

Analysis of factors causing work accidents among oil palm harvesters at PTPN IV Dolok Ilir

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ABSTRACT

According to the ILO every year more than 250 million people experience accidents at work. Throughout 2023, 224 thousand cases of work accidents occurred in the oil palm plantation sector Based on the Occupational Safety and Health Profile, according to data from BPJS Employment, cases of work accidents in North Sumatra in 2024 reached 9,319 work accidents. Work accidents that often occur at PT Dolok Ilir Palm Oil Plantation are impaled by palm thorns, crushed by palm fronds, cut by machetes, eyes exposed to palm waste, scratched by palm fruit thorns. The purpose of this study was to determine the factors that cause the incidence of work accidents in labor workers. This research method uses quantitative with a cross-sectional approach. Sampling using the sloving formula with cluster random sampling technique. The results of the study showed that there were factors that influenced the incidence of work accidents in oil palm harvesters were age, use of PPE, and attitudes with a Sig value. < 0,05. Attitude is the most dominant factor in the incidence of work accidents with an Exp B value = 3.892, which means that a negative attitude is 3.892 times more risky than a positive attitude. It is expected that workers can increase awareness about the importance of prioritizing safety when working.

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INTRODUCTION

Work accidents are unexpected and unwanted events, which can cause harm to humans and property. Although we have entered the era of the industrial revolution 4.0 which is marked by the application of sophisticated technology, good equipment and use of materials, and a workforce that has expertise and skills in doing work, but in a process of work activities there are still sources of danger ((Pemerintah Republik Indonesia), 1970). According to the impact of hazards in every job, there are various kinds, such as accidents, material losses, or even death (Tarwaka, 2014). Law Number 1 of 1970 concerning Occupational Safety explains that all workers have the right to safety when working which aims to increase productivity and welfare (Hidayatullah & Tjahjawati, 2018).

International Labour Organization ³ said, every year there are more than 250 million accidents at work and more than 160 million workers become ill due to workplace hazards.

Moreover, 1.2 million workers die from accidents and illnesses at work. This figure shows that human and social costs are higher than production costs. Then in January 2024, there were 33,409 cases of work accidents in Indonesia with details of 92.07% including wage earner participants, 6.99% including non-wage earner participants and 0.94% including construction service participants (BPJS, 2024b).

Indonesia's National Occupational Safety and Health (OHS) Profile 2022 shows an increasing trend in the number of work accident cases from 2019 to 2021. In 2019, there were 210,789 cases of work accidents with 4,007 fatal cases. This figure increased in 2020 with 221,740 cases of work accidents, although the number of fatalities decreased to 3,410 cases. However, in 2021, the number of work accidents again experienced a significant increase to 234,370 cases, with an increase in the number of deaths reaching 6,552 cases (Yuli A, Sudi A, Muhammad F, 2022). The occurrence of work accidents causes many losses such as injured workers and even death, damage to tools and machinery, material losses, and losses due to time delays (Maddeppungeng et al., 2021).

According to data from BPJS Employment regarding cases of work accidents that occurred in North Sumatra Province in 2023 as many as 22,174 and in 2024 as many as 9,319 cases of work accidents in North Sumatra Province (BPS, 2021). "The data show that North Sumatra ranks 6th for work accidents, which remain high compared to other provinces. The oil palm plantation industry has a high accident risk, with BPJS data reporting 370,000 work accidents in 2023 – 224,000 (60.5%) of which occurred in this sector, up from 169,000 in 2022 (Roudatus Solihah et al., 2023).

Several studies have examined the causes of occupational accidents across industries. Saputra & Azhar (2022) found that age, work period, and PPE use did not significantly affect accidents among coconut harvesters (Saputra & Azhar, 2022). In contrast, Vioni et al. (2021) found that knowledge, PPE condition, and SOPs were linked to accidents among palm oil harvesters. Similar findings showed that age, tenure, behaviour, and knowledge were related to accidents among conversion employees (Vioni et al., 2021). Istiqomah & Irfandi (2021) reported that age and work period were significant factors at PT Bumitama Gunajaya Agro, while gender, education, and PPE were not (Istiqomah & Irfandi, 2021). Hamudya & Pramesty (2022) in a construction project found age, work period, and PPE use were related, but attitudes and knowledge were not (Hamudya, Thalza Pramesty, 2022).

