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The Journal

- Aims to serve as a forum for sharing research findings and information across broad areas in occupational safety and health
- Publishes original research reports, topical article reviews, book reviews, case reports, short communications, invited editorial and letter to editor.
- Welcomes articles in occupational safety and health related fields.

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Introducing the Journal of Occupational Safety and Health

The National Institute of Occupational Safety and Health (NIOSH) is delighted to announce the publication of Journal of Occupational Safety and Health (JOSH).

JOSH is devoted to enhancing the knowledge and practice of occupational safety and health by widely disseminating research articles and applied studies of highest quality.

JOSH provides a solid base to bridge the issues and concerns related to occupational safety and health. JOSH offers scholarly, peer-reviewed articles, including correspondence, regular papers, articles and short reports, announcements and etc.

It is intended that this journal should serve the OSH community, practitioners, students and public while providing vital information for the promotion of workplace health and safety.

Apart from that JOSH aims:

• To promote debate and discussion on practical and theoretical aspects of OSH

• To encourage authors to comment critically on current OSH practices and discuss new concepts and emerging theories in OSH

• To inform OSH practitioners and students of current issues

JOSH is poised to become an essential resource in our efforts to promote and protect the safety and health of workers.

From the Editor in Chief

Workplace safety is a priority. Much needs to be done to encourage employees, employers and industries to put occupational safety and health at the top of their agenda. The most important thing is our commitment in taking action; our commitment to make the necessary changes to ensure that safety is at the forefront of everyone's thinking.

The Journal of Occupational Safety and Health (JOSH), the first to be published in Malaysia, aims to boost awareness on safety and health in the workplace.

It is no longer sufficient to simply identifying the hazards and assessing the risks. We aim to increase understanding on the OSH management system. We aim to strengthen commitment to workplace safety and better working conditions. We believe these aims can be achieved through participations and involvement from every industry.

We hope the contents of the journal will be read and reviewed by a wider audience hence it will have a broader academic base, and there should be an increased cumulative experience to draw on for debate and comment within the journal.

It is our hope that the journal will benefit all readers, as our purpose is to serve the interest of everybody from all industries. Prime focus will be on issues that are of direct relevance to our day-to-day practices.

I would personally like to take this opportunity to welcome all our readers and contributors to JOSH (Vol 14, No 1). I look forward to receive contributions from the OSH community in Malaysia and elsewhere for our next issues.

Ayop Bin Salleh
Editor-in-chief

Full Paper

Beyond Self-Report or Reality: The Health Symptoms and The Knowledge, Attitude and Practice of Pesticide Usage among Estate Workers in Oil Palm Plantations, Malaysia

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ABSTRACT : *Pesticides are commonly used for pest control in oil palm plantations. The knowledge, attitude and practices (KAP) while handling pesticides may potentially result in adverse health effects among the estate workers. The aim of this study is to determine the KAP of pesticides used and the capacity of self-reporting health conditions among workers in palm oil plantations. A cross-sectional study was conducted to investigate the KAP and its self-reporting health symptoms by using questionnaires and face-to-face interviews to 120 male estate workers who use pesticides in their daily work routine in the oil palm plantation. At least 85.8% of respondents had a good knowledge of pesticide used, 46.7% of them indicated neutral level of attitude on the pesticides' usage, and 68.3% of them demonstrated a good practice while handling mixture of pesticides. Overall, there is a significant association between the practices of pesticide usage with the self-reporting health symptoms, such as dizziness, excessive vision, cough, nausea/vomiting, redness of skin, difficulty in breathing, skin rashes, blurred vision, excessive sweating and hand tremor. More than half of the estate workers indicated a moderate to good knowledge, attitude and practices level of pesticide handling in oil palm plantations. This study suggests that the self-reporting symptoms are real and not over-reporting by workers. The increase in KAP of pesticides usage among these workers have highlighted the necessity to improve the traditional field training method of safe handling of pesticide to a sustainable field practical-based learning. The latter training approach is to engage theory into practice.*

Keywords – *Knowledge, Attitude, Practice, Pesticide Usage, Symptoms*

1.0 INTRODUCTION

Malaysia's oil palm industry is labour-intensive especially in oil palm plantations. It is estimated that there were 446,368 workers in the country (MPOB, 2011), which consists of 69% foreign workers and 31% of locals. Even so, the oil palm industry is facing a big problem in labour shortage because the duration of employment of the foreign workers depended on the work permit issued. Once the permit has expired, they would have to leave and take with them the work-related training they had gained in this country back to their home country (Abdullah *et al.,* 2011). Even though the training

of the safe use of pesticides is conducted consistently, it is still not sustainably implemented due to the high labour turnover rate (Keifer, 2000).

To date, Malaysia, including all the other upper middle-income countries, shows no positive results in reducing pesticides use (Watts *et al.,* 2010). In fact, almost 50% of the world labour force, especially in the Third World and developing countries are involved in agricultural-activities and all of the pesticide handlers are at risk of developing adverse health effects from chronic exposures to the hazardous mixture of pesticides during pesticide application (Mohd Tamrin, 2014).

Past studies on knowledge, attitude and practices (KAP) showed that most of the pesticide handlers have relatively low KAP while handling pesticides due to the low educational background, which is more likely to hamper the employers when communicating the potential health risks to pesticide handlers (Halimatunsadiah *et al*., 2016; Al-zain & Mosalami,2014). For instance, the illiterate and less educated farmers encountered barriers in understanding the safe practices of pesticides, and their poor perception regarding risk from pesticide exposure are barriers in their adopting self-protective behaviors (Damalas & Hashemi, 2010; Mekonnen & Agonafir, 2002). In fact, studies show that educated farmers were more likely to adopt the recommended safety measures while handling pesticides and were capable of conceptualizing the consequences of poor pesticide practices (Jallow *et al*., 2017; Karunamoorthi et al., 2012).

Since the knowledge, perception and practices of pesticide usage have depended on their ability to perceive the health risks, this pesticide-induced health–related symptoms has been presumed to be exacerbated by the pesticide handlers who have been less educated or less likely to be trained on the competency of handling pesticides in their workplaces (Matthews, 2008; Ziem, 2005). Therefore, this study aims to assess the knowledge, attitude and practice (KAP) of pesticide usage and the self-reporting health symptoms among the estate workers in palm oil plantations. In other words, the findings of this study could be used as baseline information to examine the awareness of pesticide used and the capacity of self-reporting health conditions among workers in palm oil plantations.

2.0 METHODOLOGY

This study was approved by the Ethics Committee Members of Universiti Putra Malaysia (UPM/TNCPI/RMC/JKEUPM/1.4.18.1/F1). This is a cross-sectional study conducted from January – March 2017, at one of the districts on the east coast of Peninsular Malaysia where oil palm cultivation has become the identity of the community. A total of 120 respondents who are known as estate workers in the oil palm sectors are recruited from among both local and foreign workers.

A questionnaire was developed based on questionnaires suggested by past studies (Norkaew *et al.,* 2010; Zyoud *et al.,* 2010). The questionnaire was evaluated by an expert validity team of ten (10) experts from agricultural, Plantation, Safety and Health professions, and then it was followed by test-retest reliability tests among respondents from the similar socio-demographical background to ensure the reliability and validity of this study instrument. Respondents who participated in this study were interviewed by the researcher using this questionnaire to gather their background information. The questionnaire consists of five (5) sections, such as, Section A: Socio-demographical information; Section B: Knowledge of pesticides usage; Section: C Attitude of pesticide usage; Section D: Practices of pesticide usage; and Section E: Pesticide-related Health Symptoms.

For the statistical analysis, descriptive analysis was performed to examine the knowledge, attitude and practices of pesticides usage among estate workers, and chi-square test was used to evaluate the association between practices of pesticide usage and self-reported health effects among respondents.

3.0 RESULTS

Among the 120 study respondents, 85.8% of them are Indonesians, and the rest are Malaysians. About 36.7% of the estate workers' age ranged from 30-year-old to 39-year-old and is followed by 35.0 % of the age range from 21-year-old to 29-year-old. At least 69.2% of them had high school education, and 24.2% of the estate workers were at elementary education level. No workers were reported as illiterate in this study. Besides, most of the respondents (89.2%) had been employed for at least a year working as pesticide applicators, and their daily working hours was approximately 6 hours or more. In addition, 43.3% of respondents preferred to take the lorry and 35% of them preferred tractor as their mode of transportation to work.

3.1 Knowledge Level of Pesticide Usage among the Estate Workers

This part consists of ten questions that could be answered by 'Yes', and 'No'. One point will be given for each correct answer, one point was deducted for each wrong answer and selecting 'doesn't know' answer did not affect the grade. In general, most of the estate workers have a good knowledge level of pesticide usage. Findings of this study indicated that 85.8% of respondents had a "high" knowledge toward pesticide usage at the palm oil plantation, 10% of them have "medium" scores and 4.2% were reported to score below 60% which was considered as having "low" knowledge of pesticide usage. The details of knowledge items examined were tabulated as in Table 1.

Table 1: Knowledge Level of Pesticides Usage among the Estate Workers (N=120)

	Knowledge Items [a]	Yes, n (%)	No, n (%)
1.	Training of pesticide handling is important for personal safety	117 (97.5)	3 (2.5)
2.	Pesticide can lead to health problem	117 (97.5)	3 (2.5)
3.	Pesticide can affects human health	111 (92.5)	9 (7.5)
4.	Pesticide can affects animals	106 (88.3)	14 (11.7)
5.	Pesticide can affects human health within 24 hours	89 (74.2)	31 (25.9)
6.	Ingesting pesticides can cause death	117 (97.5)	3 (2.5)
7.	Pesticide exposure is through inhalation	114 (95.0)	6 (5.0)
8.	Pesticide exposure is through ingestion	107 (89.2)	13 (10.8)
9.	Pesticide exposure is through skin absorption.	98 (81.7)	22 (18.3)
10.	The use of PPE is important to protect the body from exposure to toxins	117 (97.5)	3 (2.5)

[a]Low level = <60%; Moderate level = 61 - 80%; High level = between 81 - 100%.

3.2 Attitude Level of Pesticide Usage among the Estate Workers

This part consists of ten questions that could be answered by 'agree' and 'not agree'. One point will be given for answering 'agree' and vice versa. This study shows that, 46.7% of estate workers have a "neutral attitude" towards safe use of pesticides, and 34.2% of them are "not concerned" with the right attitude to handle pesticide safely while working the plantation field.

Table 2: Attitude Level of Pesticide Usage among the Estate Workers (N=120)

	Attitude Items [a]	Agree, n(%)	Not Agree, n(%)
1.	I need training of pesticide handling before start work	116 (96.7)	4 (3.3)
2.	I will standing against windy direction while spraying	45 (37.5)	75 (62.5)
3.	I will drink water after being exposed to pesticide	73 (60.8)	47 (39.2)
4.	I will wear full PPE when spraying pesticide	114 (95.0)	6 (5.0)
5.	I immediately take a bath after spraying	110 (91.7)	10 (8.3)
6.	I will take an exercise to remove pesticide toxicity through sweating	39 (32.5)	81 (67.5)
7.	I will mixing pesticide using stick rather than using hands	97 (80.8)	23 (19.2)
8.	I chose pesticide to be used based on own experience	38 (31.7)	82 (68.3)
9.	I do not need to wear a full of properly attired when spraying	13 (10.8)	107 (89.2)
10.	I will drink coconut water for treatment of pesticide poisoning	80 (66.7)	40 (33.3)

[a] Concern attitude = 81% - 100%; Neutral attitude = between 61% - 80%; Not concern attitude = less than 60%

3.3 Practice Level of Pesticide Usage among the Estate Workers

This part consists of ten questions that could be answered by 'agree' and 'not agree'. One point will be given for answering 'agree' and vice versa. This study shows that 68.3% of respondents had a "good level" of practice score. Whereby 25% of them fall under the "fair practice level" and only 6.7% of them are categorized as those who had "poor practice level".

