury, the types of injury incurred by the different occupations in the various economic activities and their frequency rates can be used to determine where the most occupational injuries occur and the extent of their severity. This can form the basis for planning preventive measures. Areas of highest risk can be targeted more effectively for safety campaigns, inspection visits and the development of regulations and procedures. As such, this study also aims to analyze information concerning work-related injuries among factory workers working in the public sector in Myanmar. That information can be used to develop necessary recommendations to assist policy makers and implementers in identifying priority work-sites for action and setting priorities for actions.

Moreover, changes in the patterns of statistics of occupational injuries over years can show where both improvements and deteriorations in occupational safety are occurring, and can warn of emerging risk areas. The data can also help to measure the effectiveness, or otherwise, of measures taken to improve occupational safety and health by comparing with other yearly data. This in turn helps to identify the most useful preventive action, thereby enabling a concentration of effort in the most effective ways (ILO 1998).

In Myanmar, according to the Integrated Household Living Conditions Assessment (IHLCA 2011), self-employed workers represent 40% of the workforce, casual laborers represent 18%, and unpaid family workers represent 15%; adding to a total of 73% working in the informal sector. Despite of prevailing differences in proportions of labour force, worker's characteristics, working environment, etc., the public sector was chosen as study area in this study. The first reason is the data availability. Because information about work-related injuries are reported monthly with a defined format through the collaborative reporting system; from

the factories under different Ministries throughout the country to the Occupational and Environmental Health Division under Ministry of Health and Sports since last decade. No similar data is available about work-related injuries in the private sector. A National Injury Surveillance System was started since 2009 in five sentinel hospitals. All are tertiary level hospitals but attended by both public and private sector workers. And it collects information relating injuries and violence but work-related accidents and injuries are not clearly identified and included in its reporting criteria (Injury Prevention Project 2013). Though Myanmar collects data about work-related injuries in most of the government factories, data is not yet well explored, analyzed or used for further actions. Secondly, recommendations developed by the use of information, attained from this study, are more likely to be used as the initial step for preventing work-related injuries because these are the government factories and they have a favorable political atmosphere to implement the interventions which also became a push to choose the public sector for this study.

2.3 Research questions

1. What is the magnitude of reported work-related injuries among government factory workers between 2011 and 2015?
2. What are the characteristics of those reported work-related injuries among government factory workers between 2011 and 2015?
3. What measures have been taken to prevent work-related injuries in government factories?
4. Which measures should be taken to prevent further work-related injuries among government factory workers?

2.4 Research objectives

2.4.1 General objective

To describe and analyze the epidemiologic characteristics of reported work-related injuries occurring among government factory workers in Myanmar between 2011 and 2015, in order to provide recommendations for the Ministry of Health and Sports and other government authorities in charge of developing policies and strategies aimed at preventing work-related injuries in government factories.

2.4.2 Specific objectives

1. To describe the magnitude of reported work-related injuries in government factories during last five years (2011 to 2015)

2. To describe the characteristics and distributions of those reported work-related injuries among government factory workers during last five years (2011 to 2015)

3. To describe the plans adopted by government factories to prevent work-related injuries and identify potential implementation gaps

4. To develop recommendations for government authorities at Ministerial and National level on prevention of work-related injuries among government factory workers

2.5 Research methodology

2.5.1 Study design

To achieve the first two objectives, secondary data was used for a cross-sectional observational study. For the third objective, the Myanmar Factories Act and National Profile on Occupational Safety and Health were reviewed.

2.5.2 Target population

Workers suffered from work-related injuries in all government factories in Myanmar from 2011 to 2015.

2.5.3 Study population

Reported cases of workers suffered from work-related injuries in government factories in Myanmar during 2011 to 2015.

2.5.4 Data collection method

Work-related injuries are reported monthly – using a standard format - through the collaborative reporting system from the factories under the different Ministries throughout the whole country. The reports go to the Occupational and Environmental Health Division under the Ministry of

Health and Sports. Reported cases of work-related injuries during the last five years (from 2011 to 2015) were retrieved with the permission of the head of that Division for this study. Completeness of the older reports was concerned by the Division and those were not retrieved for this study. The records include information concerning personal characteristics of injured workers, mechanisms and types of injuries and some possible predisposing and/or relating factors on work-related injuries.

Required documents for review (e.g. Myanmar Factory Act 1951) were obtained from official websites of International Labour Organization, Ministry of Health and Sports and Ministry of Labour, Immigration and Population.

2.5.5 Data management and analysis

While retrieving the datasets of the injuries that occurred in the last five years, only those of the years 2012, 2014 and 2015 could be obtained in Microsoft Excel format. The data from the years 2011 and 2013 were obtained as scanned copies of the original dataset. Therefore data from these two years had to be manually re-entered. The quality control of the data entry process was done by comparing the entered data against the data source (scans) for every 100 records entered. A second check took place at the end of the data entry process (total 6705 entries). Twenty percent (20%) of the entries were picked up randomly and rechecked for data correctness. Among the (1341) entries checked, a total of (6) mistakes were found and later corrected. The final dataset used for the analysis was created in Microsoft Excel 2010. In data analysis, Chi-square test and Fisher exact test at 0.05 (level of significance) were used.

2.5.6 Ethical consideration

Concerning the secondary data which is used in this study, a request letter was sent to the Occupational and Environmental Health Division, the Ministry of Health and Sports of Myanmar and a letter of permission was received signed by the Head of that Division. As names of the injured workers were included in the dataset, deletion of the names was done prior to the analysis to ensure anonymity.

2.5.7 Conceptual framework

Two suitable models were found for the study: a) Heinrich's single-cause domino theory; and b) Gordon's epidemiologic model for injury. The latter was chosen for this study because it helps to describe the factors that are

involved during an injury and shows how they interact or are connected. The domino theory only looks at the occurrence of injuries from the perspective of a process and does not help to explain what the key factors are and how they are connected. Therefore, as this study's aim is to explore and to study the epidemiology of work-related injuries and its possible factors related to it, Gordon's epidemiologic model was chosen. Additionally, this model was used to structure the thesis document. The findings section was organized in sub-chapters according to the categories mentioned in the model (characteristics of injury, agent, host and environment) (See Figure 3)

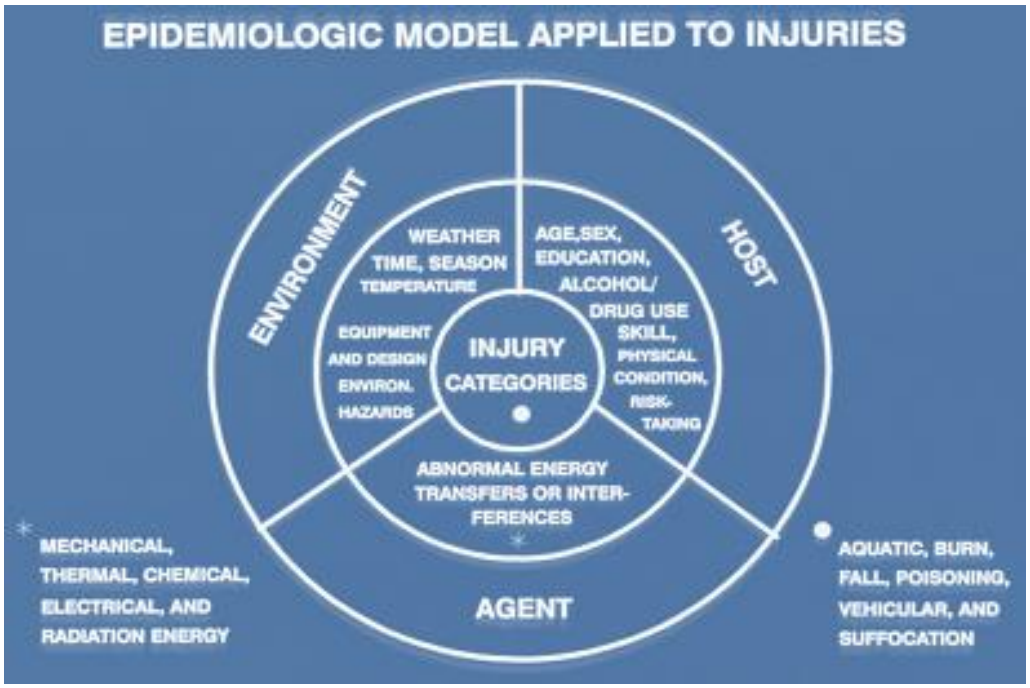


Figure 3 Epidemiologic model applied to injuries (Gordon 1949)

2.5.8 Limitations of the study and analysis

In this study, some limitations need to be considered. Such limitations will affect the internal validity of the study. Limitations are presented in the paragraphs below and then they are further expanded in the discussion section.

First of all, there may be underreporting resulted by the severity of the injury. For example; in some conditions like injuries are very minor, not bothering the worker's performance and the worker didn't want to take leave due to the incentives and bonuses, these minor injuries may not be reported to the recording person. On the other hand, if the recording person was on his/her leave while the injuries happen and nobody conveys the information of such minor injuries when he/she returns later, he/she may not know about these minor injuries and will not record them.

Besides the situations mentioned above, underreporting can also be present if the person in charge of recording the injury has not been properly trained about the operational definition of occupational injury. In such case, he/she may misclassify the injuries into non-occupational ones. In some cases, recording may not be done when the recording person was busy with other tasks and didn't record right away, and then forgot to record. Therefore such conditions or information biases can result in underreporting.

Another important consideration was underreporting caused by political intentions. Being the government factories, they usually have strong hierarchal administrative systems. Therefore administrative persons or managers in the factories can send underreported documents because they are afraid of punishments by their superiors from the Ministry and encounter criticisms by their peer factories.

There are some more issues which can be considered as limitations to this study like poor collaboration by other Ministries resulting in failure to send reports to Ministry of Health and Sports, maybe sending irregularly or do not send totally. This can lead to underreporting of cases. Presence of more than one focal unit to report can also lead to the incompleteness of data for this study. For example, if a manager of a certain factory reported the injuries to the Ministry of Labour and did not report to the Ministry of Health, those injuries may be left out from this study.

Another issue to be considered is the quality of the data used. For this study I worked with secondary data. This means that I did not have access to the original reports sent by the factories. Data quality issues, while translating or entering data into the official reporting database, are beyond the control of this study.

CHAPTER 3: FINDINGS

Myanmar gained independence in 1948 and then many private industries were established. The majority of them were nationalized by the government in 1968 and 1974. In the late 1990, for the country's economic development, the government developed 18 industrial zones as shown in following figure.

