Original Article

An Investigation of Knowledge, Attitude and Practice of Occupational Safety and Health (OSH) on Safety Climate at Workplace in Manufacturing Industry

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ABSTRACT: *To investigate the safety climate and knowledge, attitude and practice (KAP) on occupational safety and health (OSH)in the manufacturing industry, also to determine the association between safety climate factors and KAP of safety among manufacturing worker. A cross-sectional study was conducted among 59 respondents from two manufacturing plants located in Gebeng, Kuantan, Pahang. Most of the respondents were Malay (91.5%) and male (96.6%). Participants were administered a set of questionnaires (Cronbach alpha=0.674) that measured the safety climate as perceived by the workers towards their supervisor and KAP of the workers regarding safety-related matters at the workplace. Self-administered questionnaires consisted of 5 points Likert scale used to measure each of the items of safety climate and KAP. The scales for safety climate and KAP were probed using 16 items and 17 items in the questionnaires, respectively. The results were analysed using a non-parametric test, which is Spearman's rho correlations and descriptive statistics. Bivariate analysis was performed. There was a moderate positive correlation between safety climate and KAP domains (Spearman's rho: 0.581, p<0.01). Safety climate in the manufacturing plant is associated with KAP of the workers, thus KAP could affect the safety climate in the manufacturing plants.*

Keywords: *Attitude and Practice, Knowledge, Manufacturing Worker, Safety Climate.*

1.0 INTRODUCTION

Manufacturing industry can be defined as the industry that processed raw materials to form a product by means of automation, machinery or labour force at the manufacturing plant. In Malaysia, the manufacturing industry has been revolutionized to meet industrial demand as well as the nation's goals. As a result, the manufacturing sector has created huge employment and skill enhancement opportunities in Malaysia (Chew, 2005). For the past few years, this industry has contributed to the economic growth and development of Malaysia (Azer et al., 2016). In most developing countries including Malaysia, the manufacturing plants are equipped with mechanized process and systems to enhance productivity and efficiency of the plants. Despite that, according to the Federation of Malaysian Manufacturers (FMM, 2017), the industrial accidents in manufacturing industries have become a major concern. Manufacturing plant work environment may posed emerging hazards and risks at the workplace. Based on the statistics of occupational accidents by sectors released by Department of Occupational Safety and Health (2018), manufacturing industries have the highest number of non-permanent disability and permanent disability with 825 and 54 workers, respectively. Manufacturing industry also placed as the second highest workers death after construction industry. Globally, one of the prime factors of disability and mortality cases is due to the hazards at the workplace (Onowhakpor et al., 2017). Based on the report by World Health Organization (1997), occupational health risk was ranked as the 10th leading cause of fatality and injuries from all over the world. These work-related issues raise concern for more study on the safety and health aspect focused at manufacturing industries in Malaysia.

2.1 Knowledge, attitude and practice (KAP) towards safety and health at the workplace among manufacturing workers

Occupationally related accidents that cause injuries to the workers always raise concerns as one of the major issues in most countries (Li et al., 2010). Exploring KAP of workers towards OSH on daily basis can be used to aid in evidence-based intervention, which can improve work situation or even target behaviour (Goh & Chua, 2016). In the manufacturing industry, workers are exposed to various types of hazards especially in the production process. Most manufacturing plant nowadays implemented automation to enhance the productivity and efficiency of work processes. This technology exposing the workers towards many types of hazards such as physical hazards, operational hazards and mechanical hazards that have the potential to cause substantial injuries to the workers such as crushing, falling and even explosion. On the other hand, workers with adequate knowledge of safety at the workplace would enable them to perform their assigned tasks safely. Having knowledge on safety at work encourage personal responsibility to ensure safety is implemented at work. The attitude toward safety may include being positive about any safety-related activities at work such as safety training or comply with safety policies and regulations at work. The practice of safety at work included an action that can prevent any accident from occurring. !The knowledge, attitude and safety practices of workers are paramount for the mitigation and control of hazards and risk to ensure safety and health at work at optimum level (Onowhakpor et al., 2017).