Table 3: Practice Level of Pesticide Usage among the Estate Workers (N=120)

	Practice Items [a]	Usually, n (%)	Sometime, n (%)	Never, n (%)
1.	Check equipment and materials before spraying	107 (89.2)	10 (8.3)	3 (2.5)
2.	Wear gloves and masks while mixing pesticides	106 (88.3)	13 (10.8)	1 (0.8)
3.	Read label on the container and follow the instruction before spraying	85 (70.8)	31 (25.8)	4 (3.3)
4.	Avoid human and animals before spraying	106 (88.3)	10 (8.3)	4 (3.3)
5.	Choose the recommended pesticide before spraying	107 (89.2)	11 (9.2)	2 (1.7)
6.	Smell the container before use	96 (80.0)	17 (14.2)	7 (5.8)
7.	Mix pesticide with bare hands	96 (80.0)	15 (12.5)	9 (7.5)
8.	Wear safety boots while spraying	103 (85.8)	7 (5.8)	10 (8.3)
9.	Smoke while spraying	10 (8.3)	26 (21.7)	84 (70.0)
10.	Spray pesticide under windy condition	7 (5.8)	36 (30.0)	77 (64.2)
11.	Stand towards windward direction while spraying without protective equipment	7 (5.8)	36 (30.0)	77 (64.2)
12.	Clean pesticide containers with water from river after finish spraying	16 (13.3)	35 (29.2)	69 (57.5)
13.	Dispose pesticide containers into the river after use	7 (5.8)	10 (8.3)	103 (85.8)
14.	Clean the spraying equipment with detergent before storage	63 (52.5)	29 (24.2)	63 (52.5)
15.	Change clothes immediately after spraying	89 (74.2)	23 (19.2)	8 (6.7)
16.	Wash clothes immediately after spraying	91 (75.8)	18 (15.0)	11 (9.2)
17.	Store the pesticide in storage room after spraying	92 (76.7)	15 (12.5)	13 (10.8)
18.	Burn pesticide containers after spraying	10 (8.3)	13 (10.8)	97 (80.8)
19.	Wash hand after spraying and before having meal	108 (90.0)	10 (8.3)	2 (1.7)
20.	Shower immediately after spraying	95 (79.2)	13 (10.8)	12 (10.0)

[a] Good Practice= 81% - 100%; Fair Practice = 61% - 80%; Poor Practice= < 60%.

3.4 Association between the Practices of Pesticide Usages with Health Effects

The Chi-square analysis was used to evaluate the association between the practices on pesticide usage with the health effects among the estate workers. Most the estate workers indicated that their practice towards pesticide usage had a significant association with the self-reporting symptoms from the pesticides used in their daily work routine. The findings showed that there is significant association ($p<0.001$) between the practices of pesticide used and the symptoms of dizziness, excessive vision, cough, nausea/vomiting, redness of skin, breathing difficulty, skin rashes, and blurred vision. Other symptoms reported by workers indicates excessive sweating and hand tremor.

Table 4: The Association between Practices of Pesticide Usage and Self-reported Health Effects among Respondents

Symptoms		Practice level Frequency (%)			X^2	*P* value
		Good	Fair	Poor		
Headache	Yes	55 (45.8)	18 (15.0)	7 (5.8)	2.169	0.338
	No	27 (22.5)	12 (10.0)	1 (0.8)		
Dizziness	Yes	14 (11.7)	15 (12.5)	4 (3.3)	14.120	**<0.001****
	No	68 (56.7)	15 (12.5)	4 (3.3)		
Excessive vision	Yes	7 (5.8)	11 (9.2)	5 (4.2)	21.607	**<0.001****
	No	75 (62.5)	19 (15.8)	3 (2.5)		
Cough	Yes	10 (8.3)	10 (8.3)	5 (4.2)	14.973	**<0.001****
	No	72 (60.0)	20 (16.7)	3 (2.5)		
Nausea/ vomiting	Yes	12 (10.0)	10 (8.3)	6 (5.0)	17.084	**<0.001****
	No	70 (58.3)	20 (16.7)	2 (1.7)		
Redness of skin	Yes	9 (7.5)	13 (10.8)	6 (5.0)	25.646	**<0.001****
	No	73 (60.8)	17 (14.2)	2 (1.7)		
Breathing difficulty	Yes	13 (10.8)	14 (11.7)	7 (5.8)	25.047	**<0.001****
	No	69 (57.5)	16 (13.3)	1 (0.8)		
Skin rashes	Yes	9 (7.5)	11 (9.2)	5 (4.2)	17.812	**<0.001****
	No	73 (60.8)	19 (15.8)	3 (2.5)		
Blurred vision	Yes	9 (7.5)	9 (7.5)	4 (3.3)	8.851	**0.012***
	No	73 (60.8)	24 (20.0)	4 (3.3)		
Others	Yes	2 (1.7)	1 (0.8)	2 (1.7)	9.361	**0.009***
	No	80 (66.7)	29 (24.2)	6 (5.0)		

Note: No significant association was found on knowledge, attitude to self-reported health effects among study respondents

N=120 Chi-square test *significant at p<0.01

4.0 DISCUSSION

4.1 Knowledge, Attitude and Practices of Pesticide Usages among the Estate Workers

Agriculture remains as an important component of the developing economies of Malaysia. In pursuit of higher agricultural productivity, the introduction of modern farming technologies in these countries has meant an increased use of fertilizers and pesticides. In view of this, the government and industry sectors have made more efforts to reduce the risks associated with pesticides used through education and training on the safe handling of pesticides and the implementation of the Integrated Pest Management (IPM) among farming communities. Nevertheless, there is still a lack of training program/projects focusing on sustainable pesticide risk reduction (FAO, 2005).

In this study, at least 85.8% of respondents had a good knowledge of pesticide used, 46.7% of them indicated a neutral level of attitude on pesticide usage, and 68.3% of them demonstrated a good practice of handling mixture of pesticides. The study respondents recognized the potential route of exposure, e.g. inhalation, ingestion and skin absorption while handling pesticides and that pesticides can cause harm. In addition, the study respondents who have good knowledge and perception are more likely to use pesticides based on the recommended guidelines for personal protective measures in their organization. For example, most of them claimed that, wearing PPE is the only resort they can use to protect themselves against the hazards of the pesticides used during their routine of work.

Estate worker's source of information and the degree of which they trust the informants may shape their perceptions of risk of pesticides and the adoption of preventative measures (Rios-Gonzalez *et al*., 2013; Oo *et al*., 2012). Therefore, with the knowledge acquired through training, information and instruction provided on site, most of the estate workers (96.7%) agreed that training is necessary for them to better understand the safety and health signals, the potential health effects, as well as the first aid and emergency procedures. In addition, with the acquired knowledge in each estate worker, most of them (95%) reported of wearing protective clothing while handling pesticides and 66.7% of them will drink water after being exposed to pesticides with the belief that it will help to dilute the pesticide spills or contamination in their bodies. Besides,

most of them claimed to use the recommended concentration of pesticides under the guidance of their supervisor, and they were particularly concerned with the direction of the wind which would ensure that the pesticides they apply will stay within the target area.

This is also supported by past study which suggested that the attitude and practices of pesticide usage is based on their learning and experience passed on from their community (superior, neighbors, and family) (Mohd Tamrin, 2014). In fact, the practices they practiced in their workplace are highly peer-influenced. This study shows that estate worker would clean the pesticide container with water from the river after finish spraying, they are likely to store the pesticide container in a storage room located at the plantation office or their home backyard, and reuse the pesticide container for the landscaping purposes.

4.2 The Association between the Practices of Pesticide Usages with the Health Effects

As shown in Figure 1, findings of this study highlighted that, workers are aware (moderate to high knowledge level) and agree (moderate to high attitude level) that pesticides are hazardous to health. Since attitudes are changeable, people can learn from a person's past and present experiences and they can influence another person's behaviour and well-being. This safe handling of pesticide's attitudes is either present as explicit (deliberately formed) or implicit (unconscious or outside of awareness) by the estate workers based on their work experiences that causes self-reporting health symptoms which was not prominently revealed in this study. Likewise, educated estate workers are more likely to aware of pesticide-related adverse health and environmental effects (Hashemi, 2012) and they have a positive attitude towards safe use of pesticides which is supported by previous studies (Gesesew *et al*., 2016).

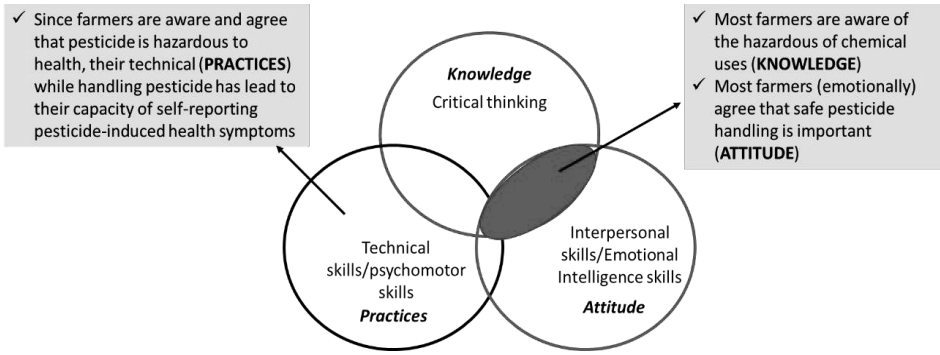

Figure 1: The Principle of Knowledge, Attitude and Practices on Safe Handling of Pesticides and the Capacity of Self-reporting Health Conditions

This study shows that, only the workers' practice levels on pesticides' usage indicated that there is a positive association with the self-reporting health symptoms among estate workers. Practices of pesticide usage are the practical consciousness on knowing "how to go on" in their daily routine of pesticide handling. In this study, the workers showed that they were aware and agreed with the fact that pesticides are hazardous to health. The background knowledge and attitude have led them to have positive consciousness to handle the pesticides safely, and at the same time, increased their capacity of self-reporting pesticide-induced health symptoms. Among the symptoms that are frequently reported when using pesticides were dizziness, excessive vision, cough, nausea/vomiting, redness of skin, breathing difficulty, skin rashes, blurred vision, excessive sweating and hand tremors, which were consistent with previous studies (Watts et al., 2010; Recena et al., 2006).

Past studies have also suggested that most of the pesticide handlers were aware that the combination of using hazardous pesticides and the lack of appropriate control equipment is detrimental to their health. However, pesticide handlers prefer to utilize control strategies that are less likely to incur costs, such as safe system of work and administrative control to mitigate the potential health risks during mixing and loading, application, drift control, and decontamination among the study population (How *et al.,* 2017).

5.0 CONCLUSION

More than half of the estate workers indicated a moderate to good knowledge, attitude and practices level of pesticide handling in oil palm plantations. The current measures or practices of pesticide use are associated with pesticide-related symptoms. This study suggests that, the self-reporting symptoms are real and not over reported by workers. The increased of KAP of pesticides usage among these workers have highlighted the necessity to improve the traditional field training method of safe handling of pesticide to a sustainable field practical-based learning. The latter training approach is to engage theory into practice.

A similar approach was also highlighted by Lekei (2010), to focus on providing a comprehensive intervention programme of safe handling of pesticides and integrating it with the Integrated Pest Management (IPM) approach. In view of this, this study recommends that, the practical practices of safe handling of pesticides shall be implemented while instilling theoretical knowledge and to inculcate the right attitude to pesticides handlers. The chances and likelihood of workers having direct exposure to pesticides could be minimized by emphasizing on a comprehensive field intervention and sustainable learning.

