



Cross-sectional Study

Prevalence of occupational injury and determination of safety climate in small scale manufacturing industry: A cross-sectional study

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ABSTRACT

Background: Occupational injuries are among the most important workplace issues. This study aims to determine the safety climate and prevalence of occupational injuries in the small-scale manufacturing industry.

Methods: A cross-sectional study with ten small scale manufacturers participated accounting for a total of 300 respondents. Data were collected from July to August 2020 using the NOSACQ-50 questionnaire.

Results: The prevalence of occupational injury for the past 12 months was at 18%. The most often injured body parts were hands and legs while among the most common injury types were open wound, burns and bleeding. The mean NOSACQ-50 scores for all dimensions are good. The associated factors are working hours per week, and compliance to SOP. There are differences in the mean scores of NOSACQ-50 between injured and non-injured workers across all dimensions.

Conclusion: The safety climate among manufacturing industry employees is at a good level, while the prevalence of occupational injury is relatively low.

1. Introduction

Globally, an estimated 100 million occupational injuries occur each year and accounted for 350,000 deaths. Most occupational injuries came from developed countries [1]. There is a high incidence of occupational injuries in Malaysia. From January to March 2020, the total number of permanent disabilities is 65. Sabah has an average of 67 cases of occupational accidents within a similar period [2]. Although the manufacturing industry has become the biggest contributor to local economic growth, it has the highest number of occupational injuries compared to other industries [2]. There is a gradual decline in the number of workplace accidents in the manufacturing industry since 2005, yet it is still the main contributor to industrial accidents [3]. Safety behaviour and practice are important strategies to prevent and control the occurrence of occupational injury. The benefit of safety climate assessment can reduce industrial injuries, thus improving

workplace safety performance. This study aims to determine the safety climate and prevalence of occupational injuries in the small scale manufacturing industry.

2. Material and methods

Ten small scale manufacturing industries in Tawau, Sabah were selected. Employees who are willing to participate accounted for a total of 300 respondents were subjected to the inclusion and exclusion criteria. Participants must have been working in the company for at least 3 months to be included in the study, while workers who were on leave throughout the study were excluded. Their history of occupational injuries from previous workplaces was not accounted for in the prevalence of occupational injury in the study. A set of self-administered questionnaires which consists of three parts, which are section A: Socio-demographic characteristics, section B: Work-related injury

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questionnaire (only for those who have had a prior history of workplace injury within one year), and section C: Nordic Occupational Safety Climate Questionnaire (NOSACQ-50). This widely used questionnaire was translated and validated into Malay language, composed of 50 items over seven different dimensions of safety climate [4]. The seven safety climate dimensions covered by the NOSACQ-50 are management safety commitment and ability, management safety empowerment, management safety justice, workers' safety commitment, workers' safety priority and non-risk acceptance, peer safety communication, learning, communication and trust in safety activity, and workers' trust in the efficacy of safety systems. The questionnaires were distributed to 300 participants across 10 small-scale manufacturing industries in Tawau. The industries comprised of mainly food products factories, recycling, plastic, fibreglass, polystyrene, and wood processing factories (Table 2). Ethical clearance was obtained from the Medical Research Ethical Committee of Universiti Malaysia Sabah. Permission was obtained from the manufacturing industry involved. The collected data were analysed using the Statistical Package for the Social Sciences by IBM (IBM SPSS) version 25. Data were entered into NOSACQ-50 data input template (MS Excel) for the safety climate questionnaires, then subsequently generated the mean score. After all the participants' data have been entered into the spreadsheet and their means for the dimensions have been calculated, a total mean for the population was calculated for each of the seven dimensions as a 'mean of the mean' [5].

3. Results

The median age of the employees in the study is 34 years old. The largest age group is 20–29 years (35.3%). Most of the workers are male (71.3%) and received secondary school level education (49%). The median working hours per week is 48. Most of the respondents are working for fewer or equal to 48 h per week (72.3%), had a duration of working ranging from 1 to 5 years (51%), have never attended any safety training (81%), reported no shortage of PPE (56.3%), claimed compliance to SOP and PPE usage (56%). The mean scores of all dimensions were in a good category and considered as positive results [6].

Table 1
Socio-demographic, work-related and behavioural risk factors association with occupational injury.

Risk factors	Occupational Injury		Odds ratio	χ^2	p-value
	Yes (%)	No (%)			
Age					
Less than 30	15 (14.2)	91 (85.8)	1		
30 or more	39 (20.1)	155 (79.9)	1.53	1.645	0.20
Gender					
Female	14 (16.3)	72 (83.7)	1		
Male	40 (18.7)	174 (81.3)	1.182	0.242	0.62
Level of education					
Higher education	27 (16.4)	138 (83.6)	1		
Lower education	27 (20)	108 (80)	1.278	0.665	0.41
Working hours/week					
48 h or fewer	31 (14.3)	186 (85.7)	1		
More than 48	23 (27.7)	60 (72.3)	2.3	7.331	0.01
Work experience					
5 years or more	14 (20.6)	54 (79.4)	1		
Less than 5 years	40 (17.2)	192 (82.8)	0.804	0.399	0.53
Safety training					
Yes	7 (12.5)	49 (87.5)	1		
No	47 (19.3)	197 (80.7)	1.67	1.411	0.23
PPE Shortage					
Yes	22 (16.8)	109 (83.2)	1		
No	32 (18.9)	137 (81.1)	1.157	0.229	0.63
Compliance to PPE					
Yes	25 (14.9)	143 (85.1)	1		
No	29 (22.0)	103 (78.0)	1.61	2.517	0.11
Compliance to SOP					
Yes	47 (16.7)	235 (83.3)	1		
No	7 (38.9)	11 (61.1)	3.18	4.255	0.04

Table 2
Comparison of mean scores of safety climate for each dimension between the injured and non-injured workers.