2.2 Safety climate at the workplace

At workplace, safety climate is considered as the embodiment of safety culture with regard to workers behaviour and expressed attitude in work organization (Cox & Flin, 1998). other study described safety climate as the current state of perception on underlying safety culture (Mearns, Whitaker & Flin, 2003). Zohar (2003) claimed that safety climate shows the perceived safety in the work settings. Later, safety climate explains as the perceptions toward element of policy and practice that demonstrated through the priority of safety (Zohar & Luria, 2005). In general, safety climate can be viewed as the collection of perceived safety that applied through procedures and policies, which denotes the behaviour of workers and the current work environment. Safety climate can be a robust predictor of safety outcomes and a solid paradigm in the process to enhance safety at work (Zohar, 2010). It can also determine hidden conditions leading to major accidents, which in turn prevent the root causes of future accidents from happening (Kvalheim, Antonsen, & Haugen, 2016). Safety climate studies become a leading indicator of safety shortcomings in any work organization other than to forecast future problem that would arise. These safety leading indicators have established a more proactive way to identify the current safety performance of work organization thus, correcting the impaired area in safety efficiently (O'connor, O'dea, Kennedy, & Buttrey, 2011). There are quite limited consensus on the number and elements of safety climate factors (Hon, Chan, & Yam, 2014). This present study included only 3 factors of safety climate, which were caring, coaching and compliance, adapted from several research studies since there is no specific study that specifies the numbers of dimensions of safety climate. Compliance toward safety regulations stated as task performance in Griffin and Neal (2000) study. It describes the fundamental of safety enforcement that should be implemented in order to ensure safety at workplace. Examples included complying to lock out and tag out procedures implemented at the workplace. Next, coaching domains of safety climate were adapted from Alruqi, Hallowell and Techera (2018). They discussed coaching as a safety education and instruction that workers received from supervisors during their work while caring domains were adapted from (Zohar & Luria, 2005). KAP of workers were explained specifically to this study. Perception of workers towards their management for three safety climate domains (coaching, caring and compliance) was also investigated. This research also studied the safety climate among manufacturing workers based on their perception towards management of the plants. This is due to employee perceptions are the fundamentals of the measurement in safety climate study (Griffin and Neal, 2000).

2.0 METHOD

2.1 Questionnaire

The survey questions were adopted and adapted from several research studies related to the safety climate and KAP study. Safety climate questionnaire was adopted from the Multilevel Safety Climate (MSC) Scale by Zohar and Luria (2005). MSC Scale consists of items that measure the interaction between supervisors and workers either supervisors can prioritize safety or company goals such as production speed or schedules. While KAP questionnaire were adapted from the study conducted by Goh & Chua (2016) among civil and structural engineers. Pilot study was conducted prior to the actual data collection and the instrument were found to be reliable. The questionnaire consisted of 3 main parts which were A, B and C. Each part of the questionnaire was designed to determine different variables. Part A comprised of questions related to the demographic data, which were gender, age, working period, department, education level, nationality and mode of work. Part B consisted of the questions related to the safety climate of that particular company. There were 16 questions in this part, each question was divided into 3 main domains of safety climate included coaching, caring and compliance. Examples of the item were "Supervisors frequently remind us about work hazards" (caring), "Supervisors use explanations (not just compliance) to get us to act safely" (coaching) and "Supervisors frequently check to see if we are all obeying the safety rules" (compliance). Part C consisted of 17 questions associated with KAP that related to the safety among the workers. Examples of the items included "Risk is a situation that involves exposure towards hazards" (knowledge), "I am aware that protective equipment is important at work" (attitude) and "I conduct my work safely" (practice). All items in both scales were rated based on 5 points Likert-type scale ranging from 1, which indicated strongly disagree to 5 indicated strongly agree.