Further research (PAHLEVI, 2020) in the HSSE Operations and Planning Division of PT Pelindo (Dewi Novita Anggraeni et al., 2023) identified that human and environmental factors play a role in work accidents, while mechanical factors there is no meaningful relationship. In the manufacturing sector, study (Konomi et al., 2022) on production workers at PT Cahaya Agam Lestari Agam Regency found that unsafe acts and supervision were associated with work accidents, but unsafe conditions did not have a significant relationship. Another study (Handayani et al., 2024) in Menes District, Pandeglang Regency, the results of the study there is a significant relationship between fatigue and the use of PPE with work accidents, while work position and safety behaviour do not have a significant effect. Meanwhile, research (Yeni Ayu Astuti & Susilawati, 2023) Studies on accidents involving sharp tools or machinery among oil palm harvesters highlight key risks: workers' knowledge, PPE use, and SOP compliance. Overall, accident causes are multifactorial, involving individual, environmental, and OHS policy factors. Based on previous research, the factors of age, work period, use of PPE, attitudes, and knowledge are relevant to be studied for workers who have a risk of work accidents such as oil palm harvesters (Ningsih & Ferijani, 2020).

North Sumatra Province is one of the plantation industry supply areas that has considerable potential in developing industries made from agricultural raw products. North Sumatra Province has plantation crops such as oil palm, rubber, coffee, and tea to make these plantations a potential crop. Oil palm is a strategic agricultural product that is used as a source of vegetable oil. The potential of the palm oil industry sector in North Sumatra can be seen from the

oil palm land area of 442,072.76 hectares with a production of 7,451,890.91 tonnes in 2021 (BPJS, 2024a). By 2023, according to Indonesia's palm oil head statistics, North Sumatra Province will be the 4th largest nationally after Riau Province, Central Kalimantan Province, and Heavy Kalimantan.

PT Perkebunan Nusantara IV Dolok Ilir is an agro-industrial company that manages oil palm plantations, including land management, nurseries, and marketing. Located in the Dolok Ilir Business Unit, Dolok Batu Nanggar District, Simalungun Regency, North Sumatra, the company has harvesting activities as one of the high-risk occupations for occupational accidents. Based on preliminary surveys and observations conducted directly at PT Perkebunan Nusantara IV Dolok Ilir, as well as interviews with several harvesters, foremen, and garden crew, it is known that work accidents are a common occurrence in the work environment. Workplace culture regarding worker compliance to reduce workplace accidents is still minimal due to low awareness of the importance of safety procedures, work habits that prioritize speed over safety, and suboptimal supervision and enforcement of occupational health and safety regulations. Based on the initial survey results, the most common workplace accident risk experienced by workers is being pricked by thorns, which poses a significant threat to safety. In addition, there are other accidents such as falling due to slippery or uneven ground conditions, being struck by harvesting tools, and slipping due to the accumulation of palm fronds on the harvesting path. The specific factors at PTPN IV Dolok Ilir are rarely discussed in previous studies. Therefore, this study aims to analyse the factors that influence the incidence of occupational accidents among oil palm harvesters in the plantation.

RESEARCH METHOD

This type of research is quantitative using a cross-sectional design to see the influencing factors on the incidence of workplace accidents. This research was conducted at PT Perkebunan Nusantara IV Dolok Ilir Unit, Dolok Batu Nanggar Sub-district, Simalungun Regency in January - March 2025. The population in this study were all oil palm harvester workers at PT Perkebunan Nusantara Unit Dolok Ilir totalling 227 oil palm harvesters who were contract workers and permanent employees. The sample in this study was taken from the total population and calculated using the slovin formula totalling 145 respondents. The sampling method in this study uses cluster random sampling technique, where the population is divided into eight afdeling. Each afdeling was determined as a cluster, and the number of respondents in each cluster was determined based on the cluster random sampling formula. The distribution of respondents is as follows: afdeling 1 was 21 respondents, afdeling 2 was 21 respondents, afdeling 3 was 10 respondents, afdeling 4 was 25 respondents, afdeling 5 was 13 respondents, afdeling 6 was 16 respondents, afdeling 7 was 21 respondents, and afdeling 8 was 18 respondents, so the total number of respondents was 145.