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Full Paper

Awareness of Safety Management and Safety Behaviour among Malaysian Small and Medium Enterprise Workers

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ABSTRACT: *This study aims to determine the awareness level of safety management and safety behavior among SMEs workers. Safety management as a subsystem in the overall management of the organization. It is designed to control hazards that can affect the safety and health of workers. Small and Medium Enterprise (SMEs) in Malaysia continue to face many challenges both traditionally and new. 80% to 90% of occupational accidents occurred involving worker of SMEs industry. A self-administered questionnaire was distributed to the involved small medium industries. Questionnaires form that consist of three sections, namely socio demographic, safety management and safety behavior. This study was conducted at selected SMEs located in Klang Valley. 226 workers responded. In order to interpret the level of awareness among the respondents, a 3-level scale (High: 3.68 – 5.00, Moderate: 2.34 – 3.67, Low: 1.00 – 2.33) based on the mean score was used suggested by Ashari & Mahmood. The findings show that the highest level of awareness was safety behavior while the lowest awareness level was safety promotion policy respectively. Findings also showed that, there were moderate correlation between safety management and safety behavior. Understanding the concept of the OSH management system will help us to understand the application of OSH management system in Malaysia. OSH Management very important to prevent accident, ill health & injury at workplace towards development of safety culture.*

Keywords- *Safety Management, Safety Behavior, Small Medium Enterprises (SME), Occupational Safety Health (OSH)*

1.0 INTRODUCTION

Occupational safety and health management is one of the important aspects especially in activities that involve work at high risk level either in the construction, manufacturing, services or other industries that involve the use of hazardous material such as chemicals and machinery. Occupational Safety and Health Act 1994 (OSHA), was established on 25th February 1994. The objectives of the act are to secure the safety, health and welfare of person at work, to protect person (other than person at work) at a place of work against hazard (OSHA, 1994).

Accident among employees carries serious implication such as fatality and disability which incurred cost. Compensation expenses paid for the year 2012 due to an accident is about RM 2 billion (SOCSO, 2012). Occupational accident

statistic for the year 2013 showed the number of accident is increasing as reported by DOSH but the accident rate reduce from 3.3 per 1000 workers to 2.8 per 1000 workers (DOSH, 2014).

Small and Medium Enterprises (SMEs) industries are defined for two category which is companies in the manufacturing sector with full-time employees not exceeding 200 or annual sales turnover not exceeding RM 50 million and other one is Services and other sector with full-time employees not exceeding 75 or annual turnover not exceeding RM 20 million (SME, 2014). Saleh & Ndubisi, 2016, reported that SMEs were proven to be important sectors that contribute a lot towards the economic development of a nation. Despite the contributions and the importance played by SMEs, the industries are burdened by the industries are financial, legislations, external factor, access towards management ability and skilled workforces have caused the implementation of occupational safety and health in the workplace to be at minimum level causing the number of accidents, injuries and fatalities particularly in this sector to rise every year (Saleh & Ndubisi, 2016).

Hasle & Limborg, 2006 reported that implementing safety and health cultures in the workplace particularly in the SMEs sector tends to be low, due to their limited access to finance causing safety practices to be the first item in their list to be thrown out for cost cutting (Hasle & Limborg, 2006).

Malaysia challenges that need to facing greater with an increasing the numbers of SMEs due to issues of limited resources, survive with capital and remain competitive. Improvement of OSH issues in the workplace should be carried out in line with Malaysia's economy grew rapidly as a developing country (Lilis et al. 2011).

Among the accidents that happened in the workplace, SOCSO said that 80 to 90 percent accidents are come from SMEs (SOCSO, 2011). It showed that the implementation of OSH in SMEs is not receiving the full attention from the management. SMEs faced problems that hinder them from effectively implementation OSH. Therefore, the problems faced by SMEs in the implementation of OSH must be explored in order to help them in this particular area. The employer should play a role to make sure the workplace in a safe condition with practice a proper prevention steps to prevent any accident occur.

Accidents at workplace can cause considerable losses to a company. The loss can be very damaging especially to SMEs because their limited financial capability and production capacity. However, European Agency for Safety and Health at Work, 2007 reported that, with proper OSH management system, there will be a lot to be gain by the number of these firms which is big in numbers not only for Malaysia but all nations around the world. Small business stands to suffer substantial losses because of poor OSH, but conversely can gain most if proper systems are in place. (EU - OSHA, 2007)

Department of Occupational Safety and Health, 2000 reported that SMEs in most developing countries have a number of common similarities and limitations. Most SMEs tend to view occupational safety and health as having the lowest priority in an operation and have never treated it as a crucial part of the overall management (DOSH, 2000). Flin et al. 2000 said that typically, occupational accident is caused by unsafe condition and unsafe behavior (Flin et al., 2000)

Tharaldsen et al. 2010 said that safety management and organization impact the safety performance of a company (Tharaldsen et al. 2010). Kanten, 2013 also said that safety management of an organization can directly or indirectly affect safety performance and increases the rate of occupational accidents (Kanten, 2013). Safety climate is a measurement of a safety behavior of employees while working. Better safety climate indicates lower accident rate in an organization (Bahari, 2011).

Choundhry, 2014 said that safety management practices not only improve working conditions but also positively influence workers attitudes and behaviors with regards to safety and that can also reducing accidents at the workplace (Choundhry, 2014).

Vinodkumar and Bhasi, 2010 highlighted the main cause of various issues concerning the industrial sector was caused by the absence or lack of efficient management system. They added that Occupational Safety and Health Management System (OSHMS) could guarantee safety and health in workplace. It also influences employees' attitudes as well as behavior (Vinodkumar and Bhasi, 2010).

Behavior is defines as acts or actions by individuals that can be observed by others. This means that a person can see it with his own eyes when someone displays the behavior. Safety behavior consists of two dimensions which are safety compliance and safety participation. Employee's participation in development and promotion of OSH does reduce the levels of accidents and health problems that often occur in workplace. Gilmore and Purdue, 2000 suggested that Behavioral Based Safety (BBS) is an important factor for a change in accidental rate trend (Gilmore and Purdue, 2000). It is because accidents does not only cause by a hazardous occurrences but also due to uncertainty of human behavior.

Griffin and Neal, 2000 defines safety behavior as the performance of actual behavior consisting of safety participation and safety compliances. Safety participation describes activities that do not directly lead to workplace safety but supports the overall efforts to create safer workplace. On the other hand, Safety compliance includes all behavior that directly leads to the safety of the workplace and it is regulated (Griffin and Neal, 2000).

This study aims to determine the level of awareness safety management and safety behavior among SMEs workers towards Occupational Safety and Health at the workplace. Seven variables that are considered to be included as the level of awareness that consider in this study as follow: (1) Management Commitment, (2) Safety Rules and Procedure, (3) Safety

Promotion and Policy, (4) Safety Training, (5) Worker's Involvement, (6) Safety Communication and Feedback and (7) Safety Behavior. Thus, it is aiming to answer the question of "What is the relationship between safety management and safety behavior". Respondents involved are employees who working in services and manufacturing sector in SME.

2.0 METHODOLOGY

This study used a cross-sectional study design focusing on employees who are working in services and manufacturing sector in SMEs. The data collection was conducted over 10 month. Data were collected at the SMEs industry in Klang Valley area. Companies were selected based on list of SMEs company. 1000 survey forms were sent out to the employees of 100 companies that received the forms and 226 workers responded.

Questionnaire was developed in three sections, namely, socio demographic, safety management (i.e. management commitment, safety rules and procedure, safety promotion and policy, safety training, worker's involvement, safety communication and feedback) and safety behavior. 5-Point likert scale (i.e. 1=strongly disagree, 5 = strongly agree) was used for each item.

Seven (7) component variables were developed in the questionnaire, namely, management commitment, safety rules and procedure, safety promotion and policy, safety training, worker's involvement, safety communication and feedback and safety behavior. This element where refer to the MS 1722:2011 & OHSAS 18001:2007 Occupational Health and Safety Management Systems (OHSMS) & study on Awareness Level of Behaviour Based Safety (BBS) by Rosliza et al. (2015) and Siti Nasyrah et al. (2015) All data received was analyzed using Statistical Package for Social Science (SPSS). Analysis of data comprises of 3 parts:

(a) Demography

The data comprising the demographic information of the respondents was analyzed using descriptive statistics and presented using frequency distribution and percentages.

(b) Frequency of awareness level

Ashari & Mahmood (2013), in their objective of the study is to measure the respondent's level of basic knowledge pertaining to legislated employment rights and benefits at the workplace. In order to interpret the level of basic knowledge possessed by the respondents, a 3-level scale based on the mean score was developed. The objective was answered by calculating the mean score of the variables. High level (3.68 – 5.00) indicates the respondent has extensive knowledge on the provisions of the law with high confidence about details. Moderate level (2.34 – 3.67) indicates sound knowledge but with some uncertainty about details while low level (1.00 – 2.33) indicates inadequate or less knowledge on the provisions of the law. (Ashari & Mahmood, 2013). Study by Rosliza et.al (2015) and Siti Nasyrah et al. (2015) on topic Awareness Level of Behavior Based Safety (BBS) also referred this scale as shown in Table 1.

Table 1: Level of Awareness (Ashari, 2013)

Mean Score	Level
3.68 – 5.00	High
2.34 – 3.67	Moderate
1.00 – 2.33	Low

(c) Correlation between safety management and safety behavior

In order to do interpret the correlation between safety management and safety behavior, 5-level scale based on the range scored (Table 2) was used. (Idrus, 2004)

Table 2: Range for Pearson Correlation

Range	Level of Correlation / Relation
< 0.20	No Correlation, No Relation
0.20 – 040	Low Correlation but have some Relation
0.41 – 0.71	Moderate Correlation, Have Relation
0.72 – 0.90	High Correlation, Clear Relation
> 0.91	Very High Correlation, Strong Relation

Reliability refers to the ability to measure consistency of variable over time. Cronbach's alpha coefficient greater than 0.7 is reasonably reliable (DeVellis, 2003). Overall Cronbach's alpha for seven sections is 0.982. Table 3 shows the Cronbach's alpha for each section.

Table 3: Cronbach's Alpha Analysis for Section

Section	No. of Items	Cronbach's Alpha (r)
Management Commitment	13	0.925
Safety Rules and Procedure	7	0.899
Safety Promotion and Policy	6	0.914
Safety Training	12	0.945
Worker's Involvement	6	0.919
Safety Communication and Feedback	7	0.907
Safety Behavior	10	0.941

From the Cronbach's alpha for each items, it can be concluded that all the questions were reliable and consistent. The workers lack of knowledge on safety rules and procedure with the Cronbach's alpha was 0.899. Other than that, the other items had Cronbach alpha higher than 0.9.

3.0 RESULTS AND DISCUSSION

3. 1 Demography

Respondent's response for this study was 226. 70% of them were male and the remaining was female. Most of the respondents were from aged group of below than 30 (56%). Malay ethnic background was the major respondents (90%). Eighty- two of the subjects have qualification in Sijil Pelajaran Malaysia (SPM) follow by diploma qualification, Degree or master qualification and certificate qualification. The summary of socio demographic analysis is shown in Table 4.

Table 4: Socio-Demographic Data

Characteristic	N	%
Gender		
Male	158	70
Female	68	30
Age		
< 30 years	127	56
31 – 40 years	63	28
41 – 50 years	29	13
> 50 years	7	3
Education		
Degree/master	38	17
Diploma	63	28
Certificate	37	16
SPM	82	36
Other	6	3
Race		
Malay	203	90
Chinese	11	5
Indian	7	3
Other	5	2

*n = 226

3.2 Level of awareness

The analysis of awareness level safety management and safety behaviour was done. The results of analysis are shown in Table 5 and Table 6 respectively.

