

# Basic Causes of Occupational Accidents among Indonesian Migrant Workers in Taiwan

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## Abstract

Complaints related to work accidents are in the 6th highest position of the many complaints of Indonesian Migrant Workers in Taiwan. So far, the protection of Indonesian Migrant Workers in terms of work safety has focused more on social security for Indonesian Migrant Workers who experience work accidents or death due to work accidents. Efforts to prevent work accidents so that Indonesian Migrant Workers do not experience work accidents or deaths due to work accidents do not yet exist. Therefore, it is necessary to analyze the basic causes of work accidents that occur to Indonesian migrant workers in Taiwan so that work accident prevention efforts are effective. The purpose of this study was to determine the basic causes (cut set) of work accidents that occur to Indonesian migrant workers in Taiwan. Starting with identifying the characteristics of 100 Indonesian migrant workers working in Taiwan, then analyzing cases of work accidents that have been experienced by these migrant workers using a cross-sectional study. The most common cases of work accidents experienced by these migrant workers were analyzed for their basic causes using the Fault Tree Analysis method. The results of the analysis using the FTA method for work accidents in the form of pinched hands obtained 8 cut sets. From the basic causes of work accidents that occur to Indonesian migrant workers in Taiwan that have been identified, efforts to prevent work accidents that can be made are that when working, workers should not work while joking or being sleepy, provide appropriate and comfortable PPE, and provide strict sanctions for workers who do not use PPE.

**Keywords:** Cause; Indonesian Migrant Worker; Taiwan; Occupational Accident

## 1. Introduction

The Republic of Indonesia is a country that ranks fourth in terms of population density in the world and is a major source for hundreds of thousands of workers seeking work abroad, such as in Malaysia, Taiwan and Saudi Arabia. The high rate of placement of migrant workers abroad seems to indicate that working abroad continues to be the dream of some people. Their substantial income is one of the reasons they seek their fortune overseas. Based on data on the distribution of sending Indonesian Migrant Workers, the top 3 countries for sending Indonesian Migrant Workers are Malaysia, Taiwan and Saudi Arabia. Taiwan is the largest country for sending Indonesian Migrant Workers in East Asia (BNP2TKI, 2022).

Indonesian Migrant Workers, hereinafter referred to as PMI, are every Indonesian citizen who fulfills the requirements to work abroad in an employment relationship for a certain period of time by receiving wages. This definition comes from article 1 paragraph (1) of Law No. 39 of 2004 concerning the Protection of Indonesian Migrant Workers Abroad. However, in reality there are still many cases that befall Indonesian workers abroad (Republic of Indonesia, 2004). PMI has problems when working abroad so that the state is obliged to protect all its citizens both at home and abroad. In fact, there have

been many efforts made by the Indonesian government to reduce PMI violations. The protection of Indonesian migrant workers is one of the six program focuses or policies of the Ministry of Manpower (Kemenaker) in 2019. The government will continue the migrant worker facilitation program as well as a form of protection. The Ministry of Manpower emphasized that the government must be real present to protect and seek job market opportunities for Indonesian migrant workers. This policy appears in several government policies written in laws, government regulations, and other ministerial regulations.

Although there have been many policies issued by the Indonesian government in providing protection to Indonesian Migrant Workers, the implementation of the protection has not been able to protect Indonesian Migrant Workers, especially in terms of work safety. Based on data on complaints of problems of Indonesian Migrant Workers in Taiwan, work accidents are one of the complaints that have a considerable number of complaints, especially in manufacturing and fishermen. Complaints related to work accidents are in the 6th highest position of the many complaints of Indonesian Migrant Workers in Taiwan. So far, the protection of Indonesian Migrant Workers in terms of work safety has focused more on social security for Indonesian Migrant Workers who experience work accidents or death due to work accidents. Efforts to prevent work accidents so that Indonesian Migrant Workers do not experience work accidents or deaths due to work accidents do not yet exist. Therefore, it is necessary to analyze the basic causes of work accidents that occur to Indonesian migrant workers in Taiwan so that work accident prevention efforts are effective.