The independent variables are age, work period, use of PPE, attitude, knowledge, and supervision and the dependent variable is work accidents. This research instrument uses a questionnaire. Data analysis used univariate analysis to see the frequency of each variable, bivariate analysis using the chi-square test to determine the relationship between the independent variable and the dependent variable, and multivariate analysis using multiple logistic regression test to determine the factors that have an influence on the incidence of work accidents and see the most dominant variable. This research has passed the ethical feasibility test with number: 044.D/KEP-MLP/VII/2025.

RESULTS AND DISCUSSIONS

Univariate Analysis

Univariate analysis was analysed based on descriptive to see the distribution of the proportion of each variable which includes respondent characteristics such as worker age,

worker tenure, PPE use, worker knowledge, worker attitude, and worker supervision, as well as the dependent variable, namely work accidents in workers.

Table 1. Respondent characteristics

Characteristics	Frequency	Percentage (%)
Age		
Young (≤ 35 Tahun)	89	61,4
Old (> 35 Tahun)	56	38,6
Total	145	100
Working Period		
Baru	87	60
Lama	58	40
Total	145	100
Use of PPE		
incomplete	61	42,1
complete	84	57,9
Total	145	100
Attitude		
Negative	72	49,7
Positive	73	50,3
Total	145	100
Knowledge		
Bad	61	42,1
Good	84	57,9
Total	145	100
Supervision		
Bad	57	49,3
Good	88	60,7
Total	145	100
Work Accident		
Ever	54	37,2
Never	91	62,8
Total	145	100

Based on Table 1. shows that respondents with young age are 89 people(61.4%) and old adults are 56 people (38.6%). Respondents with a new working period totalled 87 people (60%) and a long working period totalled 58 people (40%). The complete use of PPE was 84 people (57.9%) and those who did not use PPE were 61 people (42.1%). Respondents with positive attitudes were 73 people (50.3%) while respondents with negative attitudes were 72 people (49.7). Good knowledge 91 people (62.8) and poor knowledge 54 people (37.8). Respondents with good supervision 88 people (60.7%) while respondents with poor supervision 57 people (49.3%). A total of 54 (37.2%) respondents had experienced work accidents and 91 respondents (62.8%) had never experienced work accidents.

Bivariate Analysis

Bivariate analysis aims to see the relationship between variables, namely: analysis of the relationship between age factors, work period factors, PPE use factors, attitude factors, knowledge factors, and supervision factors on the incidence of work accidents.

Table 2. Bivariate analysis of factors associated with occupational accidents in harvesters palm oil harvesters

Variables	Work Accident		PR	95% CI	P value
	Ever	Never			
Age					
Young	42	47	3,277	1,529-7,020	0,002
Old	12	44			
Work Period					
New	41	46	3,085	1,462-6,512	0,003
Old	13	45			

Variables	Work Accident		PR	95% CI	P value
	Ever	Never			
Use of PPE					
Incomplete	32	29	3,110	1,545-6,258	0,001
Complete	22	62			
Attitude					
Negative	38	34	3,982	1,934-8,198	0,000
Positive	16	57			
Knowledge					
Bad	16	41	0,717	0,360-1,430	0,344
Good	38	50			
Supervision					
Bad	19	41	0,662	0,331-1,326	0,243
Good	35	50			

* multivariate analysis if $< 0,25$

Based on table 2. Demonstrate factor analysis that influence work accidents in oil palm harvesters using the chi-square test if there is a relationship obtained the results of p- value ($\alpha = 0.05$). In the analysis above, there is a significant relationship with the incidence of work accidents, namely age ($0.002 < \alpha$), length of service ($0.003 < \alpha$), use of PPE ($0.001 < \alpha$), and attitude ($0.001 < \alpha$). In knowledge there was no significant relationship with a value of ($0.344 > \alpha$) as well as supervision ($0.243 < \alpha$) Furthermore, variables with a p value of 0.25 were used as candidates for multivariate tests.