Table 5: Level of Awareness

Section	Mean Value	Rating
Management Commitment	3.97	High
Safety Rules and Procedure	3.96	High
Safety Promotion and Policy	3.76	High
Safety Training	3.94	High
Worker's Involvement	3.92	High
Safety Communication and Feedback	4.06	High
Safety Behavior	4.21	High

Table 6: Correlation Safety Management & Safety Behaviour

Section	Pearson Correlation	Rating
Management Commitment & Safety Behaviour	0.57	Moderate Correlation, have relation
Safety Rules and Procedure & Safety Behaviour	0.58	Moderate Correlation, have relation
Safety Promotion and Policy & Safety Behaviour	0.54	Moderate Correlation, have relation
Safety Training & Safety Behaviour	0.61	Moderate Correlation, have relation
Worker's Involvement & Safety Behaviour	0.66	Moderate Correlation, have relation
Safety Communication and Feedback & Safety Behaviour	0.61	Moderate Correlation, have relation

Table 5 shows that the highest level of awareness was safety behaviour (4.21) while the lowest awareness level was safety promotion policy respectively (3.76). Thus, it means that the workers' awareness in safety behavior was higher than other variables. . It is clearly stated that workers have high knowledge and understanding in the component under behavior factors, but less awareness about Safety Promotion and Policy. It indicates that the Safety Promotion and Policy needs to be more attention from employer and to have an intervention to ensure awareness level are at a better level.

Other than that, communications of various kinds are used to enhance the general effectiveness of any motivational effort. The coverage and impact of communication will be higher in two-way communication and can lead to changes in behavior. Regular communication about safety issues between managements, supervisors and workforce is an effective management practice to improve safety in workplace.

As shown in Table 6, there are correlation between safety management and safety behaviour. Table 6 finding regarding the correlation between safety management and safety behaviour are in agreement with Idrus, 2004. When the safety management and safety behavior were applied at the company, it can give effect such as if the safety behaviour was applied, the number of accidents at the company will decrease.

Safety training was found to lead to an improvement in employees' safety behaviour. Safety training provided by the employers can improve the safety performance of employees. This will in turn decrease industrial accident rate because when employee behave safely while performing their task, the chances of human error can be minimized. Even for SMEs, safety training proves to be important in ensuring the achievement of safety behaviour among the employees.

Management commitment and safety rules and procedures predicted safety compliance directly whereas safety training and safety communication and feedback predicted safety compliance indirectly. It is also evident that workers' involvement in safety and safety promotion policies predicted safety participation directly whereas safety training, safety communication and feedback, and safety rules and procedures predicted safety participation indirectly.

A key element in every successful organization, in any successful accident prevention program and in any occupational safety and health program is effective of safety training. It improves behavioral skills, related knowledge and/or attitudes. Safety training also provides the means for making accidents more predictable. To improve the level of safety and health for all employees, organization should institute a systematic, comprehensive safety and health training program for new employees, provide a mentor for these employees and use a buddy system to help orient new employees in the safety, health and quality systems.

Employee involvement is a behavioral oriented technique that involves individuals or groups in the upward communication flow and decision-making processes within the organization. The amount of participation can range from no participation, where the supervisor makes all decisions, to full participation, where everyone connected with, or affected by the decision, is involved.

Here are some suggestions on how to promote OSH focus on SME's worker:

i. Training

Safety training it's a type of training that aimed to increase the worker motivation, skill and knowledge. Training cover two parts which is on theory and practical. Although, training incurred large number of money, but the impact of training is worth. Training programs in OSH are important because they can help to build and enhance the capabilities of SMEs in implementing OSH industry in the workplace. Previous study have found that any support or assistance received by industrial SMEs in implementing OSH program can encourage proper implementation of OSH application in the workplace (Lingard and Rowlinson, 2005)

ii. Education

Promote OSH by education is more on theoretical part. Education can be done by different method such as distributing brochure, poster, and workshop.

iii. OSH Day

Many activity and program can do to promote the prevention of occupational accidents and diseases globally. It is an awareness-raising campaign intended to focus international attention on emerging trends in the field of occupational safety and health and on the magnitude of work-related injuries, diseases and fatalities worldwide. In many parts of the world, national authorities, trade unions, employers' organizations and safety and health practitioners organize activities to celebrate this date.

iv. Health Surveillance

Medical or health surveillance it's one of activity to do by company based on current job situation. Health surveillance need to be carry out through any worker who exposed to noise or vibration, solvents, fumes, dusts, biological agents and other substances hazardous to health, or work in compressed air. Health surveillance allows for early identification of ill health and helps to identify any corrective action needed.

A safety rule is also another direct way to improve employee's safety behavior. Positive relationship between employee and employer was very important to reduce the accident case.

In the SMEs, the level of specialization is lower compared to big companies. Employees are more involved in the daily operations of their company and this enables them to know more about the company they worked in. Therefore, management can utilize the knowledge of their employee by consulting them in safety issues faced in their daily operation.

4.0 CONLUSION

Accident prevention trainings, campaigns OSH, posters, charts, seminars and the like should always be held to raise awareness and concern about the OSH at work. Good OSH management system in the workplace is important to create a safe working environment.

In this study, awareness level for safety management and safety behavior among SME worker was identified. Through this study, awareness knowledge for workers needs to be improved especially for the part that related with law and regulation. More attention needed to make sure that safety management and safety behavior was in line with the awareness knowledge and behavior practices. Understanding the concepts of OSH management will help us to understand the situation and can prevent accident, ill health and injury at workplaces.

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Full Paper

Examining the Influence of Safety Leadership towards Safety Behaviour in SME Manufacturing

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ABSTRACT : *Safety behaviour is important in preventing industrial accident. Safety leadership attribute by the supervisors is one of the determinants of safety behaviour among the employees. This study aimed to determine the influence of employer's safety leadership towards worker's safety behaviour within Small and Medium Enterprises (SME)-Manufacturing in Negeri Sembilan. Three independent variables representing safety leadership namely safety motivation, safety concern and safety policy were selected whilst safety compliance and safety participation were the dimensions used to measure safety behaviour. Self-administered questionnaire were distributed and answered by 210 employees of Negeri Sembilan's SME-Manufacturing. The results revealed that safety concern and safety policy had significantly influenced safety compliance. Whilst, safety motivation and safety concern determined the workers' safety participation. No significant influence found by safety motivation towards safety compliance as well as safety policy towards safety participation. Safety concern was the important component of safety leadership as it consistently explained the variance in all dimensions of safety behaviour.*

Keywords - *Safety Leadership, Safety Motivation, Safety Concern, Safety Policy, Safety Compliance, Safety Participation, Safety Behaviour.*

1.0 INTRODUCTION

Study on human safety behaviour as the main predictor of industrial accident started as early as 1940s when Heinrich (1941) concluded that 88% of the accidents were contributed by the unsafe behaviour. Bowander (1987) then found workplace accidents were contributed by several factors namely engineering factor, technological factor, system failure factor including human behavioural factor. This finding also matched with Gyekye (2010) who determined that safety behaviour of the workers (unsafe act) was the main fundamentals to cause work related accident besides the working environment (unsafe condition). A part of those researches, many more studies regarding the contributors of safety behaviour had been conducted as the scholars believed that the development of safety behavior would prevent workplace accidents. (DePasquale & Geller, 1999; Langford, Rowlinson, & Sawacha, 2000; Medina, McSween, Rost, & Alvero, 2009; Rundmo, Hestad, & Ulleberg, 1998; Tucker & Turner, 2011).

Workplace accident is a major problem in an industrialised world. For Malaysia, it becomes a serious issue as the accident related to work increases from year to year (SOCSO Annual Report, 2012 and 2013). Industrial accidents cause a lot of impacts to the involved organizations such as financial loss and also non-monetary aspects of loss such as decrease in of morale of the employees as well as impact on the reputation of companies involved (Noorul Huda Zakaria, Norudin Mansor & Zalinawati Abdullah; 2012). Previous researches furthermore concluded that accident in workplaces could be reduced if the employees and employer were committed in having and maintaining good safety behaviour (Makin & Suntherland, 1994; Christian et.al., 2009). Therefore, safety behaviour must be seriously addressed and promptly monitored at the workplaces to prevent industrial accident cases.

Safety behaviour can be stated as employees' feeling and intention towards performing work safely. It is also defined as the behaviour of complying safe working procedures in order to hinder workplace accidents and occupational diseases. Several previous researches found the predictors towards developing safe working behaviour at the workplaces. The predictors are namely management commitment, management safety practices, company's safety policy and procedures (Chinda, 2011; Vinod Kumar & Bhasi, 2010; Lu and Tsai 2008). On the other hand, Zohar (1980, 2000, 2002) and Hayes, Peranda and Trask (1998) discovered how workers perceived their job-related hazards and management attitude towards safety would influence their safety behaviour. Whereas, several researchers also determined that leadership behaviour among managers and supervisors, specifically on safety related matters, has been found to have significant influence on employees thinking, perception as well as behavioural change towards workplace safety and health (Barling, et. al., 2002; Kelloway, Mullen & Francis, 2006; Mullen & Kelloway, 2009).

Phoon (2010) reported that the Department of Occupational Safety and Health (DOSH) stated nearly 90% of workplace accident cases in Malaysia occurred in the Small and Medium Enterprises (SME). Workplace safety audits conducted by DOSH found that the unsafe acts committed by the SME workers, plus the limitation of SME as small organization mainly contribute to the high statistic of accidents. SME is significantly different in characteristics as compared to larger organizations. The differences are in terms of limited financial, expertise, knowledge and staffing capabilities (Lilis Surienty, 2012; Baba Md Deros, Ahmad Rashdan Ismail & Mohd Yusri Mohd Yusof, 2012), plus the firm size (Cook, 2007) have put on a constraint in developing safety behaviour . Thus, it takes different approaches appropriate to the constraints in developing safety behaviour among the SMEs.

Holt (2011) stated in his study that leadership skills of the senior management of SME are crucial to demonstrate workplace safety behaviour. Thus, this study believes that safety leadership roles among the owner-managers of SME could influence safety behaviour among their employees and further reduce accident cases in their workplaces.

2.0 METHODOLOGY

Based on previous researches, this study chose employer's safety leadership attributes namely "safety motivation", "safety concern" and "safety policy" as the independent variables. Whilst, "safety behaviour" which is measured by two dimensions namely "safety compliance" and "safety participation" has been chosen as the dependent variable. The research framework is illustrated as per Figure 1.

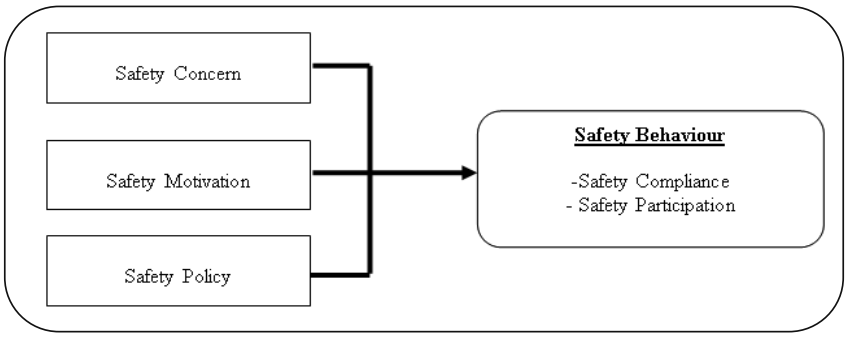

Figure 1: Research Framework

Based on the above research framework, alternate hypotheses were developed to express the relationship between safety leadership and safety behaviour:

H1: safety leadership with respect to safety motivation will be significantly related to safety compliance among the SME workers

H2: safety leadership with respect to safety motivation will be significantly related to safety participation among the SME workers

H3: safety leadership with respect to safety policy will be significantly related to safety compliance among the SME workers

H4: safety leadership with respect to safety policy will be significantly related to safety participation among the SME workers

H5: safety leadership with respect to safety concern will be significantly related to safety compliance among the SME workers

H6: safety leadership with respect to safety concern will be significantly related to safety participation among the SME workers

For the purpose of data collection, a set of self-administered questionnaires consists of items to measure the dependent variable and the independent variable was developed and used. The items for safety leadership attributes were the adapted from Lu and Yang (2010). Whereas, the items for safety behaviour were adapted from Campbell et al. (1993), Borman and Motowidlo (1993), Neal et al. (2000) and Neal and Griffin (2002, 2006).