3.0 RESULT AND ANALYSIS

3.1 Reliability analysis of the instrument

In this study, the administered questionnaire had a total of 6 factors for both safety climate scale and KAP scale. To determine the internal consistency of the questionnaire, reliability test was performed on each of the 6 factors in the questionnaire. Table 1 shows the Cronbach alpha values for safety climate; active, proactive and declarative practices were 0.801, 0.806 and 0.846, respectively. These high values indicated the reliability of the questionnaire was good.

Table 1 Alpha Value of Safety Climate Factors

Factors	No of questions	Cronbach alpha value
Active practices (caring)	5	0.801
Proactive practices (coaching)	5	0.806
Declarative practices (compliance)	6	0.846

In Table 2, Cronbach alpha values for 3 factors of KAP were 0.682, 0.693 and 0.621 for knowledge, attitude and practice, respectively. Alpha scores between 0.60 and 0.70 could be considered at borderline, but in general, they did not consider poor (George & Paul Mallery, 2003). The possible reason for the low alpha value is due to the low number of factors for each of the KAP scale, so it is considered within the tolerable limit (Kvalheim et al., 2016).

Table 2 Alpha Value of KAP

Domains	No of questions	Cronbach alpha value
Knowledge	5	0.682
Attitude	7	0.693
Practice	5	0.621

3.2 Respondents

This study involved a total of 59 respondents from 2 manufacturing companies located in Kuantan. From the survey conducted, out of 59 of the respondents, there are 57 male workers with 96.6% and only 2 female workers involved in this study with 3.4%. Both age range of 16-25 and 26-35 had the highest percentage with 30.5% respectively. The oldest age range 46-65 make up with 22%. The age range of 36-45 has the lowest percentage with 17%. The respondents participated in this study majority consist of Malaysian with 91.5% and only 8.5% comprises of others nationality. For the educational level, high school certificate holder has the highest percentage with 49.1% followed by diploma holder with 30.5% and middle school certificate with 13.6%. Bachelor degree holder has the lowest percentage out of all educational level of the respondents with 5.1%. Majority of the respondent that participated in this study forms the maintenance department (42.4%), followed by the production department with the second highest percentage 40.7%. Both personnel and safety health environment department have the same percentage with 5.1% respectively while marketing and research and development has the lowest percentage of participation with 1.7%. Based on table 3 most of the workers having less than 5 years of working experience in the company with 57.6% followed by 6-15 years of working experience with 25.4%. While workers with more than 16 years of working experience are the least participated in the survey with 17%.

Table 3 Demographic Information of the Respondents

	Items	Frequency	%
Gender	Female	2	3.4
	Male	57	96.6
Age	16-25	18	30.5
	26-35	18	30.5
	36-45	10	17
	46-65	13	22
Nationality	Malaysian	54	91.5
	Others	5	8.5
Education level	Middle School Certificate	8	13.6
	High School Certificate	29	49.1
	Diploma	18	30.5
	Bachelor degree	3	5.1
Department	Production	24	40.7
	Personnel	3	5.1
	Maintenance	25	42.4
	Research & Development	1	1.7
	Project engineering	2	3.4
	Safety, Health and Environment	3	5.1
	Marketing	1	1.7
Years of work	0-5	34	57.6
	6-15	15	25.4
	16-25	10	17

3.3 Descriptive analysis on safety climate domains

3.3.1 Active Practices

There were 5 items to measure active practices factor which were “my direct supervisors makes sure we receive all the equipment needed to do the job safely”, “my direct supervisors emphasizes safety procedures when we are working under pressure”, my direct supervisors frequently tells us about the hazards in our work”, my direct supervisors reminds workers who need reminders to work safely” and “my direct supervisors says a “good word” to workers who pay special attention to safety”. Fig. 1 below shows the percentage of disagreement and agreement of workers towards their supervisors on active practices at work. Most workers with 63.05% strongly agree that their supervisors conduct active practices of safety climate factors. While, 27.80% agree and 5.08% being neutral. In contrast, 3.73% disagree and 0.37% strongly disagree that the supervisors conduct active practices at work.