Multivariate Analysis

Multivariate analysis was conducted to analyse the influential variables and see the dominant variables affecting the incidence of work accidents in oil palm harvesters in PTPN IV Dolok Ilir oil palm plantations.

Table 3. Final multivariate modelling

No.	Variabel	B	S.E	P	Exp (B)	95% CI
1	Constant	- 4,922				
X2	Age	1,1020,420	0,009	3,009	1,320-6,859	
X3	Use of PPE	1,1720,394	0,003	3,228	1,490-6,993	
X4	Attitude	1,4730,399	0,000	4,362	1,994-9,544	

Omnibus Test: 0,000

Based on table 3, there are factors that influence the incidence of work accidents, age, use of PPE, and attitude. Age has an Exp (B) value of 3.009, which means that young age is 3.009 times more risky than old age. In the use of PPE, the Exp (B) value is 3.228, which means that not using PPE is 3.228 times more risky than using PPE. Attitude is the most dominant variable with an Exp (B) value of 4.362, where a negative attitude is 4.362 times riskier than a positive attitude. The omnibus test results show a value of (0.000) which means that the model above is said to fulfil the feasibility.

Based on the results of data processing, it is known that the number of workers who have experienced work accidents is 54 people (37.2%) while those who have never experienced work accidents are 91 people (62.8%). Of all cases of work accidents that occurred, none resulted in fatalities. The types of accidents that occurred only ranged from minor accidents such as being pricked by palm thorns, scratched by palm fruit, cut, or hit by objects of work equipment. The body parts that suffered accidents were the hands and feet.

The Influence of Attitude Factors on Work Accidents

Attitude is a factor that has contributed to the formation of safe behaviour at work, therefore several disciplinary efforts need to be made by companies such as setting working time, increasing competence in the field of work, using PPE, and work procedures are expected to

provide a stimulus or stimulus for workers to get a good attitude in carrying out their work. (Bafadhal et al., 2022).

Based on the data obtained from the results of the study, it can be seen that out of 54 respondents who have experienced work accidents, more workers with negative attitudes have experienced work accidents than workers with positive attitudes. Based on the results of the chi-square test above, the p value ($0.000 < 0.05$) indicates that there is a significant relationship between attitude and work accidents. The work attitude variable is the most dominant factor affecting work accidents with an influence of 4.362 times on work accidents seen from the exp (B) value of the multivariate test, which means that to reduce the number of work accidents, interventions must be made for workers who have negative attitudes such as smoking while working, not using complete PPE, and not attending tool box meetings.

The test results above contradict the research (Hamudya, Thalza Pramesty, 2022) stated that there was no significant relationship between attitudinal factors and work accidents with a p value = (0.842). However, in line with research (Roudatus Solihah et al., 2023) which shows there is a significant relationship between attitude and work accidents with a p value (0.000) and has an influence of 1.496 times on work accidents. The results of the study from 145 workers, who had a positive attitude there were 16 worker respondents who had experienced work accidents and workers with negative attitudes who had experienced work accidents as many as 38 people. This indicates that the more negative the attitude, the higher the tendency for work accidents to occur and vice versa, if workers have a positive attitude, the incidence of work accidents will also decrease. In the results of this study, it is known that the attitude that has the most negative responses is the attitude of workers towards the use of PPE while working, because workers feel that they are uncomfortable and disturbed when working using PPE.

The results of researchers' observations saw that oil palm harvesters at PT Perkebunan Nusantara IV Dolok Ilir often removed PPE when there were no supervisors in the workplace. Then there is no smoking ban while working and there are no K3 signs in the work location, of course, this affects the attitude of the workers. For workers who have a good attitude while working such as focusing on work, using PPE, not joking with other workers, using tools that are still suitable for use will minimise the potential for workplace accidents in the workplace (Susanty et al., 2023). In work accident prevention efforts, perceptions and beliefs influence attitudes about the hazard of accidents, the costs, and the benefits of taking preventive action. For this reason, the impacts caused by work accidents and preventive actions must be informed to oil farm harvester to create a safe attitude at work (Handayani et al., 2024).