The questionnaire was pre-tested on 25 non-management workers of a health supplement SME manufacturing in Nilai, Negeri Sembilan and 25 production workers of an automotive parts manufacturing SME in Seremban. Reliability test was also conducted. The pilot test revealed that all items are reliable for application and the results are illustrated in Table 1.

Table 1: Reliability Coefficient for Questionnaire Items (Pilot Test)

Variables	Number of Items	(r)
Safety Concern	5	0.876
Safety Motivation	7	0.828
Safety Policy	4	0.835
Safety Compliance	4	0.835
Safety Participation	2	0.635

Post to the pilot test, the questionnaires were administered to 400 out of 907 SME manufacturing workers in Negeri Sembilan. The sampling number was determined based on sampling table introduced by Krejie and Morgan (1970). The selection of the subject was performed using random table (MacNealy, 1999).

3.0 RESULTS AND DISCUSSION

This research is a quantitative hypothesis testing research. Thus, descriptive (frequencies, min, max, mean and standard deviation) and inferential (correlation coefficient and multiple regression) analysis were applied to determine the results. Descriptive analysis results are depicted in Table 2. Based on the result, safety policy, safety compliance, safety participation and safety concern are the high-level variables (Davis, 1971).

Subsequently, results for correlation analysis shows that the independent variables (safety concern, safety motivation and safety policy) are positively correlated at 0.01 with the dependent variable (safety compliance and safety participation). The highest correlation between independent variables and safety compliance is indicated at safety policy (r=0.643) followed by safety concern (r=0.636) and safety motivation (r=0.513). Whereas, the highest correlation between independent variables and safety participation is indicated at safety concern (r=0.546) followed by safety motivation (r=0.528) and safety policy (r=0.477). The correlation analysis result is summarized in Table 3.

Table 2: Descriptive Analysis

	N	Min	Max	Mean	Std Deviation
Concern	210	1.60	5.00	3.9733	0.62335
Motivation	210	1.71	5.00	3.6748	0.66640
Policy	210	1.50	5.00	4.0071	0.66253
Compliance	210	1.50	5.00	4.0619	0.59632
Participation	210	1.00	5.00	3.7643	0.82885

Table 3: Correlation Analysis

	Concern	Motivation	Policy	Compliance	Participation
Concern	1	0.787**	0.882**	0.636**	0.546**
Motivation		1	0.707**	0.513**	0.528**
Policy			1	0.643**	0.477**

Subsequently, multiple regression was conducted to identify the significance of the predictors as well as to determine how well the independent variables will predict the value of the dependent variable (Bougie and Sekaran, 2013). The result shown in Table 4 indicates a significant influence by safety concern as well as safety policy towards safety compliance. However, safety motivation did not influence safety compliance. Among the independent variables, safety policy (β=0.366, t=3.300, p=0.001) was found to have the greatest influence on safety compliance. Thus, the analysis supported Hypotheses 1 and Hypotheses 3 but it did not support Hypotheses 2.

Table 4: Model Summary A

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.660[a]	.435	.427	.45134

a. Predictors: (Constant), Policy, Motivation, Concern

The result in Table 5 indicates a significant influence by safety concern as well as safety policy towards safety compliance. However, safety motivation did not influence safety compliance. Among the independent variables, safety policy (β=0.366, t=3.300, p=0.001) was found to have the greatest influence on safety compliance. Thus, the analysis supported Hypotheses 1 and Hypotheses 3 but it did not support Hypotheses 2.

Table 5: Beta Coefficient A

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Concern	.285	.122	.298	2.346	.020
Motivation	.017	.076	.019	.228	.819
Policy	.330	.100	.366	3.300	.001

a. Dependent Variable: Safety Compliance

Table 6 indicates the significant influence of independent variables towards safety participation (R=0.569) and also accounted for 32.4% of the variance.

Table 6: Model Summary B

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.569[a]	.324	.314	.68653

b. Dependent Variable: safety participation

Furthermore, in Table 7, the result of beta β value indicated that safety concern and safety motivation significantly predicted safety participation whereas safety policy had no significant influence (β=-0.037, t=-0.304, p=0.761). Thus, Hypotheses 4 and Hypotheses 5 were supported while Hypotheses 6 was rejected. Subsequently, safety concern (β=0.376, t=2.701, p=0.007) was found to have the greatest influence on safety participation.

Table 7: Beta Coefficient B

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Concern	.500	.185	.376	2.701	.007
Motivation	.321	.116	.258	2.780	.006
Policy	-.046	.152	-.037	-.304	.761

b. Dependent Variable: safety participation

4.0 CONCLUSION

This study concluded that safety leadership attributes among the employers of SME (Manufacturing) in Negeri Sembilan influenced workers' safety behaviour. Specifically, safety motivation influenced safety participation among the workers but did not influence the safety compliance. The results are consistent with Neal and Griffin (2006) and Griffin and Hu (2013), who determined that safety motivation only influenced safety participation but not safety compliance. On the other hand, employers' safety leadership in terms of safety policy significantly influenced safety compliance. This result matched with Kanten (2013) who concluded that that factory workers were more compliant to with workplace safety rules and procedures when they were satisfied with the management safety programs. However, this study revealed that safety policy did not influence safety participation. The regression analysis results also revealed that safety leadership with respect to safety concern significantly influenced safety compliance as well as safety participation of their workers. This result matched with the result from Inness, Turner, Barling and Stride (2010) and; Lu and Yang (2010).

In conclusion, this study confirmed that safety concern is the most important dimension of safety leadership attributes as it consistently explained the variance in both dimensions of safety behavior. This study confirmed that reciprocity (Gouldner, 1960) through safety concern attributes could foster safety compliance and safety participation behaviour among the SME's employees.

5.0 FUTURE RESEARCH

Previous studies comparable to this study were conducted in other major sectors while this study was conducted in the SME. In addition, other studies were conducted in the developed countries such as Australia (Neal and Griffin, 2006), Taiwan (Lu & Yang, 2010) and Canada (Sivananthan, Turner and Barling, 2005); this study extended the research in understanding the relationship between safety leadership and safety behaviour within the South-East Asia region, specifically Malaysia. Though, this study was only conducted on SME (manufacturing sector) in Negeri Sembilan, it could be conducted throughout Malaysia. Furthermore, safety leadership contributed 30-40% of the safety behaviour. Thus, it is also suggested to conduct studies in determining the influence of demographic factors such as ethnicity (Lu & Yang, 2010; Omer Sadullah & Kanten, 2009), educational level (Nahar, Ford, Hallam, Bass, &Vice, 2013), safety training (Cooper & Phillips, 2004), working conditions (Kanten, 2013), and OSH related enforcement by the government authorities (Scholz & Gray, 1990) towards safety behaviour among the SME workers in Malaysia.

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Full Paper

Association between Organizational Factors, Occupational Stress and Cortisol Level among Lecturers in a Private University in Selangor

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ABSTRACT: *Stress reduces the performance and productivity of employees. One of the most important stressors originate from organizational factors, which are decision latitude, psychological demand, social support and job insecurity. This creates four kinds of jobs: passive, active, low strain and high strain. The objective of the study is to determine the association between organizational factors with occupational stress and cortisol level among lecturers in University Selangor. This cross-sectional study used a purposive sampling, which involved 45 lecturers from various faculties. The instrument used in this study was Job Content Questionnaire (JCQ) which is a Psychosocial Job Assessment Instrument designed by Karasek et al., (1998). The questionnaire has been translated to Malay version by Edimansyah et al., (2006). 10ml of blood sample was collected from each respondent by certified phlebotomist. Results from the statistical analysis showed that majority of the respondents were female (75.6%), aged below forty years old (82.2%), married (77.8%) and hold a master degree (68.9%). Most of the respondents were found having low decision latitude 35(77.5%). Majority of the respondents were also found in passive group 13(28.9%) which were having low psychological job demand and low decision latitude, while others are in low strain 11(24.4%), high strain 11(24.4%) and active group 10(22.2%) respectively. There was a significant association between two organizational factors with occupational stress level, which are decision latitude and psychological job demand ($p<0.05$). However, there is no significant difference of mean between occupational stress and cortisol level ($p>0.05$). As a conclusion, two out of four organizational factors, which are decision latitude and psychological job demand showed a significant association with occupational stress levels. Cortisol as one of stress biomarkers may not be significant due to small sample size.*

Keywords *- Decision latitude, job insecurity, mental health, psychological demand, social support*

1.0 INTRODUCTION

Stress is the inability to cope with perceived or real threat to one's mental, physical, emotional and spiritual wellbeing which results in a series of physiological responses and adaptation (Selye, 1976).

Baba et al., (1999), had defined job stress as the imbalance between the demands one faces at work and the resources available to meet those demands. Among the factors believed to have contributed to the occurrence of job stress are organizational factors, career development and work environment.

According to Jones & Bright (2001), Karasek's demand-control model of occupational stress has had a large influence on the job design and occupational health literature, in part because it is practical and testable. In Karasek's model, workplace stress is a function of how demanding a person's job is and how much control the person has over their own responsibilities. This creates four kinds of jobs: passive, active, low strain and high strain.

Stress reduces the performance and productivity of employees. One of the most important stressor originates from occupational stress factors. This research will determine which occupational stress factors are affecting the lecturers and this will be supported by stress biological markers. Stress whether it is caused by psychological, physical or emotional factors can be measured biologically. Stress activates the HPA axis causing several hormones to be released including cortisol (Absi & Arnett, 2000). The objective of the study is to determine the association between organizational factors with occupational stress and cortisol level among lecturers in University Selangor.

2.0 METHODOLOGY

A cross-sectional study from September 2015 until January 2016 was conducted in UNISEL Shah Alam campus. The sample size was calculated using Snedecor and Cochran 1989's formula in reference to a study by Nur Aqilah et al. (2012) resulting in 50 subjects and they were recruited via purposive sampling based on the list of the lecturers obtained from the Human Resource Department. The inclusion criteria were Malaysian full-time lecturers with at least one year working experience in UNISEL. We excluded those lecturers who are afflicted with any type of disease, who are pregnant and who are on study leave.

2.1 Questionnaire

This self-administered questionnaire consists of three parts. The first part of the questionnaire consists of socio demographic status of the respondents which include age, gender, ethnicity, marital status, number of family members, number of children, educational level, monthly salary and length of services. The second part of the questionnaire consists of Job Content Questionnaire (JCQ) which is a Psychosocial Job Assessment Instrument designed by Karasek *et al*., (1998). This questionnaire has been translated to a Malay version by Edimansyah *et al*., (2006). This part consists of four domains as stated below:

Table 1: Question Number of Stress Risk Factors

Domain	Risk Factor	Question
1	Decision Latitude	Q6,Q8,Q9,Q10,Q11,Q12,Q13,Q14,Q17, Q18,Q26,Q61,Q62,Q70
2	Psychological Demands	Q3,Q4,Q5,Q7,Q15,Q16,Q22,Q23,Q32, Q60,Q63, Q65,68
3	Social Support	Q48,Q49,Q50,Q51,Q52,Q53,Q54,Q55, Q56,Q57, Q58,Q59,Q66,Q67,Q69,Q71
4	Job Insecurity	Q33,Q34,Q35,Q36,Q37,Q38,Q39,Q40, Q41,Q42, Q43,Q44,Q45,Q46,Q47,Q64

Each of the domains was rated on four point Likert scales which are strongly disagree (1), disagree (2), agree (3) and strongly agree (4).

2.2 Statistical Analysis

Data were entered, cleaned and analyzed using SPSS version 22.0 for Windows. Mean and standard deviation were used to describe the characteristics of the lectures for continuous data, whereas percentage was used for categorical data. Chi –square analysis was conducted to determine the association between the occupational stress and organizational factors.

2.3 Ethical Consideration

Ethical approval was obtained from the Ethics Committee of UNISEL and written consent was obtained from the subjects.

3.0 RESULTS

Fifty lecturers were selected to participate in this study. However, only forty five of them were willing to participate which indicated 90% response rate. Majority of the respondents were female (75.6%), aged below forty years old (82.2%), married (77.8%) and master degree holders (68.9%).