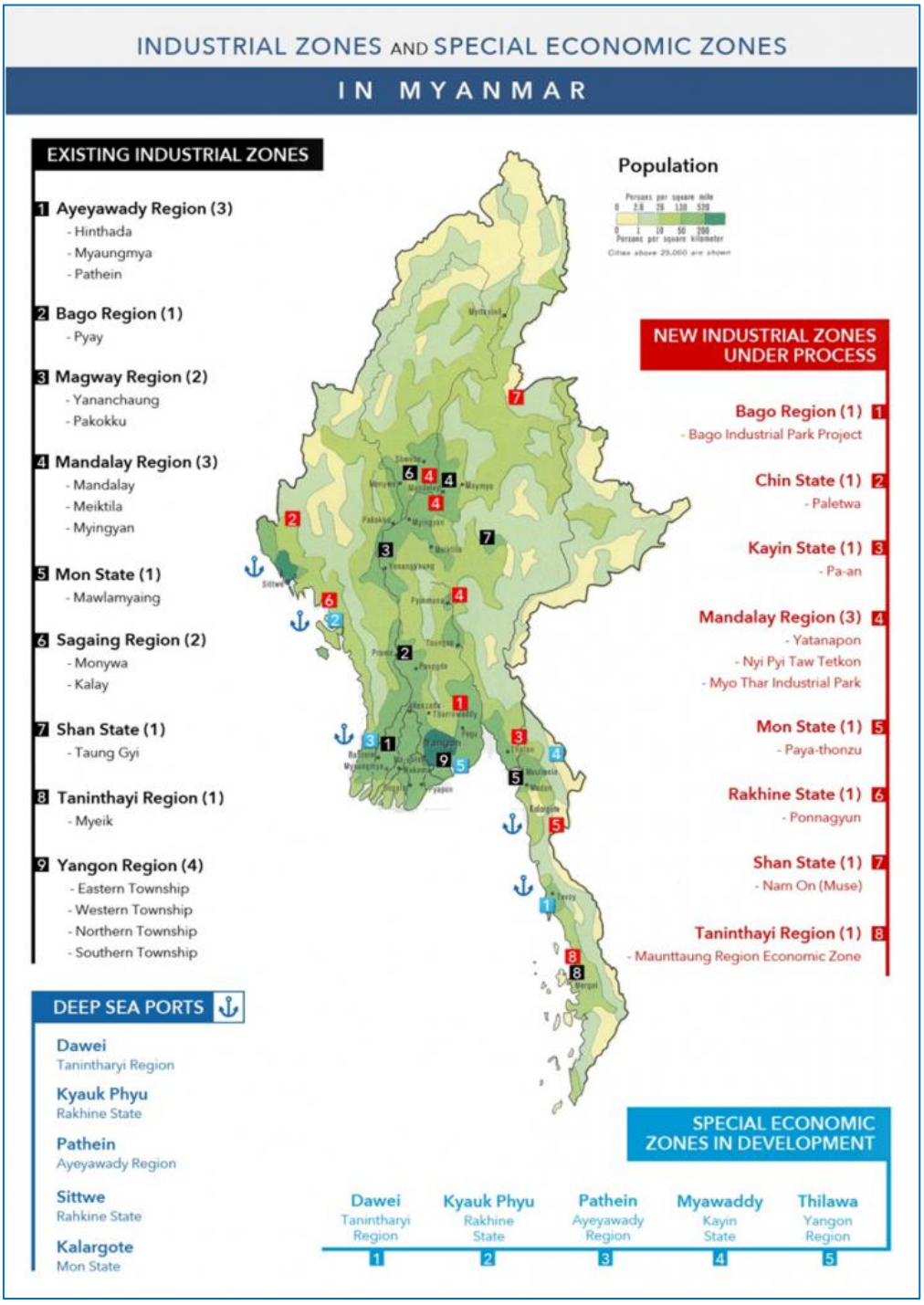


Figure 4 Map of Myanmar showing 18 existing industrial zones

Source: Myanmar Business Today, Volume 2, Issue 49

According to the 2014 Myanmar Population and Housing Census, 91% of industries in these industrial zones are private owned and most are small scale industries. Large scale industries are government industries. Those large scale industries had more systematic infrastructure, machineries, equipment, management, production and process control, quality control and resource management, compared with small scale industries (Ko Ko 2014). Public-Private cooperated industries are also present, about 5% of total industries in Myanmar (MOIP 2015).

Regarding the Ministry of National Planning and Economic Development's classification, there are 14 economic sectors in Myanmar: Agriculture; Livestock and Fishery; Forestry; Mining; Processing and Manufacturing; Construction; Transportation; Communications; Financial Institutions; Social and Administrative Services; Electric Power; Energy; Rentals and Other Services; and Trade. Government Ministries exist to administrate their respective sectors. For example: the Ministry of Agriculture and Irrigation administrates agriculture and livestock and fishery sectors.

According to information obtained from the President's office's official website, there is a total of 21 Ministries in Myanmar. Among the Ministries, those which have factories under their administration are;

1. Ministry of Industry (1)
2. Ministry of Industry (2)
3. Ministry of Agriculture and Irrigation
4. Ministry of Energy
5. Ministry of Electric Power
6. Ministry of Transport
7. Ministry of Forestry
8. Ministry of Defense
9. Ministry of Mines

Until 2011 the Ministry of Industry (1) and (2) were the two different Ministries producing different products. Ministry of Industry (1) had factories producing small products like household utensils, consumer goods, etc. while the Ministry of Industry (2) had factories producing larger products like machineries and equipment, transport vehicles, etc. They were combined into a single Ministry of Industry since 2012 as one of the earliest reorganizations at Ministerial level. Restructuring also took place in other Ministries. The Ministry of Energy and the Ministry of Electric Power were combined and restructured into the Ministry of Electricity and Energy in 2016. The Ministry of Transport and the Ministry of Communication were also combined into the Ministry of Transport and Communications.

This study presents the information about the reported work-related injuries that occurred among the workers from government factories, which are under these Ministries from 2011 to 2015.

3.1 Magnitude of the reported work-related injuries among workers of government factories in Myanmar from 2011 to 2015

Among 8 Ministries, it was found that the Ministry of Defense and the Ministry of Forestry did not send reports for some years as shown in table (1). Except the Ministry of Energy, the Ministry of Industry and the Ministry of Mines, the reporting status of other Ministries, during last 5 years, were found to be low. Among them, the Ministry of Agriculture and Irrigation had the lowest reporting status of 1.2% for 2013 and 2015. Therefore this caused the study to be weaker to a certain extent and less reliable in interpreting the actual magnitude of the injuries occurred during the last 5 years.

Table 1 Number of reporting factories per Ministry and their reporting status per year

Name of Ministry	Number of reporting factories and status of reporting (%) per year										Total number of factories
	2011	%	2012	%	2013	%	2014	%	2015	%	
Ministry of Agriculture and Irrigation	7	8.4	4	4.8	1	1.2	2	2.4	1	1.2	83
Ministry of Defense	1	4.8	0	0	0	0	2	9.5	2	9.5	21
Ministry of Electric Power	3	4.3	2	2.9	20	29.0	20	29.0	21	30.4	69
Ministry of Energy	14	87.5	13	81.3	16	100	15	93.8	15	93.8	16
Ministry of Forestry	2	2.4	2	2.4	3	3.5	0	0	0	0	85
Ministry of Industry	32	100	28	87.5	27	84.4	25	78.1	24	75	32
Ministry of Mines	1	100	1	100	1	100	1	100	1	100	1
Ministry of Transport	5	4.1	4	3.3	5	4.1	7	5.7	7	5.7	122

A closer look at the number of injuries reported and the size of the workforce of reporting factories per Ministry show large variations. As mentioned above, it was found that the Ministry of Defense did not report for 2012, 2013 and the Ministry of Forestry did not report for 2014, 2015. It was also found that 12 out of 41 data points were zeros (table 2) which suggests no injuries had occurred. It was found that the Ministry of Agriculture and Irrigation had reported injuries only in 2011 and no more injuries in the last 4 years. In the Ministry of Energy, it was found that injuries became zero in 2012 after 27 injuries were occurred during its previous year (2011) and 14 injuries occurred again in 2013.

In the Ministry of Electric Power, big difference in workforce was noted between 2011 and 2012. A decrease in workforce was also noted for the Ministry of Agriculture and Irrigation during the first 3 years. In the Ministry of Forestry, a big fluctuation was seen for the workforce in their reported years. This fluctuation in workforce was also noted for the remaining Ministries. In the Ministry of Transport, during 2011 and 2012,

a marked decrease in workforce was found but the number of injuries was not much different.

Table 2 Distribution of total workforce of reporting factories and total reported work-related injuries per Ministry per year

Sr.	Name of Ministry	Description	2011	2012	2013	2014	2015
1	Ministry of Agriculture and Irrigation	Total reported injuries	8	0	0	0	0
		Total workforce of reporting factories	6044	2614	396	22	19
2	Ministry of Defense	Total reported injuries	0	0	0	11	10
		Total workforce of reporting factories	699	NR	NR	283	1543
3	Ministry of Electric Power	Total reported injuries	0	0	5	7	2
		Total workforce of reporting factories	2459	693	7723	8664	5375
4	Ministry of Energy	Total reported injuries	27	0	14	7	7
		Total workforce of reporting factories	24444	10807	7766	7312	9307
5	Ministry of Forestry	Total reported injuries	13	3	0	1	0
		Total workforce of reporting factories	108	715	164	NR	NR
6	Ministry of Industry (1)	Total reported injuries	105	119	128	44	50
		Total workforce of reporting factories	14965	38263	14004	6521	19807
7	Ministry of Industry (2)	Total reported injuries	40	Combined with Ministry of Industry (1) and form Ministry of Industry.			
		Total workforce of reporting factories	6627				
8	Ministry of Mines	Total reported injuries	0	0	0	2	1
		Total workforce of reporting factories	621	803	168	157	128
9	Ministry of Transport	Total reported injuries	57	52	50	35	12
		Total workforce of reporting factories	13411	2486	4750	5583	9347
	Grand Total	Total reported injuries	250	174	197	107	82
		Total workforce of reporting factories	69378	56381	34971	28542	45526

*NR means "not recorded"

Table (3) shows incidence of reported work-related accidents per year. Given the concerns about data quality, the following table needs to be read carefully. The Ministry of Agriculture and Irrigation had four consecutive years without accidents. The Ministry of Defense and the Ministry of Electric Power had marked decreases in incidence of reported cases between 2014 and 2015. The Ministry of Energy had a gradual decrease in incidence of reported cases during the last 3 years. The Ministry of Forestry had a huge difference in incidence of reported cases between 2011 and 2012; the indicator decreased from 120.37 reported injuries per 1000 employees per year to 4.20 reported injuries per 1000 employees per year. Marked decreases were also noted in the Ministry of Industry and the Ministry of Transport between 2014 and 2015. Due to the presence of data gaps, cumulative incidences are not comparable between the Ministries.

Table 3 Incidence of reported work-related injuries according to Ministries and years (per 1000 workers per year)

Sr.	Name of Ministry	Year					Cumulative incidence
		2011	2012	2013	2014	2015	
1	Ministry of Agriculture and Irrigation	1.32	0	0	0	0	0.88
2	Ministry of Defense	0	-	-	38.87	6.48	8.32
3	Ministry of Electric Power	0	0	0.65	0.81	0.37	0.56
4	Ministry of Energy	1.10	0	1.80	0.96	0.75	0.92
5	Ministry of Forestry	120.37	4.20	0	-	-	17.22
6	Ministry of Industry	7.02	3.11	9.14	6.75	2.52	4.85
7	Ministry of Mines	0	0	0	12.74	7.81	1.60
8	Ministry of Transport	4.25	20.92	10.53	6.27	1.28	5.79
Grand total		3.60	3.09	5.63	3.75	1.80	3.45

3.2 Characteristics and distributions of reported work-related injuries among workers of government factories in Myanmar from 2011 to 2015

3.2.1 Injury's characteristics

Nature of injury

According to data, it was found that abrasions were the most common type of injuries reported every year and a marked decrease was found between 2013 and 2014. Other common injuries are multiple injuries and cuts. This pattern is similar every year. Poisoning, puncture wounds and sprains and strains were found only in 2011. A big decrease in multiple injuries was also seen between 2011 and 2012. When reported injuries were checked according to the Ministries, multiple injuries were found to be more common in the Ministry of Energy and the Ministry of Forestry. In other Ministries, abrasions were commonest followed by cuts and fractures.