The purpose of this study was to determine the basic causes (cut set) of work accidents that occur to Indonesian migrant workers in Taiwan. Starting by identifying the characteristics of 100 Indonesian migrant workers working in Taiwan, then analyzing cases of work accidents experienced by these migrant workers using a cross-sectional study. The most common cases of work accidents experienced by these migrant workers were analyzed for their basic causes using the Fault Tree Analysis method. This study contributes to the determination of important characteristics in statistics (Lin et al., 2018; Lin & Prasetyo, 2019; Lin et al., 2019a; Lin et al., 2019b; Martinez et al., 2019; Miraja et al., 2019; Prasetyo, 2019; Prasetyo et al., 2014; Prasetyo et al., 2019; Torres et al., 2019) that can be used for preventive measures, especially for Indonesian migrant workers working in Taiwan.

## **2. Materials and methods**

### *2.1 Materials*

Each participant was given a questionnaire containing two parts to fill out. The first part is questions related to the respondent's identity asking about age, gender, marital status, educational background, profession, length of work, length of residence in Taiwan, and difficulty in communicating. The second part is questions related to work accidents that have been experienced.

### *2.2 Data collection procedures*

This research went through several stages of the process, starting from a case study of the problems discussed, data collection through questionnaires distributed to 100 Indonesian Migrant Workers in Taiwan, analyzing cases of work accidents experienced by these migrant workers, and data analysis using the FTA method.

### *2.3 Data analysis*

To analyze cases of work accidents experienced by Indonesian Migrant Workers in Taiwan using a cross-sectional study and to analyze the data using the FTA method to determine the basic causes of work accidents experienced by Indonesian Migrant Workers in Taiwan.

## **3. Results and discussion**

### *3.1 Characteristics of Respondents*

Table 1 shows the characteristics of the 100 workers who participated in this study. The respondents

were mostly female (83%) with an age range of 40-49 years (36%). Their marital status was mostly married (63%). Their educational background was high school (36 workers). A total of 50 (50%) respondents worked as care takers/care givers. Forty-seven workers had worked for more than four years. 34 respondents (34%) had lived in Taiwan for 4-6 years. While in Taiwan, 87 respondents (87%) did not experience any difficulties in communicating.

**Table 1.** Participants characteristics.

Characteristics of Respondents	Categories	n	%
Age	≥ 60 years old	1	1
	50-59 years old	11	11
	40-49 years old	36	36
	30-39 years old	30	30
	20-29 years old	22	22
Gender	Man	17	17
	Woman	83	83
Marital Status	Married	63	63
	Single	21	21
	Divorced	16	16
Educational Background	Master Degree	4	4
	Bachelor's Degree/Diploma Degree	3	3
	High School	36	36
	Junior School	48	48
	Elementary School	9	9
Profession of Work	Care Taker/Care Giver	50	50
	Household Servant	24	24
	Working in Factory	9	9
	Chef	4	4
	Hotel Staff	2	2
	Trader	2	2
	Other	9	9
Length of work	More than four years	47	47
	3-4 years	23	23
	1-2 years	26	26
	Less than one years	4	4
Length of Residence in Taiwan	Less than one years	3	3
	1-3 years	22	22
	4-6 years	34	34
	7-9 years	18	18
	10-12 years	12	12
	13-15 years	5	5
	More than fifteen years	6	6
Difficulty in Communicating	No	87	87
	Yes	13	13
<b>Total</b>		100	100

### 3.2 Cause Combination of Indonesian Migrant Workers Accidents

Table 2 shows the combination of accident causes that occurred in 14 Indonesian migrant workers in Taiwan who experienced work accidents. Based on Table 2, seven cases were found to have 2, 4, 5 and up to 6

causes. For 2 causes, one worker was reported to have experienced a work accident due to being hit by a hard object from a work tool/material and working not in accordance with work procedures, one worker was reported to have experienced a work accident due to being hit by a hard object from a work tool/material and being pinched by a work tool/machine, and one worker experienced a work accident due to working not in accordance with work procedures and being pinched by a work tool/machine. For 4 causes, two workers were reported to have experienced work accidents due to being hit by a hard object from a work tool/material, working not in accordance with work procedures, being exposed to solutions or chemical splashes, and being pinched by a work tool/machine and one worker experienced a work accident due to being hit by a hard object from a work tool/material, being pinched by a work tool/machine, impaired concentration due to vibration, and being crushed. For 5 causes, one worker was reported to have a work accident due to working not in accordance with work procedures, being exposed to solutions or chemical splashes, being pinched by work tools/machine, having disturbed concentration due to noisy machines/work tools, and having disturbed concentration due to vibrations. For 6 causes, one worker was reported to have a work accident due to being hit by a hard object from a work tool/material, working not in accordance with work procedures, being exposed to solutions or chemical splashes, having disturbed concentration due to noisy machines/work tools, having disturbed concentration due to vibrations, and being crushed.