The identification of organizational factors was based on median values for all factors. Table 2 shows most of the respondents had low decision latitude 35(77.5%). Figure 1 shows the distribution of occupational stress levels among

respondents in this study. The result showed that most respondents were in the passive job group (28.9%) which has a low psychological job demand and low decision latitude. Among the 45 respondents in this study, 11 from them are in high strain group which have a low decision latitude and high psychological job demand. Table 3 describe the significant association between two organizational factors with occupational stress level which are decision latitude and psychological job demand ($p<0.05$). There is no significant difference of mean between occupational stress and cortisol level ($p>0.05$) as shown in Table 4.

Table 2: Distribution of Organizational Factors

Organizational Factors	N (%)
Decision Latitude	
Low	35 (77.8)
High	10 (22.2)
Psychological Job Demand	
Low	24 (53.3)
High	21 (46.7)
Social Support	
Low	23 (51.1)
High	22 (48.9)
Job Insecurity	
Low	24 (53.3)
High	21 (46.7)

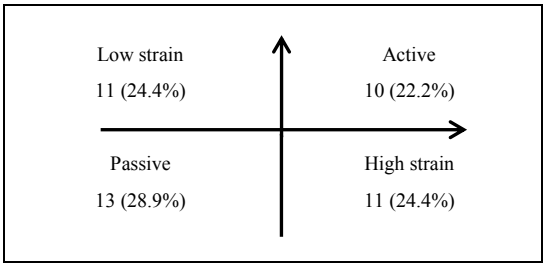

Figure 1: Distribution of Strain Category based on Karasek-Theorell Job Strain Model

Table 3: Association between Organizational Factors and Occupational Stress

Organizational Factors	High Strain		Non-High Strain		χ^2	P-value
	n	(%)	n	(%)		
Decision Latitude						
Low	11	(45.8)	13	(54.2)	12.47*	**0.001**
High	0	(0)	21	(100)		
Psychological Job Demand						
Low	0	(0)	24	(100)	16.27*	**0.001**
High	11	(52.4)	10	(47.6)		
Social Support						
Low	6	(26.1)	17	(73.9)	0.07#	0.793
High	5	(22.7)	17	(77.3)		
Job Insecurity						
Low	4	(16.7)	20	(83.3)	1.91*	0.167
High	7	(33.3)	14	(66.7)		

*Fisher exact test, #Pearson chi square (Significant at $p<0.05$.)

Table 4: Cortisol Level by Occupational Stress

Job strain	Cortisol	
	Mean±SD	p-value
High strain	253.21±89.72	0.156
Non-high strain	208.26±76.14	

4.0 DISCUSSION

The prevalence of occupational stress among lecturers in UNISEL was 24.4%. Another 75.6% (non-high strain) of the lecturers were categorized as passive (28.9%), low strain (24.4%) and active (22.2%). Thus, the result had indicated that the lecturers in UNISEL were mainly in passive groups (28.9%), which is the combination of low decision latitude and low psychological job demand.

Two out of four organizational factors showed a significant association with the occupational stress levels. More than half respondents reported having low decision latitude. They were not given the opportunity to make decision in the organization. In UNISEL, most of the decisions were made by the administration and the top management. This is one of the reasons why they feel they did not have freedom of speech in giving their own opinion.

The psychological job demands dimension relates to 'how hard workers work', organization constraints on task completion and conflicting demands. It also relates to the workload that workers need to do. In theory, the higher the psychological job demands the higher the stress the workers experienced. The experience of distress is associated with a wide range of physical, psychological and behavioral disturbance. According to the lecturers in UNISEL, the workload is a never ending story but it was still acceptable and they could handle the workload but once in a while they could not handle the workload as they needed to complete some of the tasks in a very short time frame. Even worse, they need to stay back after office hours to settle their work and complete the task, or they have to bring back the unfinished task to be completed at home. Psychological job demand is one of the contributor or stressor to occupational stress in the organization. This finding is supported by research conducted by Nada et. al (2014) and Swee et.al (2007).

Social support and job insecurity had no significant association with occupational stress. This finding is similar to a study done by Huda *et al.* (2004) which was conducted among lecturers in the School of Medical Sciences, Universiti Sains Malaysia.

Cortisol as one of stress biomarker in this study had a higher level in stressed lecturers compared to non-stressed lecturers. However, the independent sample t-test done indicated there was no significant difference in the two groups. This could be due to the small sample size in the study.

5.0 CONCLUSION

As a conclusion, two out of four organizational factors which are decision latitude and psychological job demand showed a significant association with the occupational stress levels. The difference in the cortisol level between the two groups was not significant. This may be due to the small sample size.

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Full Paper

Knowledge, Attitude and Practices of Musculoskeletal Disorder in a Workplace: The Perspective from Malaysian Employers

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ABSTRACT : *This study aims to assess the level of Knowledge, Attitude and Practices (KAP) on Musculoskeletal Disorders (MSDs) from employer perspectives in Malaysia industries. A developed KAP questionnaires were distributed and returned by 39 employers. Most employer show good scores to majority of items in Knowledge and Attitude sections. However, good practices are still lacking as the scores are quite low for half of the items. Kruskal-Wallis test for independent sample was used to test the relationship between gender and KAP scores. It was found out that gender is linked with few items in Knowledge and Attitude section ($r < 0.05$) while no indication of relationship with Practice scores. As the number of reported MSDs cases are increasing in Malaysia, hence understanding of KAP factors are crucial in order to tackle the problem.*

Keywords - *Employer perspective, KAP, Musculoskeletal disorders*

1.0 INTRODUCTION

Musculoskeletal Disorders (MSDs) are disorder of the muscles, tendons, joints, nerves, cartilage, and supporting structures of upper and lower limbs, neck, and lower back which were caused by extended exposure or abrupt exertion to physical factors such as awkward posture or vibration (Bernard, 1997). A study done in United States indicates 29-35% of all occupational injuries and diseases are due to MSDs (Bhattacharya, 2014).

In Malaysia, the number of occupational MSDs cases reported to the Social Security Organization (SOCSO) has increased tremendously, from 10 cases in year 2005 to 675 cases in year 2014 (SOCSO, 2014). Manufacturing sector shows the highest prevalence in term of death, non-permanent disability and permanent disability. A demographic analysis of MSDs occurrence among industrial workers in Malaysia showed MSDs is highest among manufacturing including electronics (51.72%) and public administration industry workers (20.25%) from year 2009 to 2014 (Jafri et al, 2012). A study on estimation of compensation cost related to MSDs in Malaysia indicated high compensation claims of accidents caused by MSDs related factors such as strenuous movement (RM7,687,846.90), over exertion in lifting objects (RM 1,842,328.66), over exertion pushing or pulling objects (RM 1,047,917.08) and over exertion in throwing objects (RM 30,821.09). Sprain and strain recorded the highest number of cases with total compensation cost about RM 9,933,127.09 (Jafri et al, 2012).

MSDs may be caused by physical exposure and psychosocial factors at work (Campo et al, 2008). Numbers of the risk factors could be occupational and non-occupational. Risk varies by age, gender, socioeconomic status, and ethnicity (Punnett, 2004). MSDs risk factors can be generalized into three main categories; knowledge, attitude and practices, work-related factors and external factors (Salazar et al, 2009).

A KAP survey or instrument contains questions which acquire the Knowledge, Attitude and Practices of respondents for a certain case study. Knowledge is a set of understanding, one's capacity to imagine and one's way of perceiving. The level of knowledge assessed by the survey will assist to identify areas where information and education can be improved. Attitude is the tendencies to act. It is an intermediate variable between the situation and the response to the situation. It helps to explain that among the possible practices for a subject submitted to a stimulus, that subject adopts one practice and not another. Meanwhile practices are the observable individual actions in response to a stimulus. KAP survey provides access to quantitative and qualitative information where questions are predefined and formatted into standardized questionnaire. KAP questions do not reveal only KAP characteristics trait but also the idea that each person has of the problem. These factors are often the source of misconception that may represent obstacles to interventions (Doctor, 2011).

There is limited specific instrument to examine risk factors of MSDs in term of KAP from the perspective of employer in Malaysia industries. The objective of this study is to determine the factor that cause MSDs injuries through KAP survey. With a clear understanding of the factors that cause MSDs, appropriate improvement or intervention can be proposed to increase safety level at the workplace.

2.0 METHODOLOGY

A survey instrument to analyze KAP level on MSDs from the perspective of Malaysian employer was developed in three stages. The first stage involved searching the database for literatures and application of KAP related to MSDs in industries. The findings from literatures reviews were analyzed and referred to as a guidance in developing items, questions and scales for developing the survey instrument. The instrument's wordings and word phrases were rephrased in the Malay language for clarity and reduce ambiguity.

The sociodemographic data for the respondent representing employer comprises of gender, age, highest education level, years of experience in current job and years of experience in health and safety related works. Section 2, 3 and 4 include the questions on knowledge, attitude and practices of MSDs from employer perspectives. General aspects about MSDs, law, psychology, risk factors, sign and symptoms and treatment were included in the knowledge section. The attitude section includes general aspects about MSDs, health seeking attitude, prevention, treatment and risk taking attitude. Practices section includes practicing MSDs prevention in the organization.

Categorical responses (true, false, not sure) were applied in knowledge section. Each correct answer was given 2 marks, 1 mark for not sure and 0 marks for wrong answer. In attitude section, the responses were recorded using 5-Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) and for practices, the responses were also recorded using 5-Likert ranging from 1 (very low) to 5 (very high). All responses were then converted into scoring marks. The total score was calculated for knowledge, attitude and practice domain. The survey instrument consists of 41 items; 16 items for knowledge, 14 items for attitude and 11 items for practice.

In the second stage, the pilot test of the survey instrument was done on 24 part time students from UTM SPACE, which were also industrial workers from various industries. In the third stage, the improved survey instrument were distributed to experts to check for its content, clarity, coverage and design. This phase was conducted during International Symposium on Advancements in Ergonomics and Safety 2015 (ERGOSYM2015) at Universiti Malaysia Perlis (Athirah et al, 2015). Finally, the improved survey instruments were distributed to 20 employers at the seminar for internal consistency test purposes. The value of Cronbach's alpha of knowledge, attitude and practice dimensions were 0.8, 0.7 and 0.9 respectively.

The data analysis process is done through descriptive statistics to describe the sociodemographic characteristics of the respondents. Independent sample Kruskal-Wallis test was done to explore relationship between KAP scores and gender. All analyses were performed using SPSS version 22. The proportion of respondents who answered correctly of each item in KAP were expressed as the good score and correct percentage.

3.0 RESULTS AND DISCUSSION

Employers' response rate for this study was 14% as out of 270 questionnaires sent to multiple industries, 39 responses were returned. 71.8% of them were male and the rest are female. Most of the respondent age ranged from 45 to 54 years old (35.9%). Majority of employers involved in others sector (30.8%), electronics (17.9%) and automotive (15.4%).

35.9% and 30.8% of the respondents hold Bachelor's degree and diploma respectively. As for working experience in current industry, 25.6% of the respondents have worked more than 15 years while 20.5% of the respondents have worked more than 1 to 3 years, 4 to 6 years, and 7 to 9 years. On the other hand, 25.7% of the respondents have 1 to 3 years of experience in Health and Safety work while 17.1% of the respondents have experienced for less than 1 year. The summary of sociodemographic analysis is shown in Table 1.