Table 4 Incidences of reported work-related injuries according to nature of injury and years (per 1000 workers per year)

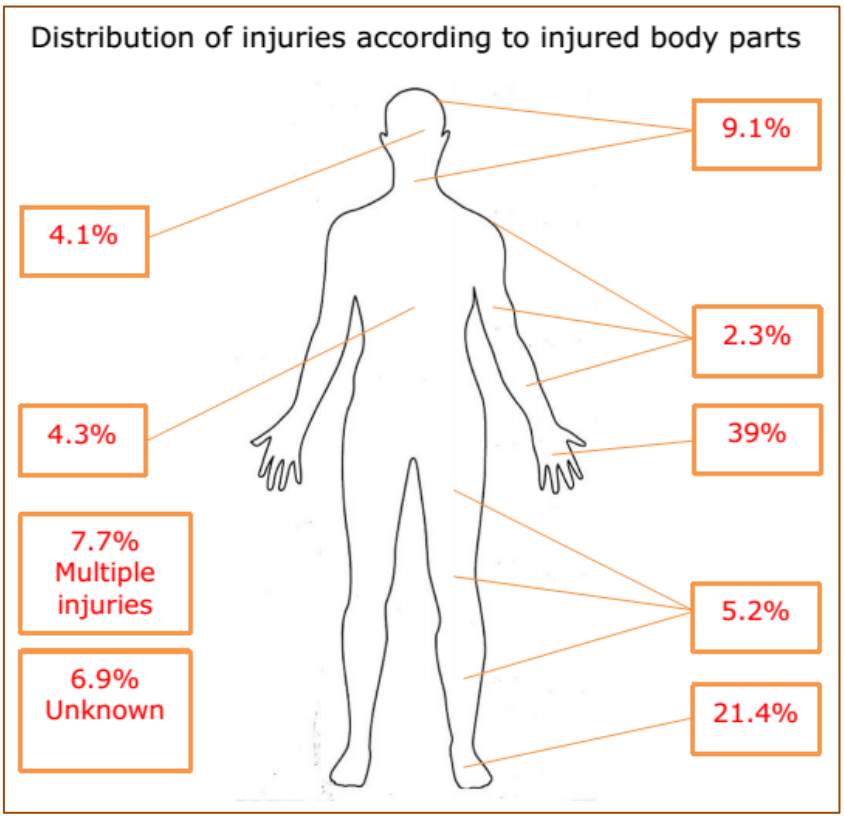
Nature of injury	2011	2012	2013	2014	2015
Abrasions	1.41	2.04	2.83	0.95	0.46
Amputations	0.04	0.09	0	0.04	0
Bruises and contusions	0.01	0.07	0.29	0.07	0
Burns (chemical)	0.01	0	0	0.04	0
Burns (thermal)	0.13	0.04	0.20	0.21	0.04
Concussion and internal injury	0.30	0.05	0.26	0	0
Cuts	0.16	0.27	0.60	0.42	0.26
Dislocation	0	0.02	0.09	0.04	0

Effects of electric current	0.01	0.04	0.03	0	0
Fracture	0.27	0.18	0.37	0.39	0.11
Multiple injuries	0.39	0.02	0.14	0.21	0.07
Poisoning	0.04	0	0	0	0
Puncture wound	0.01	0	0	0	0
Sprains, strains	0.01	0	0	0	0
Others	0.12	0.09	0.03	0.49	0.46

Injured body parts

According to the distribution of injuries and injured body parts, most injuries caused damage to hand and fingers (39%). Foot and toes are the second commonest body parts that were injured (21.4%). Injuries to head and neck were third commonest comprising (9.1%) of total injuries. Multiple injuries were found to be (7.7%) of total injuries. This finding was concordant with another study by Kumar SG, Rathnakar U and Harsha Kumar H., done in 2010 at Mangalore city, Karnataka, India.

Figure 5 Distribution of the reported injuries according to injured body parts



When cross tabulating the injured body parts with the mechanisms of injuries, shown in table (5), it was found that most of the hand and finger injuries were caused by striking them against objects. Most of the feet

and toe injuries were caused by striking them against objects too. This was also the same for the head and neck injuries.

Table 5 Distribution of mechanisms of injury by injured body parts

Mechanism of injury	Injured body part/s								Grand Total
	eyes	feet, toes	hand, fingers	head and neck	multiple injuries	shoulder, forearm, arm	thigh, knee, legs	trunk	
Caught in or between objects	1	10	101	2	3	3		2	122
Contact with extreme temperature		5	9		5			1	20
Exposure to or contact with electric current			2	1	2			2	7
Fall or slip on same level		4	7	5	5	3	12	5	41
Fall to different level		5	3		2	2	3	2	17
Inhalation, absorption, ingestion, poisoning, etc.		4							4
Over-exertion	1								1
Strike against object	7	64	106	33	4	4	4	6	228
Struck by sliding, falling objects	5	32	17	11	8	4	6	6	89
Others	4	18	28	6	16	1	5	3	81
Unknown	15	31	43	16	17	2	12	8	144
Grand total	33	173	316	74	62	19	42	35	754

*Out of total 810 injuries, 56 injuries are not known about which body parts that they injured and most of their mechanisms of injury are not known.

Patterns of injury

Most of the injuries were found to be in minor severity in every year except for 2014 when most of the injuries were in moderate severity. There was a marked decrease in incidence of severe injuries that needed intensive care and/or surgical interventions, between 2013 and 2014. Fatal injuries were reported only in 2011.

Table 6 Incidences of reported work-related injuries according to patterns of injuries and years (per 1000 workers per year)

Pattern of injury	Year				
	2011	2012	2013	2014	2015
Minor	1.47	2.15	3.15	1.23	0.92
Moderate	1.08	0.60	1.43	1.58	0.48
Severe	0.35	0.14	0.26	0.04	0.00
Fatal	0.06	0.00	0.00	0.00	0.00

When cross tabulating the patterns of injuries with the mechanisms of injuries, it was found that most of the minor injuries resulted from striking against objects. Most of moderate severity injuries were also

caused by striking against objects. It was found that nearly half of the severe injuries did not record how they were inflicted.

Table 7 Distribution of mechanisms of injury by patterns of injury

Mechanism of injury	Pattern of injury					Grand Total
	minor	moderate	severe	die	unknown	
Caught in or between objects	66	36	10		12	124
Contact with extreme temperature	1	19			1	21
Exposure to or contact with electric current	7	2				9
Fall or slip on same level	17	24	1		2	44
Fall to different level	9	5			4	18
Inhalation, absorption, ingestion, poisoning, etc.		3			1	4
Over-exertion					1	1
Strike against object	169	43	7		18	237
Struck by sliding, falling objects	59	17	3	2	10	91
Others	35	37	3	2	8	85
Unknown	47	40	18		71	176
Grand total	410	226	42	4	128	810

After calculating the incidences of reported injuries according to the patterns of injuries and the Ministries for each year, it was found that minor and moderate severity injuries were more frequent in most of the Ministries. Fatal reported work-related injuries were found only in the Ministry of Energy and the Ministry of Forestry. Reports from the Ministry of Mines did not include information about the severity of injuries.

Table 8 Incidences of reported work-related injuries according to patterns of injury and Ministries (per 1000 workers per year)

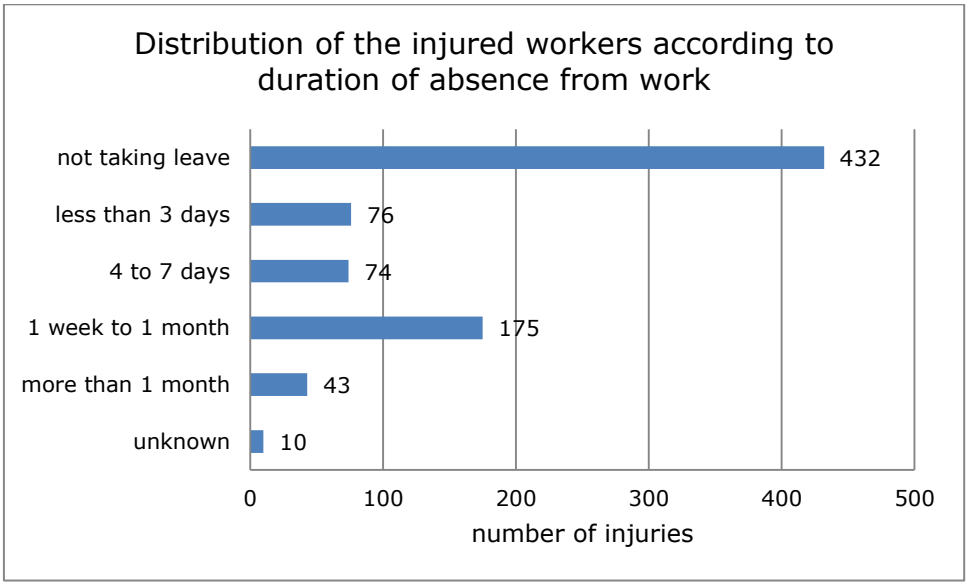
2011				
	Minor	Moderate	Severe	Death
Ministry of agriculture and irrigation	0.66	0.17	0.17	0
Ministry of energy	0.08	0.82	0	0.08
Ministry of forestry	0	101.85	0	18.52
Ministry of industry	3.71	1.71	0.37	0
Ministry of transport	1.19	0.45	1.12	0
2012				
	Minor	Moderate	Severe	Death
Ministry of forestry	4.20	0	0	0
Ministry of industry	2.33	0.55	0.10	0
Ministry of transport	11.67	5.23	1.61	0
2013				
	Minor	Moderate	Severe	Death
Ministry of electricity	0	0.39	0	0

Ministry of energy	1.03	0.26	0.39	0
Ministry of industry	6.36	2.00	0.21	0
Ministry of transport	2.74	3.58	0.63	0
2014				
	Minor	Moderate	Severe	Death
Ministry of defense	0	35.34	0	0
Ministry of electricity	0.81	0	0	0
Ministry of energy	0.27	0.41	0	0
Ministry of industry	2.91	2.30	0	0
Ministry of transport	1.25	2.87	0.18	0
2015				
	Minor	Moderate	Severe	Death
Ministry of defense	4.54	1.94	0	0
Ministry of electricity	0.37	0	0	0
Ministry of energy	0.32	0.43	0	0
Ministry of industry	1.46	0.61	0	0
Ministry of transport	0.11	0.32	0	0

Absence from work or duration of leave due to injuries

As a result, (432 injuries) 53% of total injured workers did not take leave. (175 injuries) 22% of total injured workers took leave for the certain period between 1 week to 1 month and only (43 injuries) 5% took leave for more than one month.

Figure 6 Distribution of the reported injuries according to duration of absence from work



When cross tabulating the duration of absence from work with the mechanism of injury, it was found that a proportion of workers who took

no leave was higher in all mechanism of injury. Among the workers who took long duration of leave i.e. more than one month, most of them were found to be suffering from injuries due to caught in or between objects.

Table 9 Distribution of mechanism of injury by duration of absence from work

Mechanism of injury	Away from work (in days)								Grand Total
	0	<3	4-7	8-14	15-21	22-30	>30	unknown	
Caught in or between objects	67	10	8	14	10	3	11	1	124
Contact with extreme temperature	12		3	3	2	1			21
Exposure to or contact with electric current	6		1	1	1				9
Fall or slip on same level	27	2	1	3	1	4	5	1	44
Fall to different level	8	1		2	2	2	3		18
Inhalation, absorption, ingestion, poisoning, etc.	3		1						4
Over-exertion	1								1
Strike against object	155	25	20	14	14	4	4	1	237
Struck by sliding, falling objects	55	14	4	6	4	3	4	1	91
Others	48	9	5	7	5	7	3	1	85
Unknown	50	15	31	36	18	8	13	5	176
Grand total	432	76	74	86	57	32	43	10	810

After calculating the incidences of reported injuries who took leaves according to duration of absence from work and the Ministries for each year, it was found that most of the workers in the Ministry of Industry took leave of less than 3 days. It was also found that no injuries from the Ministry of Electric Power took leave. Taking leave for the duration of 1 week to 3 weeks was commonly found in the Ministry of Transport.