**Table 2.** Cause combination of Indonesian Migrant Workers accidents.

(N=14)	Freq.	%
<b>1-cause</b>	<b>6</b>	<b>43%</b>
• Exposure to chemical solutions or splashes	3	22%
• Pinched by a work tool/machine	2	14%
• Bump by hard objects from tools/work materials	1	7%
<b>2-causes</b>	<b>3</b>	<b>21%</b>
• Bump by hard objects from tools/work materials*Working not in accordance with work procedures	1	7%
• Bump by hard objects from tools/work materials*Pinched by a work tool/machine	1	7%
• Working not in accordance with work procedures*Pinched by a work tool/machine	1	7%
<b>4-causes</b>	<b>3</b>	<b>21%</b>
• Bump by hard objects from tools/work materials*Working not in accordance with work procedures*Exposure to chemical solutions or splashes*Pinched by a work tool/machine	2	14%
• Bump by hard objects from tools/work materials*Pinched by a work tool/machine*Disruption of concentration due to vibrations*Struck down	1	7%
<b>5-causes</b>	<b>1</b>	<b>7%</b>
• Working not in accordance with work procedures*Exposure to chemical solutions or splashes*Pinched by a work tool/machine*Disturbed concentration due to noisy machines/work tools*Disruption of concentration due to vibrations	1	7%
<b>6-causes</b>	<b>1</b>	<b>7%</b>
• Bump by hard objects from tools/work materials*Working not in accordance with work procedures*Exposure to chemical solutions	1	7%

or splashes*Disturbed concentration due to noisy machines/work tools*Disruption of concentration due to vibrations*Struck down		
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### 3.3 Frequency Distribution of Occupational Accident

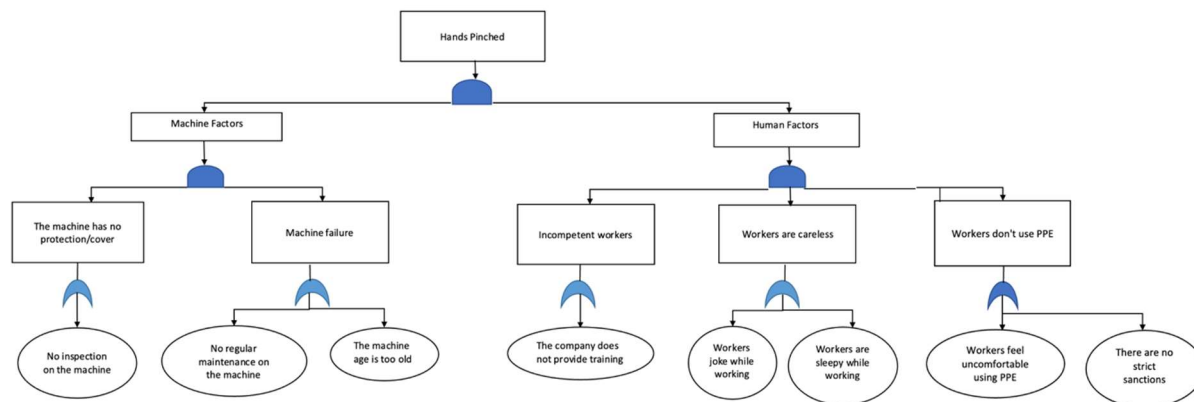
Table 3 shows the frequency distribution of work accidents from 35 cases of work accidents that occurred to Indonesian migrant workers in Taiwan. Based on Table 3, the causes of work accidents in detail consist of impact by hard objects from work tools/materials, working not in accordance with work procedures, being exposed to solutions or chemical splashes, being pinched by work tools/machine, disturbed concentration due to noisy machines/work tools, disturbed concentration due to vibrations, and being crushed. Seven workers experienced work accidents due to impact by hard objects from work tools/materials, six other workers experienced work accidents due to working not in accordance with work procedures, seven workers experienced work accidents due to being exposed to solutions or chemical splashes, eight workers experienced work accidents due to being pinched by work tools/machine, two workers experienced work accidents due to disturbed concentration due to noisy machines/work tools, three workers experienced work accidents due to disturbed concentration due to vibrations, and two workers experienced work accidents due to being crushed. Therefore, it is important to educate Indonesian migrant workers in Taiwan about work hazards, especially those related to the danger of hands being pinched by work tools/machine.