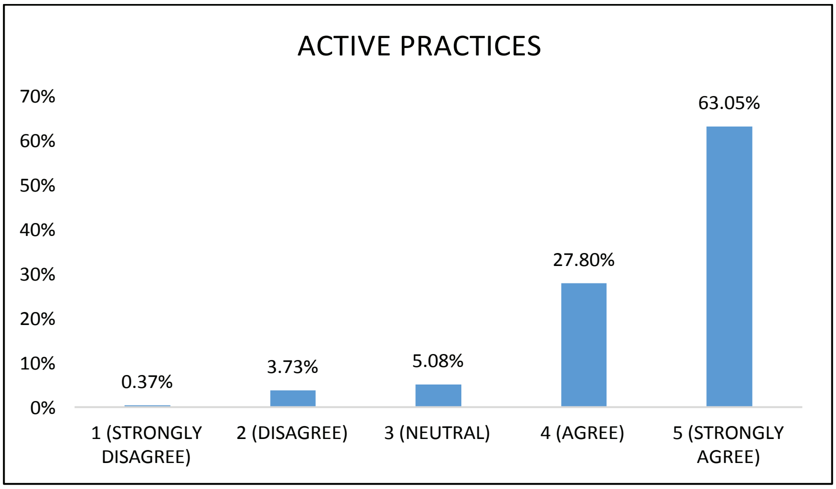

Figure 1 Active practices by supervisors as perceived by the workers

3.3.2 Proactive Practices

Items included in proactive practices factors were "my direct supervisors discusses how to improve safety with us", "my direct supervisors uses explanations (not just compliance) to get us to act safely", "my direct supervisors refuses to ignore safety rules when work falls behind schedule", "my direct supervisors spends times helping us learn to see problems before they arise" and "my direct supervisors frequently talks about safety issues throughout the work week". Fig. 2 below shows the workers' perception towards the supervisors relating to the coaching of safety issues at work. Based on Fig. 2, strongly agree take a huge portion which is 54.92%, then followed by agree with 28.81% and neutral which is 8.81%. Both strongly disagree and disagree make up the least percentage which are 3.73%. In general, most of the workers strongly agreed with the prepared questions which indicate that the management train the workers to work safely.

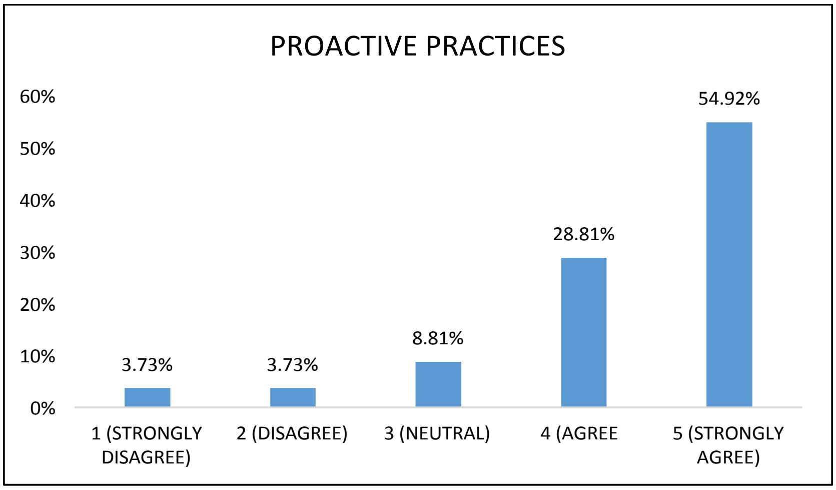

Figure 2 Proactive practices perceived by the workers towards their supervisor at work