Table 1: Sociodemographic Analysis of the Respondents

Variable	N	(%)
Gender		
Male	28	71.8
Female	11	28.2
Age group		
25 – 34 years	13	33.3
35 – 44 years	10	25.6
45 – 54 years	14	35.9
55- 64 years	2	5.1
Education level		
SPM	2	5.1
STPM	1	2.6
Technical/Vocational	4	10.3
Diploma	12	30.8
Bachelor's degree	14	35.9
Master's degree	6	15.4
Sectors		
Others	12	30.8
Electronics	7	17.9
Automotive	6	15.4
Metal	3	7.7
Plastics	3	7.7
Wood	2	5.1
Paper	2	5.1
Food and beverages	1	2.6
Clothing and textiles	1	2.6
Chemicals	1	2.6
Experience in current industry		
1 – 3 years	8	20.5
4 – 6 years	8	20.5
7 – 9 years	8	20.5
10 – 12 years	2	5.1
13 – 15 years	3	7.7
> 15 years	10	25.6
Experience in Health in Safety		
< 1 year	6	17.1
1 – 3 years	9	25.7
4 – 6 years	6	17.1
7 – 9 years	5	14.3
10 – 12 years	4	11.4
13 – 15 years	2	5.7
> 15 years	3	8.6

In Knowledge section, the items and its respective correct answer frequency and percentage are summarized in Table 2.

Table 2: Knowledge Section Correct Answers

Item	Description	N	(%)
Q7	MSDs is a disorder that affect body movement or musculoskeletal system	34	87.2
Q8	MSDs occur when the body physical ability is higher than mechanical workload	19	48.7
Q9	There is a law in Malaysia to protect workers from MSDs in the workplace	21	53.8
Q10	Productivity may decrease due to MSDs	39	100
Q11	MSDs may affect morale and work ethic	36	92.3
	Risk factors:		
Q12a	Repetitive motion	37	94.9
Q12b	Prior history of broken bones	12	31.6
Q12c	Inadequate break time	30	76.9
Q12d	Awkward body posture	36	92.3
Q13	Employee will recover to normal if no longer exposed to risk factors	21	53.8
	Symptoms and signs:		
Q14a	Severe headaches	14	36.8
Q14b	Tingling or vibration on whole body, hands, or legs	33	84.6
Q14c	Stiff or strain of muscle on whole body, hands, or legs	37	94.9
	Treatments:		
Q15a	Anti-flammatory medications	25	65.8
Q15b	Muscle strengthening and stretching exercise	34	89.5
Q15c	Occupational or physical therapy	38	97.4

More than 30 respondents answered correctly 10 questions out of 16 while other questions were indicated high frequency of wrong or unsure answers. Most of the respondents (87.2%) knows that MSDs is a disorder that affect body movement or musculoskeletal system and productivity may decrease due to MSDs (100%). Other than that, majority of the respondents agree that MSDs which is caused by repetitive motion (94.9%), inadequate break time (76.9%), and awkward body posture (92.3%) may affect morale and work ethic (92.3%). The respondents are also able to identify tingling and vibration on whole body, hands, or legs (84.6%) and stiff or strain of muscle on whole body, hands, or legs (94.9%). 89.5% and 97.4% of the respondents correctly identified muscle strengthening and stretching exercise, and occupational or physical therapy as MSDs treatments. Unfortunately, 51.3% and 46.2% of the respondents did not know MSDs will occur if work load is higher than physical ability, and there is a law in Malaysia that protect workers from MSDs respectively. There was also considerable confusion concerning whether employee will recover to normal if no longer exposed to MSDs risk factors or not. Depending on the severity level, the condition might be irreversible. Having this wrong information may lead them to ignore the seriousness caused by MSDs on their health and working capability. Overall, the respondents show good knowledge for majority of the items.

In attitude section, good attitude scores towards MSDs are focused on for each of the items, hence depending on the positivity of questions, only two of highest marks are considered for analysis. Table 3 shows summary of good attitude scores.

The respondents show good attitude for majority of the items. The highest respondents good score (94.9%) are indicated by item Q24, Q27 and Q28 where they consider MSDs training and prevention are as important or very important to the organization and workers' safety. Majority of the respondents are also agrees that they need to change the way employee work due to MSDs injuries (92.3%). Low score obtained are for item Q16 as most respondents say employee need to know MSDs by himself and item Q23 where only 28.2% of the respondents believed their knowledge regarding MSDs preventions and detection are updated and sufficient. Similar results from previous study show that 48% believed their knowledge are adequate and 73% felt the need to improve their knowledge (Yu et al, 2015). This might be due to exposure of new challenges and new knowledge every day.

Table 3: Good Attitude Scores

Item	Description	N	(%)
Q16	Employee is responsible to know MSDs risks and symptoms by himself	8	20.5
Q17	I assign work to employee according to their physical abilities	35	89.7
Q18	There is good communication here about MSDs and safety issues which influence work	19	48.7
Q19	Changes aimed to reduce MSDs are probably to be successful	32	82.1
Q20	I am not concerned about MSDs early treatment because it may cure by itself	34	87.2
Q21	I do not need to change the way employee work due to MSDs injuries	36	92.3
Q22	Some health and safety rules are not really effective	26	66.6
Q23	My knowledge regarding the prevention and detection of MSDs is current and sufficient	11	28.2
Q24	Training and education on minimizing MSDs risk should be done regularly	37	94.8
Q25	Advantage of actions to reduce MSDs are like to exceed the costs	28	71.8
Q26	I'm sure it's only a matter of time before employee develop MSDs from work	10	25.6
Q27	I consider MSDs prevention and safety are as important as production works	37	94.9
Q28	Some health and safety rules and procedures do not need to be obeyed to get the job done safely	37	94.9
Q29	I always give sufficient time to get the job done safely	34	87.2

In Practice section, each question answered with 'high' or 'very high' are considered as good practice. Table 4 shows summary of good practice scores.

Table 4: Good Practice Scores

Item	Description	N	(%)
Q30	Regular workplace safety inspection	34	87.2
Q31	Regular body and musculoskeletal system health screening	9	23.1
Q32	Employer check, advice and correct employee's bad posture	32	82.1
Q33	Often study on MSDs related information	17	43.6
Q34	Seminars, courses, or talks on MSDs at workplace	11	28.2
Q35	Training on health and safety related issues for employee	30	76.9
Q36	Short breaks from work	32	82.1
Q37	Light exercise session during working hours	15	38.5
Q38	Encourage to report unsafe conditions at workplace	39	100
Q39	Notify upper management on important MSDs and safety issues	35	89.7
Q40	Involved in ongoing evaluation of MSDs and safety issues	24	61.5

6 out of 11 questions indicated high frequency of good scores. A total of 39 respondents (100%) said they are encouraged to report unsafe conditions at the workplace. The next highest are item Q39 where 89.7% of the respondents notify upper management on important of MSDs and safety issues. 87.2% of the respondents do regular workplace safety inspection and 82.1% of the respondents check, advice and correct employee's bad posture. However, only 23.1% of the respondents provide regular body and musculoskeletal system health screening while 28.2% of the respondents arrange seminars, courses, or talks on MSDs at the workplace for employee. It can also be seen that light exercise session is not emphasized during working hours. There is a body of literature that suggests an exercise programme can be an effective prevention. The benefits associated with a general exercise programme include an improved general attitude, decreased depression, reduced stress and muscular tension as well as decrease in new back problems, which work together towards prevention and/or reduction of lower back pain (Cilliers, 2013).

In order to determine the underlying factors which might affect KAP level of the respondents, statistical analysis was done using Kruskal-Wallis independent sample test by comparing gender and KAP scores. In Knowledge section, there is relationship between gender and item Q13 ($r = 0.004$) and Q15a ($r = 0.04$). Gender and attitude items show relationship existence for 4 items which are Q19 ($r = 0.05$), Q20 ($r = 0.04$), Q21 ($r = 0.01$) and Q28 ($r = 0.05$). Due to monotonic relationship of the variables, male or female alone both might affect good attitude scores positively or vice versa. For example, female are more concerned about safety and may report unsafe or disturbing work conditions than male. The study

found that the situation correlate with women seeking medical care more often than men (Tessier-Sherman et al, 2014). The individual factor of gender has frequently been treated as a potential cofounder or effect modifier in ergonomic epidemiological studies (Zwart et al, 2001). On the other hand, there are no relationship between practice items and gender.

4.0 CONCLUSION

Factors that cause MSDs injuries from the perspective of Malaysian employers were established in this study. This study will provide references and guidelines for future studies of MSDs related injuries for various industries in Malaysia, be it manufacturing or non-manufacturing. Other than that, it may assist management and employers to focus on necessary initiatives and interventions to minimize MSDs problem at the workplace

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Full Paper

The Needs of Process Safety Management in Palm Oil Industry

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ABSTRACT : *The global demand for palm oil is growing, thus prompting an increase in the global production. Such increasing demand for palm oil is due to palm oil's relatively cheap price and versatile advantage both in edible and non-edible applications. Being world second largest producers, Malaysia's palm oil industry is growing in complexity and successively to succeed on the global level by accounts for about 30% of the world production of palm oil in 2015/16. But, reliability and safety issues are still problematic areas that need to be addressed by all parties in this industry e.g. millings, refineries and oleochemicals. Although there are laws and guidelines that provide protection for reliability, safety and health such as OSHA 1994, OHSAS 18001 and MS 1722, palm oil industry is relatively lacking behind in process safety as several catastrophic accidents occurred were believed caused by process safety failures. Therefore, process safety management in palm oil industry must be enhanced to standard similar to other industries such as chemical process and oil and gas industries, so that it can prevent major hazard accidents which can result in fatality, asset damage and environmental impact. This papers investigates the needs of process safety management in palm oil industry and proposes a generic process safety management framework which may be useful for palm oil industry. From the study, it can be concluded that proactive actions are certainly required to overcome process safety issue in palm oil industry as several catastrophic accidents occurred were believed caused by process failures.*

Keywords - *palm oil industry, process safety management*

1.0 INTRODUCTION

In order to satisfy the high global demand for vegetable oils, both for edible and non-edible industrial applications, global palm oil production has increased from 16.1 million tons in 1995/96 to 58.8 million tons in 2015/16 (US Department of Agriculture, January 2017). The main palm oil producing countries are Indonesia and Malaysia, with 32 and 17 million tons of palm oil being produced in 2015/16 respectively (US Department of Agriculture, January 2017).

The growing palm oil industry has been an important source of economic growth for palm oil producing countries. For example, Malaysia palm oil export reached RM 45.6 billion in 2015 and it was accounted for 5.8% of the total exports, which was the top 5 exports after electrical and electronic products, chemical and chemical products, petroleum products, and liquefied natural gas (MITI, January 2017). Nevertheless, reliability and safety issues are still problematic areas that need to be addressed by all parties in this industry e.g. millings, refineries and oleochemicals.

Although there are laws and guidelines that provide protection for reliability, safety and health such as OHSA 1994, OHSAS 18001 and MS 1722 (Hong wai Onn, 2013), palm oil industry is relatively lacking behind in process safety as several catastrophic accidents occurred were believed caused by process failures (DOSH, January 2017). Therefore, Process Safety Management (PSM) in palm oil industry must be enhanced to a higher-level standard to minimize the risk of process-related incident in the industry.

2.0 ACCIDENTS IN PALM OIL INDUSTRY

There are several accidents in the palm oil industry that has been reported and recorded in Malaysia. These accidents (DOSH, January 2017) are summarized in table 1.

Based on table 1, several accidents were process-related incidents that might cause by various reasons such as malfunction of the equipment and failure of executing safe operating procedure. These accidents have not only cause fatalities, severe injuries, but also properties damaged as a result of fire and explosion.

Table 1: Accidents Statistic in Malaysia Palm Oil Industry (DOSH, January 2017)

Case	Date	Incident Description	Fatality
1	May 2010	Workers were killed inside kernel bunker (a confined space) in palm oil mill.	3
2	March 2011	Workers was killed as he was wedged between fresh fruit bunch cages.	1
3	December 2011	Workers was killed as he fell inside an equipment which was still in running mode.	1
4	January 2013	Sterilizer (a pressure vessel) in palm oil mill exploded and killed the nearby workers.	4
5	July 2014	Workers were drowned in palm oil mill storage tank.	2
6	October 2014	Steam boiler furnace collapsed with hot ashes spared out, and killed the worker who was performing maintenance work inside the furnace.	1
7	October 2014	Worker fell from high working platform.	1
8	October 2015	Worker was killed as struck-by lorry in palm oil mill.	1
9	October 2015	Workers got injured due to dust explosion in oleochemical plant.	0
10	March 2016	Worker was killed as struck-by wheel loader in palm oil mill.	1
11	Jun 2016	Worker got injured due to malfunctioned of pneumatic system of steam boiler.	0

3.0 KEY DIFFERENCES BETWEEN PROCESS SAFETY AND OCCUPATIONAL SAFETY

In terms of occupational safety and health (OSH), palm oil industry is complying with the Occupational Safety and Health Act 1994 and some are voluntarily taking pro-active measures to manage their OSH risks and improve their OSH performance by implementing OHSAS 18001 and MS 1722. Nevertheless, in regards to process safety, there is lack of studies despite the fact that several occurrences of accidents have caused fatalities and severe injuries because of process-related accidents.