**Table 3.** Frequency distribution of occupational accident.

(N = 35)	Freq.	%
• Bump by hard objects from tools/work materials	7	20%
• Working not in accordance with work procedures	6	17%
• Exposure to chemical solutions or splashes	7	20%
• Pinched by a work tool/machine	8	23%
• Disturbed concentration due to noisy machines/work tools	2	6%
• Disruption of concentration due to vibrations	3	8%
• Struck down	2	6%

### 3.4 Fault Tree Analysis

The following are the results of the analysis to determine the basic causes of work accidents experienced by Indonesian Migrant Workers in Taiwan using the FTA method. The top event in the form of a work accident, where a pinched hand was selected based on the results of a questionnaire distributed to 100 Indonesian Migrant Workers in Taiwan. From the results of the questionnaire, it can be seen that the type of work accident that often occurs to Indonesian Migrant Workers in Taiwan is a pinched hand.



**Figure 1.** Fault Tree Analysis.

The results of the analysis using the FTA method for work accidents in the form of pinched hands obtained 8 cut sets, namely the absence of inspections on the machine, the absence of periodic repairs on the machine, the age of the old machine, the company does not provide training to workers, workers joke when working, sleepy, feel uncomfortable, and there is no strict sanctions from the company if workers do not follow company procedures.

### 3.5 Work Accident Prevention

From the basic causes of work accidents that occur to Indonesian migrant workers in Taiwan that have been identified, the following are efforts to prevent work accidents that can be made:

1. Inspect the machines used in the work periodically and repair if any discrepancies are found.
2. Do not use old machines.
3. The company should often provide training to its workers to improve their competence.
4. When working, workers should not work while joking or falling asleep.
5. Provide appropriate and comfortable PPE.
6. Implement strict sanctions for workers who do not use PPE.

## 4. Conclusion

The purpose of this study was to determine the root cause (cut set) of work accidents that occurred to Indonesian migrant workers in Taiwan. Starting with identifying the characteristics of 100 Indonesian migrant workers working in Taiwan, then analyzing cases of work accidents experienced by these migrant workers using a cross-sectional study. The most common cases of work accidents experienced by these migrant workers were analyzed for their root causes using the Fault Tree Analysis method.

Based on the research that has been conducted, seven workers experienced work accidents due to impact by hard objects from work tools/materials, six other workers experienced work accidents due to work not in accordance with work procedures, seven workers experienced work accidents due to exposure to solutions or chemical splashes, eight workers experienced work accidents due to being pinched by work tools/machine, two workers experienced work accidents due to impaired concentration due to the noise of machines/work tools, three workers experienced work accidents due to impaired concentration due to vibrations, and two workers experienced work accidents due to being crushed. The results of the analysis using the FTA method for work accidents in the form of pinched hands obtained 8 cut sets.

From the basic causes of work accidents that occur to Indonesian migrant workers in Taiwan that have been identified, efforts to prevent work accidents that can be done are to inspect the machines used in work regularly and repair them if any discrepancies are found, not to use old machines, the company should often provide training to its workers to improve their competence, when working, workers should not work while joking or being sleepy, provide appropriate and comfortable PPE, and impose strict sanctions on workers who



do not use PPE. This study contributes to the determination of important characteristics in statistics (Lin et al., 2018; Lin & Prasetyo, 2019; Lin et al., 2019a; Lin et al., 2019b; Martinez et al., 2019; Miraja et al., 2019; Prasetyo, 2019; Prasetyo et al., 2014; Prasetyo et al., 2019; Torres et al., 2019) that can be used for preventive measures, especially for Indonesian migrant workers working in Taiwan. This study also contributes to highlighting some important issues of Indonesian migrant workers in Taiwan that require constructive dialogue between the Taiwan Ministry of Labor, agencies or brokers, and the Indonesian Economic and Trade Office to prevent future work accidents.