3.3.3 Declarative Practices

Six items in the declarative practice factor are "my direct supervisors frequently checks to see if we are all obeying the safety rules", "my direct supervisors is strict about working safely when we are tired or stressed", "my direct supervisors makes sure we follow all the safety rules (not just the important ones)", "my direct supervisors insists that we obey safety rules when fixing equipment or machines", "my direct supervisors is strict about safety at the end of the shift, when we want to go home" and "my direct supervisor insists we wear our protective equipment even if it is uncomfortable". Fig. 3 below indicated the perception of workers towards the supervisors on compliance to safety policies and procedures. Strongly agree had the most percentage with 59.04% which indicate that the supervisors compliance with the safety regulations at work. Agree and neutral make up 29.40% and 6.78% respectively. In contrast, disagree and strongly disagree had the lowest percentage with 3.40% and 1.41% respectively.

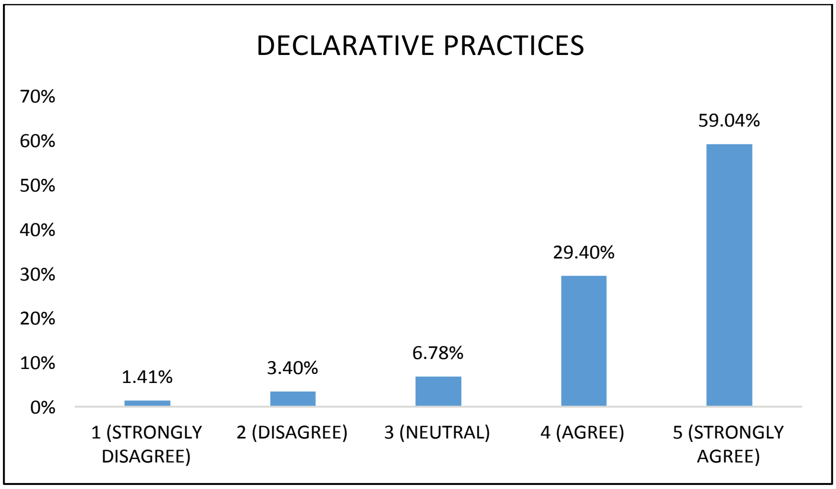

Figure 3 Declarative practices as perceived by the workers towards their supervisors at work

3.3.4 Descriptive analysis of KAP of workers towards safety at the workplace

From the result obtained, all of the workers showed excellent knowledge on safety at the workplace and also very good attitude towards safety at the workplace. For practice factor, there were 96% of the workers acquired high practice of safety at work and only 3.4% of the workers acquired low practice of safety at work. Overall, the workers in both manufacturing plants were having adequate level of knowledge, attitude and practice of safety at the workplace. Fig. 4 shows the mean of knowledge, attitude and practice of the workers towards safety matters at the workplace. The results showed that the workers have the highest mean on knowledge of safety at the workplace with mean 4.17, followed by the attitude towards safety with mean 4.16 and the lowest in practice of safety with mean 4.05. The mean values were ranked based on 5 point Likert scale as 1 indicated the lowest through 5 as the highest.

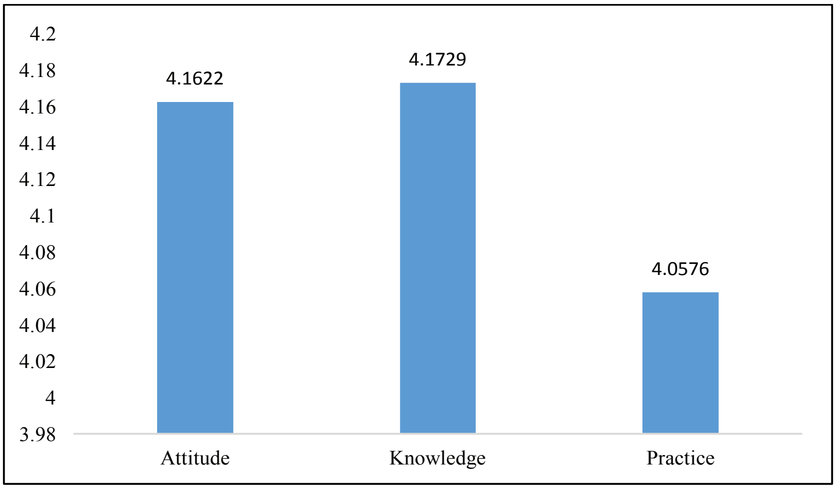

Figure 4 Mean of Knowledge, Attitude and Practice of the manufacturing workers at work