Table 10 Incidences of reported work-related injuries according to duration of absence from work and Ministries (per 1000 workers per year)

Name of Ministry	< 3 days	4 – 7 days	1 week – 1 month	>1 month
2011				
Ministry of agriculture and irrigation	0.33	0.33	0.33	0
Ministry of energy	0.04	0.04	0.04	0.08
Ministry of forestry	0	18.52	74.07	9.26
Ministry of industry	1.07	0.05	1.20	0.42
Ministry of transport	0.75	0.75	2.16	0.45
2012				
Ministry of forestry	2.80	1.40	0	0
Ministry of industry	0.24	0.16	0.16	0.21
Ministry of transport	1.61	4.42	10.86	2.01
2013				
Ministry of electric power	0	0	0	0

Ministry of energy	0	0.13	0.13	0.13
Ministry of industry	0.57	0.64	0.57	0.14
Ministry of transport	0.42	2.53	4	1.26
2014				
Ministry of defense	3.53	10.60	14.13	0
Ministry of electric power	0	0	0	0
Ministry of energy	0	0	0.55	0
Ministry of industry	0.31	0	0.77	0.15
Ministry of mining	0	12.74	0	0
Ministry of transport	0.18	1.07	4.48	0
2015				
Ministry of defense	1.30	0.65	0	0.65
Ministry of electric power	0	0	0	0
Ministry of energy	0	0	0.11	0
Ministry of industry	0.45	0.15	0.15	0
Ministry of mining	0	0	0	0
Ministry of transport	0	0.32	0.64	0

3.2.2 Host's characteristics

Age

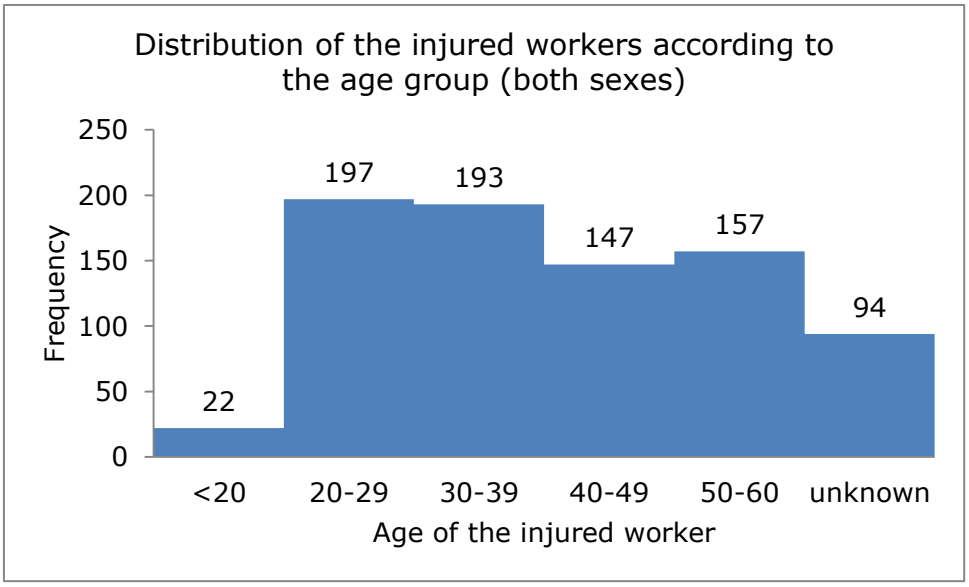
As age distribution of the total workforce was not known, it was difficult to calculate the incidences of reported work-related injuries according to Ministries and age group. According to proportion of the age group within the Ministries, workers who were in the age group of 20 - 29 years and 40 – 49 years reported more work-related injuries than other age groups in most Ministries. In the Ministry of Energy, about 31% of the injuries are not recorded about age. In the Ministry of Industry, 4% of injuries occurred in workers who were under 20 years of age.

Table 11 Distribution of reported work-related injuries according to age group and Ministry (both sexes)

Sr.	Name of Ministry	Age of injured worker						Total
		<20	20-29	30-39	40-49	50-60	Un-known	
1	Ministry of agriculture and irrigation	0%	12.5%	0%	50%	25%	12.5%	100%
2	Ministry of defense	0%	52.4%	23.8%	9.5%	9.5%	4.8%	100%
3	Ministry of electric Power	0%	50%	35.7%	7.1%	7.1%	0%	100%
4	Ministry of energy	0%	7.3%	18.2%	18.2%	25.5%	30.9%	100%
5	Ministry of forestry	0%	0%	23.5%	41.2%	35.3%	0%	100%
6	Ministry of industry	4.3%	26.3%	21.2%	15.0%	19.8%	13.4%	100%
7	Ministry of mining	0%	33.3%	0%	66.7%	0%	0%	100%
8	Ministry of transport	0.5%	21.8%	32.0%	23.3%	17.5%	4.9%	100%
	Grand total	2.7%	24.3%	23.8%	18.1%	19.4%	11.6%	100%

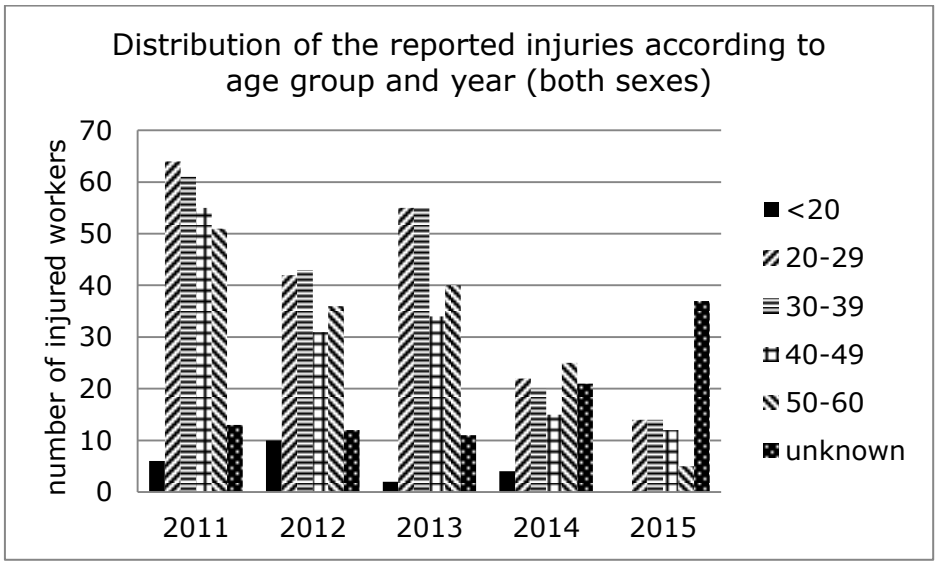
According to the findings, most of the reported work-related injuries occurred in the age group of 20-29 years. The second commonest age group is 30-39 years. Former study on occupational injuries done by Thant Zin Oo (2010) found that injuries were more frequent in a younger age of less than thirty years which was concordant with this study's finding.

Figure 7 Distribution of the reported injuries according to age group (both sexes)



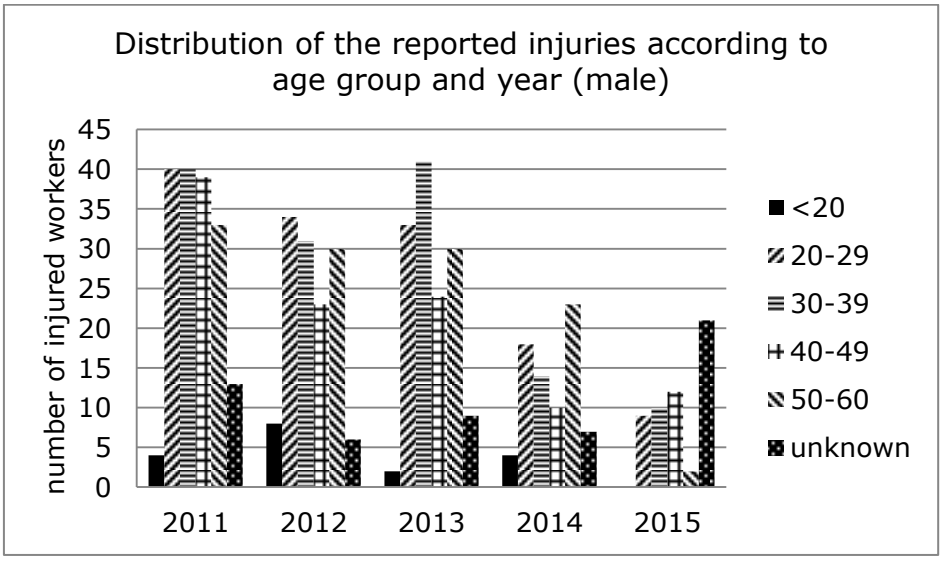
According to the findings (Figure 8), workers from age groups of 20 – 29 years and 30 – 39 years experienced more injuries than others. This condition is similar in the first 3 years. It was found that workers from the age group of 50-60 years have more injuries than other age groups in 2014. But it was also found that large numbers of injuries were not recorded about the age of the workers in 2014, more prominent in 2015, which means changes in age distribution of injured workers in 2014 is less reliable.

Figure 8 Distribution of reported injuries according to age group and year (both sexes)



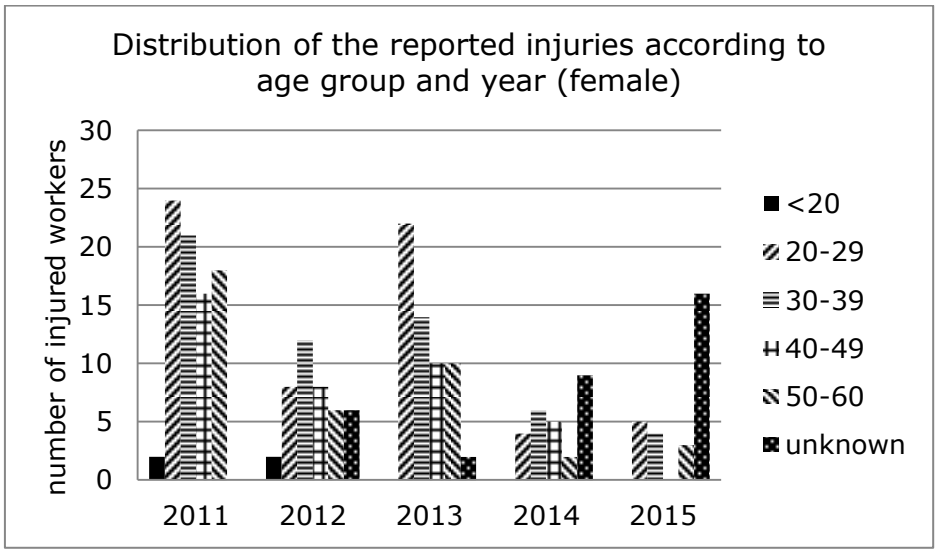
When re-stratifying by sex, it was found that male workers from age groups of 20 – 29 years and 30 – 39 years are reporting more injuries than others age groups. The age group of 40-49 years was found to be decreased between 2011 and 2012, similar in 2013 and 2014. In 2013 it was found that the age group of 30-39 became most common. And a marked rise of unknown cases in 2015 was also noted.

Figure 9 Distribution of reported injuries according to age group and year (male)



Among female workers, it was found that workers between the ages of 20 - 39 years are reporting more work-related injuries than others (Figure 10). Significant fluctuations were also noted, more prominent in the age group of 20-29 years. It was also found that large numbers of injuries were not recorded about the age of the workers in 2014 and 2015.

Figure 10 Distribution of reported injuries according to age group and year (female)



When cross tabulating the ages of injured workers with the mechanisms of injury, it was found that striking against objects was the most common mechanism of injury in the age groups of 20-24, 25-29, 30-34 and 35-39 years which were the most common age groups suffering from injuries.

Table 12 Distribution of mechanism of injury by age groups

Mechanism of injury	Age of injured worker										Grand Total
	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-60	Unknown	
Caught in or between objects	3	17	14	20	16	10	11	17	4	12	124
Contact with extreme temperature	1	4	2	3	1	1	1	1	1	6	21
Exposure to or contact with electric current			1	4	2			2			9
Fall or slip on same level		5	9	6	3	3	5	4	6	3	44
Fall to different level		1	2	2		1	3	3	4	2	18
Inhalation, absorption, ingestion, poisoning, etc.			1	2						1	4
Over-exertion		1									1
Strike against object	13	36	25	28	29	18	24	26	27	11	237
Struck by sliding, falling objects		12	11	12	8	9	8	10	8	13	91
Others	3	9	10	9	3	6	13	6	7	19	85
Unknown	2	18	19	23	22	17	17	21	10	27	176
Grand Total	22	103	94	109	84	65	82	90	67	94	810

Sex

According to the finding, male workers were found to be having higher percent distributions in all recorded years than female workers.