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### Conflict of interest

This research has no competing financial interests or personal relationships that could influence the work reported in this paper.

### References

- BNP2TKI (2022). Statistik Penempatan Tenaga Kerja Indonesia. BNP2TKI. Indonesia Jakarta
- Lin, C. J., Prasetyo, Y. T., Widyaningrum. (2018). Eye movement parameters for performance evaluation in projection-based stereoscopic display. *Journal of Eye Movement Research.*, vol.11(6):3
- Lin, C. J., & Prasetyo, Y. T. (2019). A metaheuristic-based approach to optimizing color design for military camouflage using particle swarm optimization. *Color Research & Application*, vol.44(5), pp.740–748.
- Lin, C. J., Prasetyo, Y. T., & Widyaningrum, R. (2019). Eye movement measures for predicting eye gaze accuracy and symptoms in 2D and 3D displays. *Displays*, vol.60, pp.1–8.
- Lin, C. J., Prasetyo, Y. T., Siswanto, N. D., & Jiang, B. C. (2019). Optimization of color design for military camouflage in CIELAB color space. *Color Research & Application*, vol.44(3), pp.367–380.
- Martinez, J. E. F., Prasetyo, Y. T., Robielos, R. A. C., Panopio, M. M., Urlanda, A. A. C., & Topacio-Manalaysay, K. C. (2019). The Usability of Metropolitan Manila Development Authority (MMDA) Mobile Traffic Navigator as Perceived by Users in Quezon City and Mandaluyong City, Philippines. *Proceedings of the 2019 5th International Conference on Industrial and Business Engineering - ICIBE 2019*, pp.207-211.
- Miraja, B. A., Persada, S. F., Prasetyo, Y. T., Belgiawan, P. F., & Redi, A. P. (2019). Applying Protection Motivation Theory To Understand Generation Z Students Intention To Comply With Educational Software Anti Piracy Law. *International Journal of Emerging Technologies in Learning (IJET)*, vol.14(18), pp.39.
- Prasetyo, Y. T. (2019). Evaluating Existing China Military Camouflage Designs using Camouflage Similarity Index (CSI). *Proceedings of the 2019 5th International Conference on Industrial and Business Engineering - ICIBE 2019*, pp.321-325.
- Prasetyo, Y. T., Suzianti, A., & Dewi, A. P. (2014). Consumer Preference Analysis on Flute Attributes in Indonesia using Conjoint Analysis. *Proceedings of the International Conference on Advanced Design Research and Education (ICADRE14)*, pp.111-117.
- Prasetyo, Y. T., Widyaningrum, R., & Lin, C. J. (2019). Eye Gaze Accuracy in the Projection-based Stereoscopic Display as a Function of Number of Fixation, Eye Movement Time, and Parallax. *2019 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*.
- Ratriwardhani, R. A. & Sunaryo, M. (2023). *Hazard Identification with Failure Mode & Effect Analysis and Fault Tree Analysis in the Chemical Industry*; Bali Medical Journal. Volume 12, Number 3: 2836-2839.

<https://balimedicaljournal.ejournals.ca/index.php/bmj/article/view/4435/3032>.

Republik Indonesia (2004). Undang Undang No. 39 Tahun 2004 Tentang Perlindungan dan Penempatan Tenaga Kerja Indonesia. Kementrian Tenaga Kerja dan Transmigrasi : Republik Indonesia. Indonesia : Jakarta

Torres, M. E. S., Prasetyo, Y. T., Robielos, R. A. C., Domingo, C. V. Y., & Morada, M. C. (2019). The Effect of Nutrition Labelling on Purchasing Decisions. *Proceedings of the 2019 5th International Conference on Industrial and Business Engineering - ICIBE 2019*, pp.82-86.