The Influence of PPE Use Factors on Work Accidents

Based on the results of the study, it was found that out of 61 workers who used incomplete PPE there were 32 (52.5%) workers who had experienced work accidents and 51 workers who used complete PPE as many as 22 (26.2%) who had experienced work accidents. The percentage shows that respondents who use incomplete PPE while working tend to experience work accidents compared to workers who use complete PPE at work. The exp (B) value is 3.228, which means that the use of incomplete PPE 3.228 times affects work accidents.

Research (Vioni et al., 2021) showed the same result that there was a significant relationship between the use of PPE and work accidents with a p value = 0.005. These results indicate that workers who wear incomplete PPE tend to experience work accidents than workers who wear complete PPE. The use of PPE can minimise the level of work accidents, minimise risks, and increase work productivity²². Using personal protective equipment is an obligation of workers to protect workers from the risk of work accidents (Husna et al., 2020). The goal is to maintain the safety of workers and also those around them. In addition, the PPE used must be comfortable and according to standards, and effective in providing protection against hazards that may occur (Sehsah et al., 2020).

Researchers conducted observations and interviews with oil palm harvester workers at PT Perkebunan Nusantara IV Dolok Ilir and found that PT Perkebunan Nusantara IV has provided complete PPE, namely: head protection (helmet), protective glasses (goggles), long-sleeved work clothes, cloth gloves, safety boots, and *egrek* gloves. PPE is given a 1-year allotment of use and will be given new PPE the following year, many respondents claimed to wear boots for activities outside working hours such as farming and herding cows. This causes safety boots to be damaged prematurely because workers do not take good care of the PPE provided. When working oil palm harvesters often do not use the gloves provided because they feel uncomfortable and make their hands sweat, this results in workers experiencing workplace accidents, the hands of workers are scratched by the sharp surface of the palm fruit and some are pricked by palm thorns when lifting oil palm fruit bunches (Hamudya, Thalza Pramesty, 2022).

The Influence of Worker Age on Work Accidents

Based on the results of the study, it was found that there were more young adults than old adults. In addition, based on the results of the study, younger respondents experienced more work accidents than older respondents. The results showed that there was an influence of age on the incidence of work accidents. At the age of ≥ 35 years is a period where the process of degeneration or decline in organ function occurs, so that organ function will decrease as the age of the respondent increases in work. Supported by research (Istiqomah & Irfandi, 2021) which shows the result that there is a significant relationship between age and work accidents with a *p* value (0.000).

Increasing age is able to change a more rational mindset and has the ability to manage emotions so that it shows maturity in thought and psychology (Latipah et al., 2024). Whereas at a young age (<35 years old) tend to be more careless and less careful about the dangers and risks of workplace hazards (Bachtiar Chahyadhi, 2025). The researcher's assumption from the observations made, workers with a young age are only focused on completing the work targets given so that they are completed quickly according to the target so that they ignore safety when working (Kuniagis Kalogis, 2024). Older workers are more careful when working to avoid work accidents and physical capacity which includes speed, strength, flexibility, coordination and reaction speed decreases at the age of more than 35 years. Workers with old age also consider family factors, because work accidents can cause workers to inconvenience their families and have to take time off work (Sitanggang et al., 2024).

CONCLUSION

Based on the results of the study, the factors that influence the incidence of work accidents among oil palm harvesters are age, use of PPE, and attitudes, with a Sig. value of 0.05. Attitude is the most dominant factor in the incidence of work accidents, with an Exp B value = 3.892, which means that a negative attitude is 3.892 times more risky than a positive attitude. It is expected that workers can increase their awareness of the importance of prioritising safety at work, and that companies strengthen OHS regulations. Further researchers can examine more deeply the unsafe attitude factors that affect the incidence of work accidents in oil palm harvesters at PT Perkebunan Nusantara IV Dolok Ilir. In addition, further research should explore other potential determinants, such as environmental conditions, work equipment safety, supervision quality, and organisational safety culture, to complement our understanding of workplace accident determinants in oil palm plantations. Moreover, developing a workplace accident risk prediction model based on these factors could be beneficial for screening high-risk workers, enabling targeted interventions and preventive measures before accidents occur.

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