Table 13 Distribution of reported work-related injuries according to sex

	male		female		unknown		Total	
Year	Count	%	Count	%	Count	%	Count	%
2011	169	68%	81	32%		0%	250	100%
2012	132	76%	42	24%		0%	174	100%
2013	139	71%	58	29%		0%	197	100%
2014	76	71%	26	24%	5	5%	107	100%
2015	54	66%	28	34%		0%	82	100%
Grand Total	570	70%	235	29%	5	1%	810	100%

After disaggregated by sex, incidences of reported work-related injuries in male workers per Ministry per year were found as shown in table (14). It was found that no male injuries were seen in the Ministry of Agriculture and Irrigation starting from 2012. The incidence was found to be zero in 2012 for the Ministry of Energy where other years only showed a little difference. A marked decrease was also found in the Ministry of Forestry between 2011 and 2012. Abrupt increase was also seen in the Ministry of Industry between 2012 and 2013 and in the Ministry of Transport between 2011 and 2012. Formerly there were no injuries seen in the Ministry of Mines and suddenly it increased very high in 2015. Data gaps were also seen in some Ministries.

Table 14 Incidences of reported work-related injuries in male workers according to Ministries and years (per 1000 male workers per year)

Sr.	Name of Ministry	Year				
		2011	2012	2013	2014	2015
1	Ministry of Agriculture and Irrigation	1.726	0.000	0.000	0.000	0.000
2	Ministry of Defense	0.000	-	-	34.483	4.283
3	Ministry of Electric Power	0.000	0.000	1.121	0.789	0.656
4	Ministry of Energy	2.273	0.000	2.044	1.212	0.950
5	Ministry of Forestry	103.896	6.637	0.000	-	-
6	Ministry of Industry	7.478	4.645	11.728	8.349	3.663
7	Ministry of Mines	0.000	0.000	0.000	0.000	13.889
8	Ministry of Transport	5.586	28.846	16.048	7.332	1.526
Grand total		4.641	4.567	6.649	3.791	1.999

After disaggregated by sex, incidences of reported work-related injuries in female workers per Ministry per year were found as shown in table (15), It was found that no female injuries were seen in Ministry of Agriculture

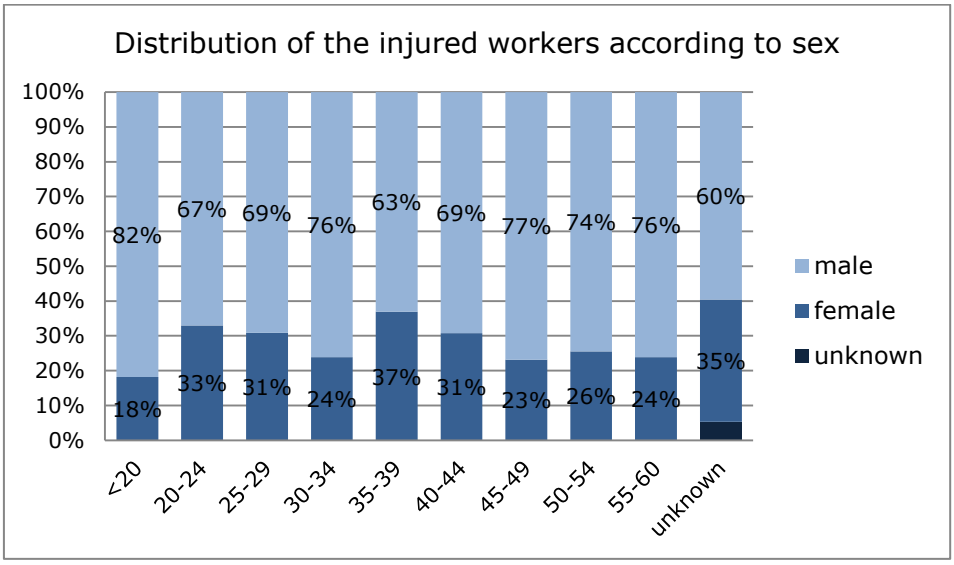
and Irrigation starting from 2012. The incidence was found to be zero in all years for the Ministry of Energy. A marked change was also found in the Ministry of Forestry between 2011 and 2012. Abrupt increase was also seen in the Ministry of Industry between 2011 and 2012. A fluctuation of incidence was also noted in the Ministry of Transport. Formerly there were no injuries seen in the Ministry of Mines and suddenly it increased very high in 2014. Data gaps and quality issues were also marked in female worker population.

Table 15 Incidences of reported work-related injuries in female workers according to Ministries and years (per 1000 female workers per year)

Sr.	Name of Ministry	Year				
		2011	2012	2013	2014	2015
1	Ministry of Agriculture and Irrigation	0.953	0.000	0.000	0.000	0.000
2	Ministry of Defense	0.000	-	-	35.714	7.435
3	Ministry of Electric Power	0.000	0.000	0.000	0.859	0.000
4	Ministry of Energy	0.000	0.000	0.000	0.000	0.000
5	Ministry of Forestry	161.290	0.000	0.000	-	-
6	Ministry of Industry	6.086	1.825	7.120	4.403	1.722
7	Ministry of Mines	0.000	0.000	0.000	29.851	0.000
8	Ministry of Transport	0.295	4.866	1.137	0.000	0.000
Grand total		2.457	1.529	4.124	3.062	1.513

When distributions of injuries were seen according to age and sex (Figure 11), proportions of male injuries suffering from work-related injuries were larger than that of females in all age groups. A study on occupational injuries done in 2011 by Than Htike Aung also mentioned that male and female distribution of study patients was nearly 2:1 ratio (male 64.8%, female 35.2 %) which was concordant with this study's findings.

Figure 11 Distribution of reported injuries according to age and sex



According to findings, among male workers, caught in or between objects was commonest in 2011. But strike against objects became commonest in later years. Among female workers, strike against objects was commonest in 2011 and 2012. But struck by sliding or falling objects, fall or slip on the same level became more frequent in later years.

Table 16 Incidence of reported work-related injuries according to mechanisms of injury and sex (per 1000 workers per year)

Mechanism of injury	Male					Female				
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
Caught in or between objects	0.91	0.48	1.05	0.40	0.22	0.46	0.22	0.78	0.47	0.27
Contact with extreme temperature	0.27	0.07	0.19	0.20	0	0.03	0	0	0	0
Exposure to or contact with electric current	0.05	0.07	0.14	0.05	0	0	0	0.07	0	0
Fall or slip on same level	0.19	0.03	0.38	0.35	0.04	0.21	0.11	0.14	0.94	0
Fall to different level	0	0	0.24	0.30	0.04	0	0.04	0.36	0	0
Inhalation, absorption, ingestion, poisoning, etc.	0.08	0	0	0.05	0	0	0	0	0	0
Others	0.55	0.42	0.19	0.20	0.74	0.27	0.07	0	0	0.76
Over-exertion	0	0	0	0.05	0	0	0	0	0	0
Strike against object	0.58	3.01	2.06	0.65	0.15	0.73	1.02	0.92	0.35	0.05
Struck by sliding, falling objects	0.36	0.28	1.05	0.35	0.19	0.15	0.04	1.35	0.82	0.22

Job experience

As shown in table (17), incidences of reported work-related injuries are found to be the highest in workers who had a working experience of 5 - 14 years. The least experienced group had the lowest incidences. It was also noted that a large proportion of workers are not recorded about their working experiences.

Table 17 Incidence of reported work-related injuries according to job experience and year (per 1000 workers per year)

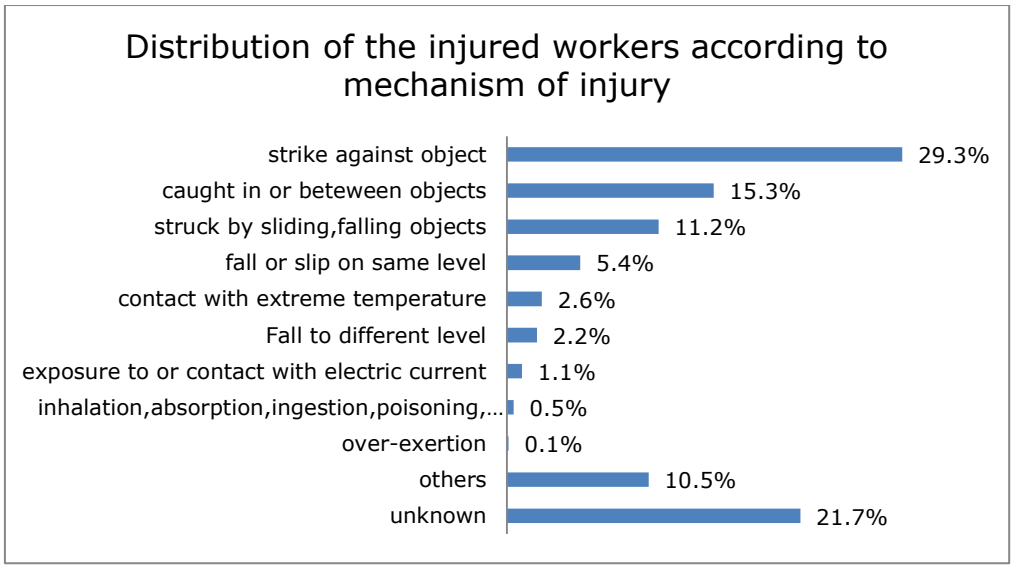
Job experience	Year				
	2011	2012	2013	2014	2015
< 1 year	0.17	0.04	0.11	0.00	0.04
1 to 4 years	0.36	0.69	1.17	0.56	0.18
5 to 14 years	0.92	0.67	1.49	1.02	0.33
15 to 24 years	0.62	0.48	1.20	0.46	0.20
> 25 years	0.50	0.46	0.66	0.67	0.15

3.2.3 Agent's characteristics

Mechanism of injury

According to the findings, injuries due to strike against objects were most frequent type and comprising (29.3%) of total injuries. As second place, injuries are due to unknown cause because they are not recorded, about (21.7%). After this, other frequent injuries were caught in or between the objects and struck by sliding or falling objects; (15.3%) and (11.2%) respectively.

Figure 12 Distribution of reported injuries according to mechanism of injury



According to the findings, caught in or between objects was the most common mechanism of injury in 2011. But for other years, strike against objects was the most common mechanism. Fluctuations of the incidences were also noted in most of the mechanisms of injuries. This finding is concordant with (Kyaw Soe Naing 2008), who stated in his study of

industrial injuries that caught in machines was the most common cause of injury.

Table 18 Incidence of reported work-related injuries according to mechanisms of injury and year (per 1000 workers per year)

Mechanism of injury	Year				
	2011	2012	2013	2014	2015
Caught in or between objects	0.69	0.35	0.94	0.42	0.24
Contact with extreme temperature	0.16	0.04	0.11	0.14	0
Exposure to or contact with electric current	0.03	0.04	0.11	0.04	0
Fall or slip on same level	0.20	0.07	0.29	0.53	0.02
Fall to different level	0	0.02	0.29	0.21	0.02
Inhalation, absorption, ingestion, poisoning, etc.	0.04	0	0	0.04	0
Over-exertion	0	0	0	0.04	0
Strike against object	0.65	2.04	1.60	0.56	0.11
Struck by sliding, falling objects	0.26	0.16	1.17	0.49	0.20
Others	0.42	0.25	0.11	0.14	0.75

According to the findings shown in table (19), it was found that strikes against objects, struck by sliding or falling objects and caught in or between objects were the most common mechanisms reported. But in the Ministry of Defense and the Ministry of Electric Power, fall and slip on the same level was the commonest reported mechanism of injury in 2014. But in 2015 there were no accidents due to this mechanism of injury in these Ministries.