In general context, “process safety” refers to a disciplined framework that managing the integrity of hazardous operating systems and processes (API Guide to Reporting Process safety Events, Version 2.0). It intends to prevent and mitigate of unintentional releases of potentially dangerous materials or energy from the processes such as prevention of leaks, spills, equipment malfunctions, over-pressures, excessive temperature, corrosion, metal fatigue, and other similar conditions (The BP US Refineries Independent Safety Review Panel, 2017). Process Safety Management (PSM) focuses on, among other things, the design and engineering of facilities, hazard assessment, management of change, inspection, testing and maintenance of equipment, effective process control, procedures, training of personnel, and human factors.

Typically, process safety risks arise from complex systems with a large number of control measures referred to as hard or soft controls. Hard controls are physical elements within the facility such as barriers, alarms and improved system design. Soft controls are internal procedures and best practices such as standard operation procedures, training, administrative controls, supervisory oversight, and the experience and knowledge of frontline operators. Process safety incidents tend to happen infrequently but can often have catastrophic results when things go wrong (Chilwoth Global, 2010) as demonstrated in Figure 1.

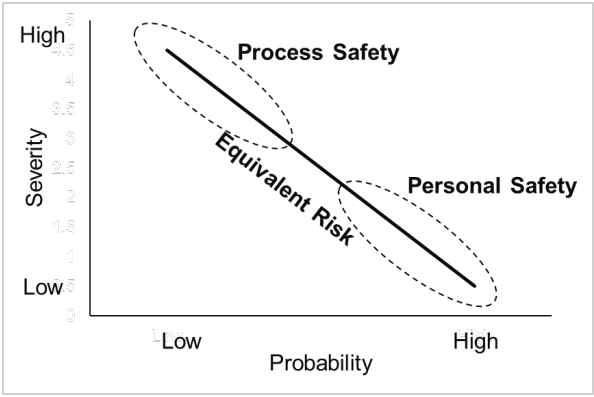

Figure 1: Key Difference between Process Safety and Personal Safety

On the other hand, "occupational safety", which is sometimes referred to as personal safety, focuses on the hazards that are more directly related to individual workers. Typically, personal safety programs address risk of various types of physical injuries such as slips, falls, struck-by incidents, physical strains, electrocution and so on. These accidents are usually associated with a hazard that is close to workers. Accidents involving personal safety tend to occur frequently but often have little consequence (Chilwoth Global, 2010) as shown in Figure 1.

Protection against a personal safety hazard is both relatively simple and, for the most part, at least nominally under the control of the potentially affected worker. Personal safety protections or controls against these types of hazards tend to be fairly straight-forward in nature. For example, personal safety controls place a heavy emphasis on training individual workers to recognize hazards, installing personal protective guards on dangerous machinery, and providing personal protective equipment to workers.

4.0 GUIDING PRINCIPLE OF PROCESS SAFETY MANAGEMENT

PSM involves the prevention of leaks, spills, equipment malfunctions, over-pressures, excessive temperature, corrosion, metal fatigue, and other similar conditions (The BP US Refineries Independent Safety Review Panel, 2017). PSM programs focus on the design and engineering facilities, hazard assessments, management of change, inspection, testing and maintenance of equipment, effective alarms, effective process control procedures, training of personnel, and human factors (The BP US Refineries Independent Safety Review Panel, 2017).

Management commitment, process safety information and hazard identification are the core elements in a successful PSM. Nonetheless, an effective PSM requires a systematic approach for identifying, evaluating, and controlling the hazards of processes. Process Hazard Analysis (PHA), one of the most important elements of the PSM programs, can help to achieve this rigorous evaluation activity (US Department of Labor, 2000). It can be used to identify hazards, risk level and control strategies for different levels, both macro and microanalysis, within the processes. The results of the studies can then be incorporated into the PSM programs, which provides ongoing management of hazards in a facility. In other words, PHA will provide information that assist both employers and employees in making decisions for improving safety and reducing the consequences of unintentional release of potential dangerous materials or energy (US Department of Labor, 2000).

PHA focuses on the identifying the potential causes, likelihood and consequences of process accidents such as fires, explosions, releases of toxic or flammable chemicals, and major spills of hazardous chemicals by combining the experience, knowledge and intuitive imaginations of expert team members using a selected analytical methodology. PHA structure is illustrated in Figure 2.

Many hazard identification approaches provide flexibility in meeting the scope and objectives of a process evaluation. The employer must apply one or more of the approaches, as appropriate, to determine and evaluate the hazards of the process being analyzed. These including Preliminary Hazard Analysis (HAZID), What-if/Checklist, Hazard and Operability Study (HAZOP), Failure Mode and Effect Analysis (FMEA), Fault Tree Analysis (FTA), Layer of Protection Analysis (LOPA) and so on.

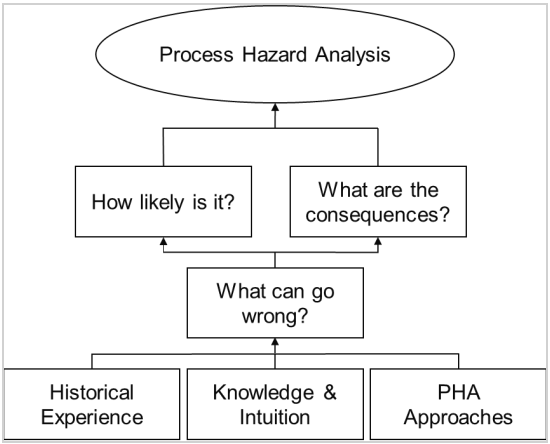

Figure 2: The Process Hazard Analysis Structure

5.0 DISCUSSION

Although the occurrence of major industrial accidents and subsequent implementation of forceful safety and environmental legislation in many countries has made the PSM an industry standard, it is still considered fairly new to Malaysia, particularly in palm oil industry. Nonetheless, (Hamidah et al, 2014) has demonstrated that both the chemical process industry and palm oil industry have not only relatively similar and common process equipment and operational condition, but also process hazards. Therefore, it is sensible to introduce PSM to palm oil industry especially several catastrophic accidents occurred over the past few years were believed caused by process failures.

The proposed key elements for PSM to be introduced to palm oil industry are summarized in Figure 3. This proposed framework and other standards or management systems may contain some overlapping requirements.

• Employee participation	• Process safety information
• Process hazard analysis	• Operating procedures
• Training	• Contractors
• Pre-start review	• Mechanical integrity
• Hot work permits	• Management of change
• Incident investigation	• Emergency planning & response
• Compliance audits	• Trade secrets

Figure 3: Proposed Key Elements for Palm Oil Industry Process Safety Management

In addition, the key elements in the PSM for palm oil industry should be the light-of-sight between the hazard, the event and the consequence. By thoroughly managing this line-of-sight hazards can be managed to a risk as low as reasonable practical in Risk Management Response as shown in Figure 4. The risk reduction is achieved by defining barriers that are typically preventive in nature, but if control measure fails, can also be a recovery measure. For example, sterilizer (a pressure vessel) in palm oil mill is prone to hazards of operating with saturated steam under high temperature of about 140^{o}C and medium pressure of 45 psi (threat of this scenario is *overpressure* and *explosion*). Hence, the control barrier(s) for the hazards can be steam regulating valve whilst the recovery measure(s) can be isolating valve and relief valve.

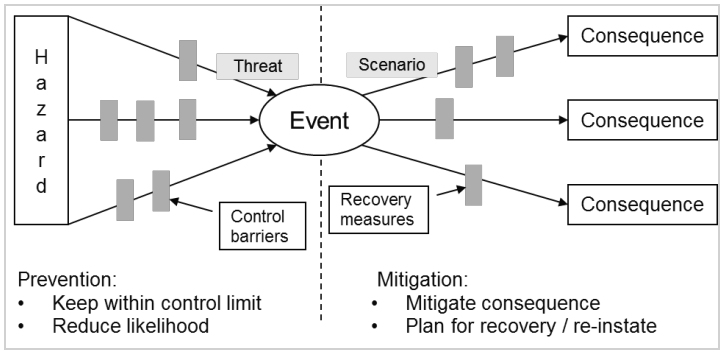

Figure 4: Risk Management Response

The Risk Management Responses is only as effective as it translates into operational, maintenance and inspection activities. For example: each barrier needs a performance test to demonstrate its proper working; the performance test has to be scheduled periodically; overdue tests need approval by a technical authority; test can only be done by staff assessed as competent or certified; all test results are approved and, in case of failure, corrective action is initiated; technical changes to barriers are tightly managed by a change process, condition of barriers is recorded and monitored; and staff and operator are trained on barrier thinking.

To create an effective PSM in an organization is a journey. The journey starts very often with having a reactive culture where the structure and compliance to PSM are largely absent. Notable efforts are certainly required to introduce the PSM standard and get organization to meet the minimum requirement. This journey then needs to continue with sustaining and improving further the PSM performance towards proactive and generative level ("process safety is the way we do business here") (Rob Holstvoogd et al, 2006) as shown in Figure 5.

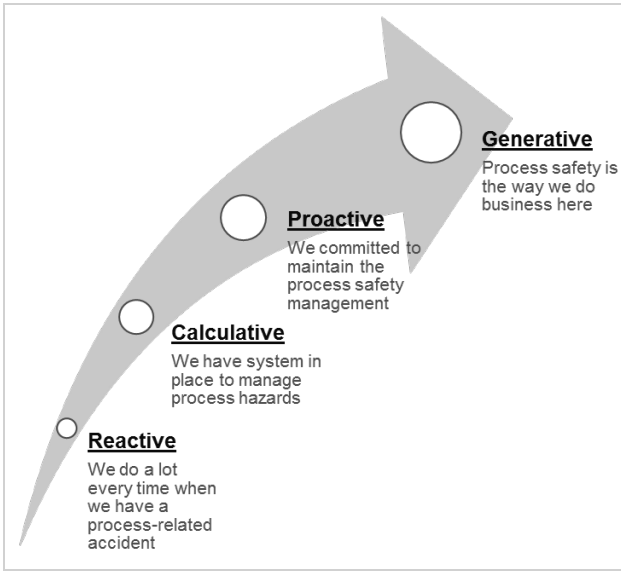

Figure 5: Generic Journey of Implementation of Process Safety Management (Rob Holstvoogd et al, 2006)

6.0 CONCLUSION

The growing palm oil industry has been an important source of economic growth for palm oil producing countries especially Malaysia. Hence, there should be no compromise in process safety to assure business sustainability. From the study, it can be concluded that proactive actions are certainly required to overcome process safety issue in palm oil industry as several catastrophic accidents occurred were believed caused by process failures. Relevant parties with full support of Malaysia government should play their major roles by making sure that the industry start implementing Process Safety Management to enhance the industry standard similar to other industries such as chemical process and oil and gas industries, so that it can prevent major hazard accidents which can result in fatality, asset damage and environmental impact.

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Book:

Perez, A.K., Little, T.H., & Brown, Y.J. (1999). Safety in numbers. Itasca, IL: National Safety Council.

On-line Publication:

National Institute of Occupational Safety and Health. Sick Building Syndrome. www.niosh.com.my/safetytips.asp?safetyid=1 (accessed October 2004)

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