Dimension	Occupational Injury		p-value
	Yes (n = 54)	No (n = 246)	
Dimension 1: Management safety priority and ability	2.89	3.29	0.00
Dimension 2: Management safety empowerment	3.1	3.44	0.00
Dimension 3: Management safety justice	2.83	3.35	0.00
Dimension 4: Worker safety commitment	2.86	3.19	0.00
Dimension 5: Workers' safety priority and risk non-acceptance	3.41	3.28	0.02
Dimension 6: Peer safety communication, learning, and trust in safety ability	2.47	3.28	0.00
Dimension 7: Workers' trust in the efficacy of safety systems	2.91	3.41	0.00

Most of the mean scores are also higher compared to the mean scores from the global 2012 NOSACQ-50 database. The prevalence of occupational injury over the past 12 months is at 18%. The most often injured body parts were hands and legs. The most common types of injuries were open wound, burns and bleeding. The type of factory which recorded the highest number of occupational injuries is a fibreglass factory with 21 cases of occupational injuries (38.9%). Respondents who worked for more than 48 h per week reported a higher prevalence of occupational injury (27.7%) compared to those who worked less than or equal to 48 h. There is a significant statistical association between working hours in a week and occupational injury ($\chi^2 = 7.331$, $p = 0.007$, $OR = 2.3$). Respondents who worked more than 48 h are 2.3 times more likely to have an occupational injury than those who worked equal or fewer than 48 h. Compliance to SOP appeared to be significantly associated with occupational injury ($\chi^2 = 4.255$, $p = 0.039$, $OR = 3.18$). Respondents who did not comply with SOP are 3.18 times more likely to have occupational injury compliant with SOP. There is no significant association between occupational injury and age, gender, educational background, duration of working, shortage of PPE and safety training (Table 1). When measuring the mean differences in safety climate between injured and non-injured workers using an independent t-test, we have statistically significant evidence that there are differences between the mean score across all 7 dimensions of NOSACQ-50 in injured workers as compared to non-injured workers (Table 2).

4. Discussion

Occupational injuries in the past 12 months were reported by 54 workers (18%). This result is much lower than a cross-sectional study involving 215 workers in the fabric manufacturing industry in Perak, where the prevalence of occupational injury was 73.5% [7]. The possibility is the variation in types of manufacturing industries involved in this study compared to a single type of manufacturing industry in the previous study. The study showed a significant association between working hours in a week and occupational injury ($\chi^2 = 7.331$, $p = 0.007$), similar findings were demonstrated [8]. Workers who worked more than 48 h are 2.3 times more likely to have an occupational injury than those who worked equal or fewer than 48 h.

Working over 48 h falls under the International Labor Organization's excessively long hours category, which mainly affects the workers. The more extended working hour can be equated with tiredness that increased the likelihood of making mistakes, not adhering to standard operating procedures, poor decision-making, and errors in judgment and ultimately, accidents. Compliance with SOP appeared to be significantly associated with occupational injury ($\chi^2 = 4.255$, $p = 0.039$). Respondents who were non-compliant to SOP are 3.18 times more likely to have an occupational injury than those who complied with the SOP. The attitude of the employees influenced the incidence of occupational

injury. By practising the SOP, injuries could be avoided.

Safe behaviour in the work practice, and following designed SOP to prevent injury, can reduce the possibility of injury [9]. Independent *t*-test demonstrates enough statistical evidence to prove that there are differences in the mean score of NOSACQ-50 in all dimensions between injured and non-injured workers. These differences indicate that perception of safety climate is different between those two groups. A previous study using the Zohar safety climate tool indicated that workers with a positive safety climate have registered fewer accidents and fewer self-reported injuries. Thus, it has been suggested that a good safety culture contributes to increased productivity and reduced costs in the long run, with fewer occupational injury [1].

Limitations of this study include that research findings were represented in a single geographical location, limited towards small scale industry, slightly small sample size and shorter study duration. Additional research is warranted to evaluate occupational injury and safety climate level involving larger samples, multiple types of industry and a longer duration of study to support these findings.

5. Conclusion

The safety climate among manufacturing industry employees is at a good level, while the prevalence of occupational injury is relatively low. Findings in this study provide useful information for interventions to improve safety culture in the manufacturing industry and reduce the prevalence of occupational injury.

Ethical approval

The Medical Research Ethical Committee approved the present study of Universiti Malaysia Sabah (Number: JKEtika 1/20 (28)).

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Authors' contribution

AA and HS wrote the initial manuscript draft and involved in literature search. KAL initiated the idea concept and supervised the research progress. MSJ provided the study design and expert opinion. SSSAR analysed the data and supervised the study progress. FR, MRH and MYI provided the expert opinion. FH involved in manuscript revision and final review. All authors agreed and approved the final version for publication.

Consent

The participants interested in this study freely completed and submitted the questionnaire. They could ignore performing if they were not interested in participating in the study.

Registration of research studies

Registration of research studies.

1. Name of the registry: [Researchregistry.com](https://www.researchregistry.com).
2. Unique Identifying number or registration ID: researchregistry6899.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): <https://www.researchregistry.com/browse-th>

[e-registry#home/registrationdetails/60cac95fc1dfdb001eecfadbf/](https://www.researchregistry.com/browse-th)

Guarantor

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Declaration of competing interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2021.102699>.

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