Table 19 Incidences of reported work-related injuries according to mechanism of injury and Ministry (per 1000 workers per year)

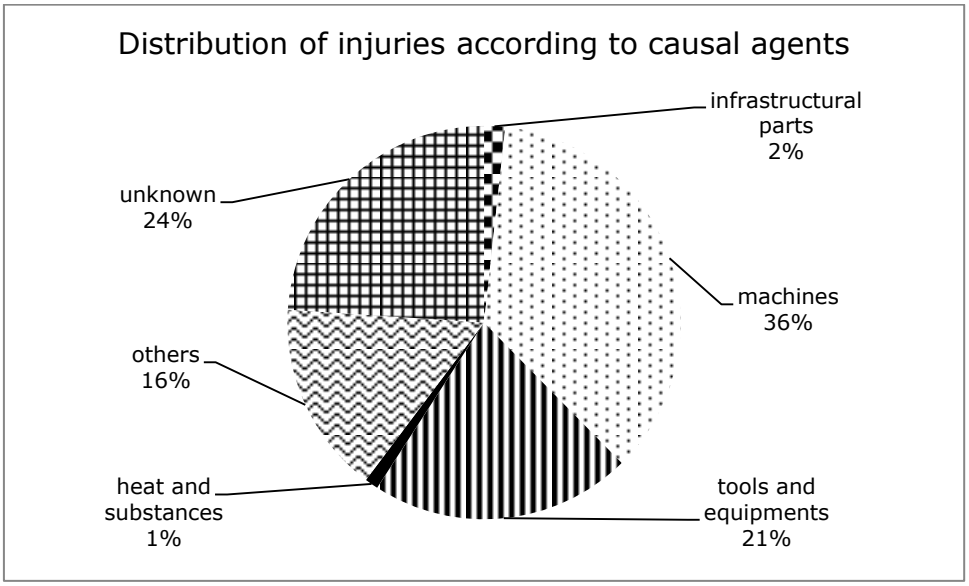
2011								
	Caught in or between objects	Contact with extreme temperature	Exposure to or contact with electric current	Fall or slip on same level	Inhalation, absorption, ingestion, poisoning, etc.	Others	Strike against object	Struck by sliding, falling objects
Ministry of agriculture and irrigation	0.50	0	0	0.17	0	0	0.33	0.33
Ministry of energy	0.08	0.20	0.04	0.16	0.12	0.12	0.12	0.25
Ministry of forestry	0	0	0	9.26	0	101.85	0	9.26
Ministry of industry	1.57	0.23	0	0.37	0	0.51	1.67	0.42
Ministry of transport	0.67	0.07	0.07	0	0	0.30	0.30	0
2012								
	Caught in or between objects	Contact with extreme temperature	Exposure to or contact with electric current	Fall or slip on same level	Fall to different level	Others	Strike against object	Struck by sliding, falling objects
Ministry of forestry	1.40	0	0	0	0	0	2.80	0

Ministry of industry	0.42	0.03	0.05	0.10	0.03	0	2.33	0.13
Ministry of transport	1.21	0.40	0	0	0	5.63	9.65	1.61
2013								
	Caught in or between objects	Contact with extreme temperature	Exposure to or contact with electric current	Fall or slip on same level	Fall to different level	Others	Strike against object	Struck by sliding, falling objects
Ministry of electric power	0	0	0	0	0	0.26	0.26	0
Ministry of energy	0.52	0	0.13	0.52	0	0	0.52	0
Ministry of industry	1.50	0.29	0.21	0.29	0.71	0.14	3.07	2.36
Ministry of transport	1.68	0	0	0.42	0	0	1.47	1.68
2014								
	Caught in or between objects	Contact with extreme temperature	Exposure to or contact with electric current	Fall or slip on same level	Fall to different level	Inhalation, absorption, ingestion, poisoning, etc.	Others	Over-exertion	Strike against object	Struck by sliding, falling objects
Ministry of defense	3.53	0	0	21.20	0	0	3.53	0	0	3.53
Ministry of electric power	0	0	0	0.81	0	0	0	0	0	0.00
Ministry of energy	0	0.27	0	0	0.27	0.14	0	0	0.14	0.14
Ministry of industry	1.38	0.15	0	0.31	0.46	0	0.46	0.15	1.07	1.23
Ministry of mining	0	0	0	0	0	0	0	0	0	12.74
Ministry of transport	0.36	0.18	0.18	0	0.18	0	0	0	1.43	0.36
2015										
	Caught in or between objects	Fall or slip on same level	Fall to different level	Others	Strike against object	Struck by sliding, falling objects				
Ministry of defense	0.65	0	0	4.54	0	0.65				
Ministry of energy	0	0.11	0.11	0.11	0	0.11				
Ministry of industry	0.45	0	0	1.26	0.20	0.30				
Ministry of mining	7.81	0	0	0	0	0				
Ministry of transport	0	0	0	0.11	0.11	0.11				

Causal agents for injuries

As illustrated in figure 13, machines are most common causal agent for most of the reported work-related injuries, comprising 36% of total injuries. Secondly, tools and equipment was common agent for injuries, which includes hand tools, electrical equipment, welding equipment, transport equipment or vehicle and lifting equipment and comprising 21% of total injuries. It was found that a large proportion (24%) of the injuries had lack of information on what the causal agents were. In the category of infrastructural parts, stairs and steps, gangways, scaffolds and staging, floors or level surface and ladders were included and heat and substances included furnaces, ovens, kilns and explosive or inflammable substances.

Figure 13 Distribution of reported injuries according to causal agent

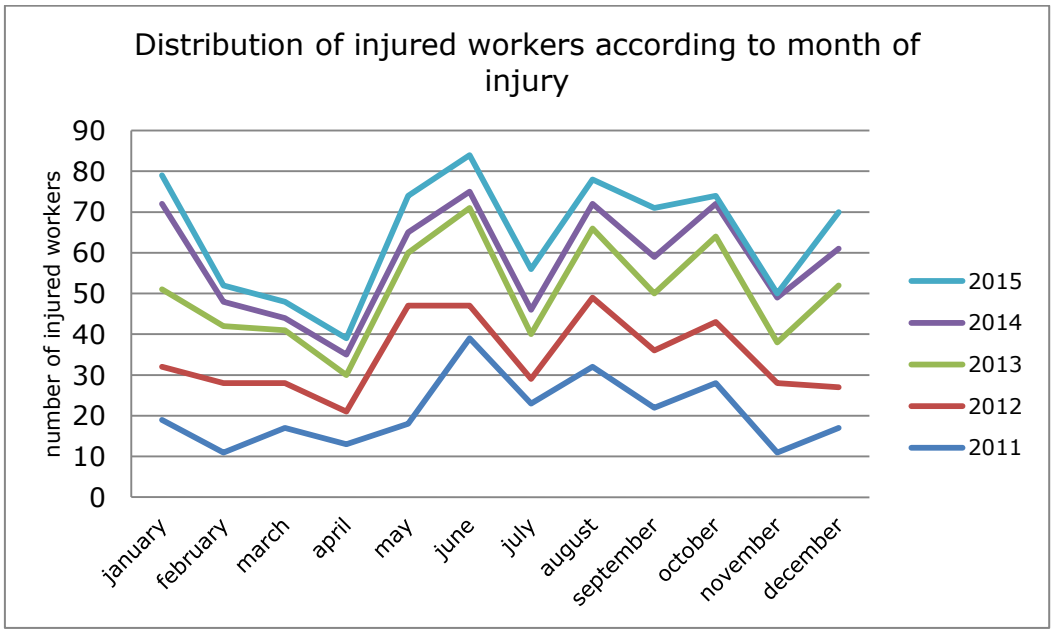


3.2.4 Environment's characteristics

Month of the year

As shown in figure (14), it was found that there were less injuries reported in April, July and November, and more in June and August. These variations were very similar in every year. In April and November, there is usually present a long holiday about 2 weeks because of traditional festivals. During these days, government factories pause their activities, reducing the chance of accidents.

Figure 14 Distribution of reported injuries according to month of injury



When cross tabulating the month of the year when injuries occurred with the mechanisms of injury, it was found that striking against objects was the most common mechanism of injury in all months except December where caught in or between objects were more common.

Table 20 Distribution of mechanism of injury by month of injury

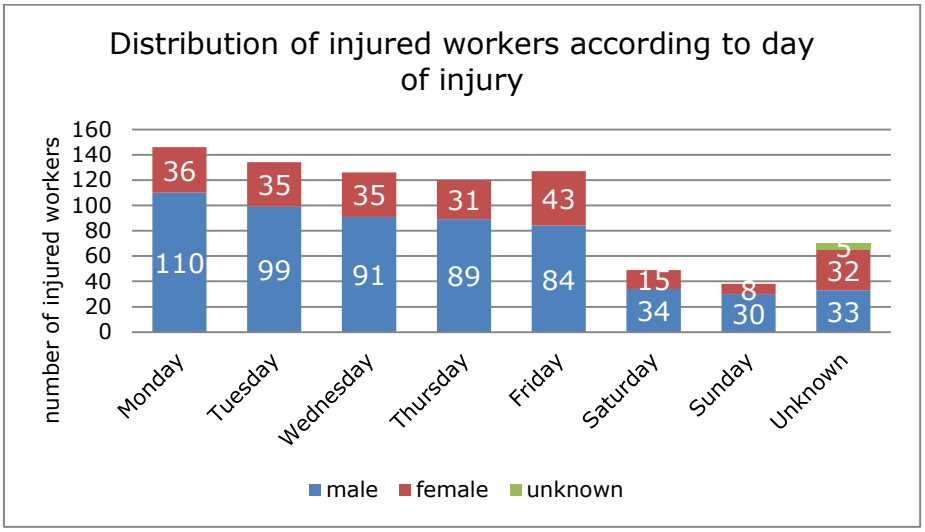
Mechanism of injury	Month of the year when injuries occurred												Grand Total
	January	February	March	April	May	June	July	August	September	October	November	December	
Caught in or between objects	7	10	8	7	16	13	7	6	7	13	8	19	121
Contact with extreme temperature	1	1	2		1	7	1	1	1	2	3	1	21
Exposure to or contact with electric current		1	1	1	1				3	1	1		9
Fall or slip on same level	9	4	1	3	2	4	4	6	6		1	4	44
Fall to different level		2	1	1		1	2	4	3	1	2		17
Inhalation, absorption, ingestion, poisoning, etc.					2	1				1			4
Over-exertion												1	1
Strike against object	29	15	15	13	30	18	14	21	19	22	18	16	230
Struck by sliding, falling objects	10	4	11	4	9	9	2	4	12	5	4	12	86
Others	2	8	2	4	4	6	13	11	4	15	4	7	80
Unknown	21	7	7	6	9	25	13	25	16	14	9	10	162
Grand total	79	52	48	39	74	84	56	78	71	74	50	70	775

*Out of total 810 injuries, 35 injuries are not known about which month that they occurred and most of their mechanisms of injury are not known.

Day of the week

The highest numbers of reported work-related injuries occurred at Monday, and Sunday had the lowest occurrence (Figure 15). Other days did not have great differences. It is noted that injuries were decreasing from Monday to Thursday and rise again on Friday. It was also found that a large number of reported injuries did not report about the day when the injury occurred.

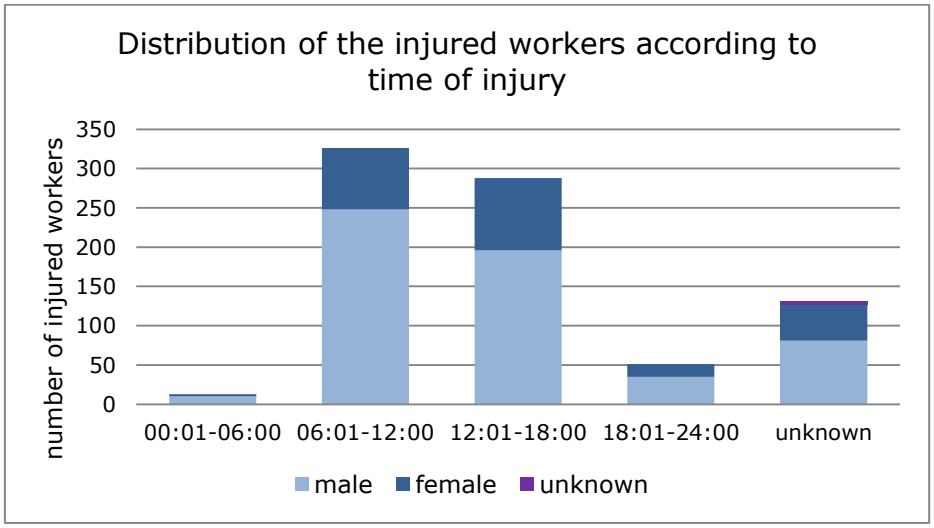
Figure 15 Distribution of reported injuries according to day of injury



Time of the day

It was found that injuries were more frequently reported between 6am to 12 noon followed by the period between 12 noon to 6pm. Majority of the work-related injuries were reported during morning and evening shifts and less occurred in night shifts. In his study, (Vernon 1992) mentioned that workers became fresh again after 12 noon break and injuries are much reduced. This was found to be discordant with the finding in this study.