3.3.5 Correlation analysis

Table 4 shows correlation coefficients analysis using non-parametric test Spearman's rho correlation of safety climate factors and KAP factors. The bivariate analysis results showed a positive significant correlation between any safety climate factors and KAP factors. This result also indicated that high safety climate value was associated with high KAP value. Knowledge and proactive practices factors showed positive moderate correlation ($r_s = 0.559$, n=59, $p<0.01$) as well as knowledge and active practices factors ($r_s = 0.499$, n=59, $p<0.01$), but knowledge and declarative practices factors have a strong positive correlation ($r_s = 0.617$, n=59, $p<0.01$). This can be interpreted as, if the knowledge of workers about safety is high, the workers perception towards supervisor's commitment in relation to comply with safety and health regulation is also high. This is also followed by the proactive practices and declarative factors. Next, the attitude and proactive practices factors have a strong positive correlation ($r_s = 0.640$, n=59, $p<0.01$) as well as attitude and declarative practices factors (0.616). Only, attitude and active practices factors have a moderate positive correlation ($r_s = 0.496$, n=59, $p<0.01$). The attitude on safety at the workplace highly indicated that the perception of workers towards supervisors declarative practices and proactive practices factors were almost the same. But workers with high attitude, have rather low perception on active practices yet still significant. The practice factor and proactive practices factor have a positive moderate correlation ($r_s = 0.464$, n=59, $p<0.01$), practice factor and active practices factor also have a positive moderate correlation ($r_s = 0.433$, n=59, $p<0.01$) as well as practice factor and declarative practices factor ($r_s = 0.524$, n=59, $p<0.01$). For the workers that acquired good practice of safety at the workplace, increased in the aspect of practicing safety would directly increase the perception of workers on supervisor declarative practices on the safety and health policies implemented at work. This situation also applied towards proactive practices and active practices factors.

Table 4 Safety Climate and KAP Domains Correlation

		Correlation coefficient		
		Safety climate		
		Proactive practices	Active practices	Declarative practices
KAP	Knowledge	0.559**	0.499**	0.617**
	Attitude	0.640**	0.496**	0.616**
	Practice	0.464**	0.433**	0.524**

** Significant at the 0.01 level (2 tailed)
Sample size, n=59

There are some studies revealed that there was a significant positive relationship between safety climate and safety behaviour, which also included declarative practices at various sectors such as constructions and repair, maintenance, addition and alteration also manufacturing and mining (Chan et al., 2017; Lyu et al., 2018; Hon, Chan, & Yam, 2014; Griffin & Neal, 2000). The current study supported these findings by demonstrated a very strong positive correlation between safety climate and declarative practices (Spearman's rho: 0.948, $p<0.001$).

4.0 CONCLUSION

The present study has demonstrated the safety condition of a workplace based on the safety climate surveys. Safety climate was used as a leading indicator to determine several surface safety-related issues of work organization and possible shortcomings in a manufacturing plant. Subsequently, it can help the management to improve the shortcomings and impairment of safety. This study highlighted that there are significant relationship between KAP and safety climate factors. This means, if the workers have appropriate knowledge, attitude and practice towards safety so relatively the workers will also perceived the supervisors declarative, proactive and active practices of safety engagement at work positively. Finally, this study proved that knowledge on safety, attitude related to safety and safety practice (KAP) at the workplace is a useful indicator to create a good safety climate in the manufacturing plant.

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