Figure 16 Distribution of reported injuries according to time of injury



3.3 Adopted plans in prevention of work-related injuries in Myanmar and its potential implementation gaps

Myanmar became a member of ILO since 1948. The country adopted and enacted the Factory Act (1951) to apply it to the entire industrial sector. All the factories from different economic sectors are involved under this

Act. Until now, health and safety provisions those who are being applied in the factories are according to the Factories Act (1951) and the enforcement of these provisions is ensured by the Factories and General Labour Law Inspection Department (FGLLID) of the Ministry of Labour (FGLLID 2014).

In the Chapter 3, The Factory Act (1951) contains the following health provisions;

- Factory shall be kept clean and free from effluvia.
- Effective arrangements shall be made for the disposal of wastes and effluences.
- Workrooms must be adequately ventilated.
- The humidification must be according to the standard and the use of water shall be purified.
- No room in a factory shall be overcrowded.
- Provide sufficient and suitable lighting.
- All floors, steps, passages and gangways shall be of sound construction and properly maintained.
- Every vessel, sump, tank, pit or opening in the ground or in a floor shall be either securely covered or strongly fenced.
- Woman, adolescent or children are not allowed to lift heavy load and an adult person cannot be permitted to carry or move a load more than 160 pounds.
- Eye protection should be taken for the risk of injury to the eyes from particles or fragments thrown off and exposure to excessive light.

In the Chapter 4, The Factory Act (1951) contains the following safety provisions;

- Fencing the dangerous parts of the moving machines
- Woman and child are not allowed to clean, lubricate or adjust any part of the machinery
- No young person shall work or be required to work at any machine without sufficient training
- Suitable striking gear or other efficient mechanical appliance shall be provided for cutting off power
- Every set screw, bolt or key on any revolving shaft, spindle, wheel or pinion shall be sunk, encased or guarded to prevent danger
- Every hoists, lifts, cranes and other lifting and hoisting machinery shall be of good mechanical construction, sound material and strength and shall be properly maintained

These provisions are stated as a guideline plan for health and safety of the workers and all types of factories in Myanmar are informed to apply them (FGLLID 2014). But the evidences (documents) to evaluate the implementation status of these provisions in the government factories in Myanmar were not found during literature search. Anyhow, the provisions that can be directly or indirectly connected to this study were explored and discussed in next discussion section.

To compare and contrast the current situations and plans, Vietnam's plans for prevention of work-related injuries and diseases were explored and studied. In Vietnam, the Occupational Safety and Health system is reflected in the law on the protection of people's health 1989, Article (56) of the Vietnamese Constitution (1992) and supplemented labour code 2002. Political commitment was also strong and powerful made by the president. The performance of occupational safety and health in agriculture has been strengthened since the Government issued a directive in 2004 (MOLISA 2010).

Vietnam takes occupational safety and health as an important part of the strategy for human resource development and protection and of the national strategy for sustainable socio-economic development. Since the country shifted towards a market oriented economy, OSH performance has changed positively and gained improvements and following plans have been implemented (Bureau for Safe Work 2006).

- Target program on labour protection (1999 – 2000) approved by the Government which was the national action program on accident and injury prevention, including OSH items.

- National policy on prevention of occupational accidents and injuries developed in 2002- 2010

- National week for OSH activities established

- Strategy for strengthening health at work through the campaign "healthy workplace" developed and implemented

- Survey done to know awareness of workers on OSH and current situations of the workers

- Major nationwide publicity campaigns on OSH launched through the national week for OSH in order to broadly attract the involvement of everyone

- Human capacity development for OSH developed and still implementing

CHAPTER 4: DISCUSSION, RECOMMENDATION AND CONCLUSION

4.1 Discussion

Regarding the objectives set for the study, three main areas were focused and discussed in this section.

1. Magnitude of the problem
2. Characteristics and distributions of work-related injuries reported through current reporting system from 2011 to 2015, and
3. Adopted plans in prevention of work-related injuries in Myanmar and its potential implementation gaps

1. Magnitude of the problem

To make a right response, knowing the actual magnitude of the problem is very important. It is one of the factors that influence the process of setting priorities. By setting the right priorities, important public health activities can be implemented efficiently and effectively. So it is important for Myanmar which has scarce resources especially in the health sector that need to be spent effectively. In term of resources, many resources are used for the passive surveillance system while collecting and conveying the information; which are human capital, materials, technical supports, etc. If the reporting system is not good, the actual magnitude of the problem cannot be gained and all spent resources will be wasted. And when the implementations will be carried out relying on that incorrect information, more resources will be wasted.

In this study, a total of 810 work-related injuries were reported from 2011 to 2015 through the collaborative reporting system. Firstly, after checking the reporting status of the factories under different Ministries, the quality of reporting was a concerning issue. This is because many factories from 5 out of 8 Ministries did not send reports. Among those who sent, some of the Ministries did not send reports regularly. Some stopped reporting. These situations reflect poor collaborations in the current injury reporting system among the government Ministries. This may be due to negligence and/or demotivation of the reporting staffs in the factories when proper supportive supervisions and regulations are not taken by the Ministry level. Overburdening of the reporting staff can also cause this situation, when reporting staffs are assigned with other jobs and they found themselves too busy to do routine reports. Another important situation that needs to be concerned was being afraid of punishments gained by reporting actual statistics. If authorities of the factories are afraid of punishments they would conceal the real figure by not reporting or underreporting.

In addition to the data gaps, there were also found years with no single injury occurred. It is really hard to interpret that there were no injuries occurring throughout a whole year in the factories which have thousands of employees. Moreover it can be seen that some ministries have big fluctuations in the workforce because it was a total number of workers from the reporting factories. It did not represent the total workforce of all factories under each Ministry. And reporting factories are also not the same year by year that possibly caused the denominator fluctuated remarkably year by year. This influenced on calculating magnitude of the problem. For example; a big increase in number of workforce, between 2014 and 2015, of the Ministry of Defense induce a marked change in the incidence during these years.

After calculating the incidences with available data, findings show some important points like four consecutive years with no work-related injuries in the Ministry of Agriculture and Irrigation and marked ups and downs of the incidences in other Ministries. Generally, incidences per year in total were decreasing during the last 3 years. Between 2014 and 2015; incidences were decreased in most of the Ministries, some were very steep. But as mentioned above, these may be just due to fluctuations in the yearly denominators or may be hopefully due to some important changes or implementations which were done in these factories during this period.

As this study was based on the reported injuries, underestimation of the actual incidence was inevitable. Underreporting can greatly influence the estimation of the actual figure and it was considered a big challenge to this study, as discussed in the limitations section.

2. Characteristics and distributions of work-related injuries reported through the current reporting system from 2011 to 2015

Injury characteristics

By observing the nature of injury, abrasions i.e. minor injuries were the most frequently reported work-related injuries till 2013. Starting from 2014, a marked decrease was seen. Severe injuries like multiple injuries and internal injuries were less frequently reported. Generally, the pattern was quite similar for all recorded years. As a proportion, about 51% of reported injuries were found to be in minor severity and only 5% of reported injuries were with severe severity. By finding this situation, it was concerned that only minor injuries like abrasions and cuts are commonly occurring in the factories or severe injuries are less likely to report when they occur. The latter may be possible when factory authorities want to avoid the punishments for letting occur severe injuries in their factories. On the other hand, if only minor injuries are occurring

during these years, appreciations and recognitions should be done for motivation of staffs.

According to the findings, the second commonest reported injuries (i.e. 28%) had moderate severity which needs health care with skilled procedures (e.g. cuts and incised wounds that need suture, not displaced fractures that need POP, etc.). This situation highlighted that many factories need health care persons who can perform these skilled procedures without delay. It was also stated in the Factory Act that every factory that have more than 150 workers should have a dispensary run by a trained person. Currently it is difficult to assign health care persons to every government factories due to the shortage in human workforce for health. For the factories that did not have that facility and the location of the factory is far from the hospital, proper referral mechanism should be prepared for these kinds of injuries.

In the findings, it was found that most of the minor and moderate injuries resulted from striking against objects and most of them were from the factories under the Ministry of Industry. This may be due to the differences in reporting status between the Ministries or due to differences in the types of assigned positions of the injured workers in the factories. In this study this information of assigned position was not available.

Only four workers who suffered fatal work-related injuries are reported during the last 5 years. This can be considered as correct information because official procedures have to be done to give compensation or other kind of things to the deceased worker's family. So underreporting of fatal work-related injuries is not possible generally in Myanmar.

In this study, most reported injuries caused damage on the upper limb because the majority was machinery injuries and most of these injuries concerned hands and fingers of the workers. This was an important finding because hands are the most engaging and useful parts of the body not only for working but also for daily activities.

According to results, 53% of the injured workers didn't take leave. This may be due to more than half of the injuries are having minor severity or may also be due to that the worker did not want to take leave due to work's pressure. 22% of injured workers take leave for the period between 1 week to 1 month and only 5% took leave for more than one month. This may be related to the severity of the injuries that they encountered. Most of the reported work-related injuries that took leave of 1 week to 1 month were form factories under the Ministry of Transport. This may be due to the fact that most of the injuries were with moderate severities.

Host characteristics

In this study, the ages of the injured workers were categorized into groups with the interval of 10 years. According to the findings, the highest numbers of the reported work-related injuries occurred in the age group of 20-29 years, followed by the age group of 30-39 years. So it was seen that 48% of the injured workers were between the ages of 20-40 years, young and productive people. According to this study, it seemed that reported work-related injuries were more common in young working age people. Low education level, lack of job experience, lack of training for work and safety, inadequate skills, unawareness and risk taking behaviors may be possible relating factors for those young workers leading to work-related injuries. When looking over all 5 years, certain age groups are seen as high in proportion in every year. That may be due to that is age is somehow related to the occurrence of injury. But as mentioned before, some other facts like less experience, recklessness, etc. can be related to younger age and these also can lead to the injuries.

Despite of the possible factors that can cause the young workers more prone to work-related injuries, reported injuries among workers of age less than 20 comprise a small proportion of the total injuries. This may be due to two things: due to the political atmosphere that gave pressure to the factory authorities not to report younger cases; or on the other hand, younger workers are more careful and concentrated at work as they don't want to make mistakes and to be punished.

To total 810 injured workers, male comprised 70% and female comprised just 29%. But it cannot be said that males were more prone to work-related injuries than females, because the participation in the labour force of males is already higher than female. When comparing the incidences, it can be seen that the incidence of male which is 4 injuries per 1000 male workers per year is also higher than female which is 2 injuries per 1000 female workers per year.

As usual, workers with much less experience in their current work are more prone to injuries. Mainly concerned with unfamiliarity, lack of skills and unawareness of risks of the own job. But in this study injuries are found to be the highest in workers who had a working experience of 5 to 14 years and the least experienced group is found to be less common. This may be due to overfamiliarity to their jobs, making them unaware and reduce concentration on work as they are having more than 5 years of job experience in the same place. But on the other hand, people with less job experiences may take more caution and be careful as they don't want to make mistakes and do not want to be punished.

Agent characteristics

According to the findings, injuries due to strike against objects were most frequent followed by caught in or between the objects and struck by sliding or falling objects. Male workers are found to be more common in all kinds of mechanism of injury. This may be due to the difference between the roles and the assigning posts of male and female workers. Different percentages of mechanisms of injury can also be seen in different ministries which may be due to the different nature of work of the factories under different ministries. In the Ministry of Defense and Ministry of Electric Power, fall and slip on the same level was the commonest reported mechanism of injury in 2014. But in 2015 there were no accidents due to this mechanism of injury in these Ministries. This situation may be due to some important changes or implementations were done in the factories under these Ministries during this period. On the other hand, it was concerned that reporting may be compromised due to some kind of actions taken by the Ministry. According to the findings, the causal agent for most reported work-related injuries are machines which comprise 36% of total injuries. This can be a result of rapid development of the industrialization sector.

Environment characteristics

It is found that injuries are less likely to occur in April and November, and more likely to occur in June and August. This figure is nearly the same every year. This may be due to the fact that there is a long holiday, about two weeks, due to a traditional festival in those months and workers are not working at those holidays. On the other hand, during June and August, which is in the rainy season, increased chance of injuries may be due to environmental conditions like wet, slippery, dump, etc.

Highest numbers of the reported work-related injuries occurred at Monday, Sunday had the lowest frequency. Numbers are also high at Friday. According to the results, reported work-related injuries are more common at the start of the week, Monday, and steadily decreased throughout the week. This may be due to a less concentration in the job on the first working day (Monday) after weekend holidays or domination of effects of problems which can be encountered in weekends. The high number at Friday may also be due to less concentration at work because of concentrating on coming holidays.

The highest number of accidents occurred between 6:00am to 12 noon which are the busy hours of the day, followed by 12 noon to 6 pm, afternoon and evening. This period contains lazy and sleepy times for workers, usually between 2pm to 4pm. According to Vernon’s study, accidents were found to be reduced after 12 noon break because workers

were fresh again after the break. But in this study, high numbers of injuries occur between 12 noon to 6pm. This may be due to insufficient time or poor quality of breaks in the factories. Injuries occurred during night shifts were found to be less frequently reported. This may be due to less people worked in the night shifts or due to difficulty in reporting at night.

Other characteristics to be considered

There also are some other important factors that are possibly related to the occurrence of work-related injuries. (Takele and Abera, 2007) mentioned that the prevalence and severity of the annual rate of injury was associated with working hours, job experience, job satisfaction, safety measures, work environment and work supervisions, in their study done in Ethiopia.

Regarding working hours, a long working period may make workers tired and so they lose their concentration, awareness, and responses. So these make them more vulnerable to work-related injuries than those workers who have short working hours. But some factors like length and quality of the breaks during the working hours should be considered.

Regarding the safety at work, it means presence of safety guidelines at work, trainings for work and job safety and availability of safety materials. According to my previous study on work-related injuries done at Yangon General Hospital in 2012, it was found that (51.4%) of patients said their work places don't have safety guidelines and (10.8%) didn't know about those guidelines neither verbal nor written directions. And (91.9%) of patients were not experienced in training for work and safety at work. Unfamiliarity and unskillfulness were frequently seen in most work-related injuries related to a lack of training and (58.6%) of patients said safety materials were not available at their work places such as gloves, helmets, safety belts, goggles, etc. leading them to be prone to injuries. So these facts, which were not included in current reporting system, should be considered too.

In addition, other factors that can influence the self-control of the worker should not be left out. For example: drinking of alcohol; taking sedative medications like cough syrups; or some medical conditions like being prone to postural hypotension, dizziness, etc. can lead the worker to lose self-control and be more prone to work-related injuries.

Therefore these factors should also be taken into consideration in making a planning for the prevention of work-related injuries as well as injury surveillance in future.

3. Adopted plans in prevention of work-related injuries in Myanmar and its potential implementation gaps

In chapter 3 (health) and 4 (safety) of the Factory Act (1951), some health and safety provisions were found to be present concerning this study.

First of all, keeping the factory clean and free from effluvia and arranging proper drainage of collected water or other substances were found in provisions, which can prevent the worker from slipping and falling and striking against objects. Controlling dust and fumes and providing suitable lighting were also found to prevent the worker from getting a vision blockage that leads to falls, slips and strike against objects. As a first leading mechanism of injury in this study was the strike against objects, inadequate or improper provisions of above mentioned measures were concerned.

Fencing the dangerous parts of the moving machineries was also found in safety provisions, which can prevent the worker from being caught in the machines. As a second leading mechanism of injury in this study was the being caught in or between objects, inadequate or improper provisions of that measure were also concerned.

Struck by sliding or falling objects and fall or slip were also found frequently in this study. It highlighted that implementation gaps may be present in such provisions as encasing and guarding of loose parts of the machines, securing tools and parts of the equipment and machines, usage of safety equipment and tools and construction and maintaining of proper floors, steps, passage and gangways and ensuring the workplace not to become overcrowded.

Contact with extreme temperature was also found in this study, which may be due to the needs in proper arrangement and usage of chambers, tanks, pipes and manholes, high humidification in a closed workplace and sometimes due to poor ventilated overcrowded workplaces.

Regarding Vietnam as a benchmark, the comparison shows Myanmar left behind about a decade. Starting from the 1988, United States of America, US and European, EU impose sanctions on Myanmar’s industrial products and that slowed down the growth of the industrial development of the country. Some of foreign companies also left the country and Myanmar’s industrialization had very limited improvement. After a change of government in 2012, Myanmar opened the doors and stepped forward. But comparing to Vietnam, there was a development gap (Kudo 2001).

Vietnam started their promotion of occupational safety and health (OSH) at about 1990. At that time they had challenging socio-economic development and work-related injuries too. But after undertaking the

strategies and plans mentioned in the findings, they gained much development in OSH (MOLISA 2010). According to their success plans, Myanmar should fill these gaps to promote the OSH which is endorsing policy for prevention of occupational accidents and injuries into the National health policy, establishing a National week for OSH activities and nationwide campaigns on OSH launched through the national week for OSH.

4.2 Recommendations

1. Injury surveillance system including data reporting and recording should be strengthened as data incompleteness and unreliability in the current reporting system were found in this study.
2. Commitments and strong collaboration should be ensured from other Ministries to strengthen the injury surveillance system.
3. Further studies, regarding work-related injuries, should be carried out in Myanmar, both area-wide and in-depth, in order to figure out the actual magnitude of work-related injuries, because in this study much limitations were present and it did not represent the actual figure of work-related injuries of the country.
4. Further studies should be done to know more about the implementation status and enforcements of Occupational Safety and Health related regulations and laws.
5. Dissemination and advocacy on study's results should be done to promote the occupational safety and health activities at Ministry level. Good reporting status of some Ministries can be used as a motivator for other Ministries with poor reporting status.
6. At Ministry level, advocacy for national OSH week activities and endorsement of occupational safety and health policy into national health policy should be done.
7. Measures for improvement of safety and health at work should be accelerated, such as opening of worksite clinics containing health care staffs, pre-employment trainings, refreshing trainings, establishment of firm safety guidelines, and efficient and an uninterrupted supply of safety materials in order to prevent or rapidly respond to the injuries.
8. Information dissemination and health education should be done about the prevention and control of work-related injuries concerning promoting the work place to become an accident-unfriendly area, importance of training for safety, formatting guidelines and posting warnings, supply of protective equipment and materials, supervision

and restriction on risky behaviors, organizing a proper health care center at the worksite for workers, and also social and economic welfare to reduce the stress of workers which can indirectly lead to work-related injuries, etc.

4.3 Conclusion

This study was based on (810) work-related injuries, reported through the collaborative reporting system, from the factories under the different Ministries during last five years (2011–2015). It points out many facts including epidemiological characteristics, distributions and some potential implementation gaps. These findings are targeted for some benefits to the population, working in the government factories, who suffered from work-related injuries in Myanmar.

In review of this study, the magnitude of the work-related injuries during last three years was decreasing in general. But due to the data gaps and weaknesses, estimation of the actual figure was a big challenge. Minor injuries were most frequently reported and severe injuries like multiple injuries and internal injuries were less frequently reported. Abrasions and cuts are commonly occurring. These injuries resulted from striking against objects and most of them were from the factories under the Ministry of Industry. Most reported injuries caused damage on the upper limb because the majority was machinery injuries and most of these injuries were hands and fingers of the workers. (48%) of the injured workers were between the ages of 20-40 years, young and productive people. The male comprised 70% of total reported injuries and injuries are found to be highest in workers who had a working experience of 5 to 14 years (both sexes). Injuries due to strike against objects were most frequent. Injuries are less likely to occur in April and November, and more likely to occur in June and August. The highest numbers of the reported work-related injuries occurred at Monday and between 6:00am to 12 noon which are the busy hours of the day.

In addition to those findings, this study can highlight the needs that exist in the current reporting system by showing the gaps and weaknesses. With the limited information, this study was also expected to fill an information gap to a certain extent, regarding the work-related injuries in Myanmar. Developed recommendations were also expected to be useful in the further management of work-related accidents and injuries.

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6. APPENDICES

6.1 Operational definitions

No.	Names of Variables	Operational definitions	Scales of measurement
1	Injury	External force/ non-contagious substance, striking the body or entering into the body and causing anatomical discontinuity of tissue or deranges physiological functions of the body. (WHO 2005)	Nominal
2	Work-related injury	An injury that results from a work-related event or from a single instantaneous exposure in the work environment leading to death, lost work time, medical treatment other than first aid, loss of consciousness, work restriction, or transfer to another job. (US Department of Labor, 1992) All injuries resulting from accidents arising out of or in the course of employment (work accidents and commuting accidents) and all occupational diseases. (ILO, 1983)	Nominal
3	Magnitude of problem	Incidence of the reported work-related injuries per 1000 workers per year	
4	Age Group	Grouping of age cohorts of workers for study	Ordinal
5	Sex	Physiological characteristics of being male or female.	Nominal
6	Place of work	The place where injured worker's factory situated (e.g. Regions, States, etc.)	Nominal
7	Time of injury	Time when injury occurred	Nominal
8	Mechanism of injury	The nature of event that results injury; How the injury was inflicted, i.e. how the person was hurt? – Caught in or between objects – Contact with extreme temperature – Exposure to or contact with electric current	Nominal

		– Fall or slip on same level – Fall to different level – Inhalation, absorption, ingestion, poisoning, etc. – Over-exertion – Strike against object – Struck by sliding, falling objects – Unknown (CDC, Injury Surveillance Guideline, adapted)	
9	Nature of injury	The physical nature of the injury; - abrasions - amputations - bruises and contusions - burns (chemical) - Burns (thermal) - concussion and internal injury - cuts - Dislocation - effects of electric current - fracture - multiple injuries - others - poisoning - puncture wound - sprains, strains - unknown (CDC, Injury Surveillance Guideline, adapted)	Nominal
10	Pattern of injury	Assessment of the degree of injury. - No apparent injury - Minor or superficial (e.g. Bruises, minor cuts) - Moderate, requiring some skilled treatment (e.g. Fractures, sutures) - Severe, requiring intensive medical/surgical management (e.g. internal hemorrhage, punctured organs, severed blood vessels) - Fatal (CDC, Injury Surveillance Guideline)	Ordinal
11	Job experience	Time period or length while injured worker has been in touch with his current job	Ratio

6.2 Reporting format (translated from Myanmar language)

(Form - 3)

Ministry of ----------

Department of ----------

List of Occupational Injuries

Date ----------

Sr.	Name	Male / Female	Age	Occupation	Department/ Section	Working experience	Injury process				Duration of leave (in days)
							Day	Time	Place	Causing material and injury condition	

6.3 Letter of permission

To

Dr Zaw Myo Aung

Assistant Director

Child Health Division

Department of Public Health

Ministry of Health

Date: February , 2016.

Dear Dr Zaw Myo Aung,

Regarding your request of permission for use of information in your thesis which will emphasize on epidemiology of occupational injuries, I hereby allow you to use the information (data) from my Division which is related to the occupational injuries in Myanmar in your study.

Dr Kyi Lwin Oo

Director

Occupational and Environmental Health Division

Department of Public Health

Ministry of Health, Myanmar