

Analysis of Risk Factors Causes of Occupational Accidents in the Vocational School

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Abstract

Vocational school is an educational institution that combines expertise programs into work practice programs. The large number of work practices carried out makes students close to the dangers in the workshop, if students are not balanced with knowledge of occupational health and safety (OHS), the actions taken by students are not safe and supervision is lacking, it will increase the incidence of workplace accidents at school. This research was quantitative research and used analytic descriptive survey with cross sectional study design. This research was carried out with 97 student in the XI grade students who were studying at Pratiwi Vocational School and agreed to participate in the research. The data were collected using questionnaire and analyzed using univariate analysis and bivariate analysis with chi-square statistical test. The result of the bivariate analysis showed that there were variables related to workplace accident, namely the knowledge of OHS variable (p-value 0.000), unsafe action (p-value 0.034) and supervision (p-value 0.036). Workplace accidents at school can be minimized by involving teachers in OSH management in school, namely increasing teacher understanding of OSH and developing teacher practical skills in providing risk education to students and giving "safety briefings" first to reminded student memories of what hazards around the workshop, cultivate occupational health and safety (OHS) in school activities and train students to identify hazards around them.

Keywords: Work Accident, Knowledge, Unsafe Action, Supervision, Vocational School

Introduction

Based on the latest estimates released by the International Labor Organization (ILO), workers who die each year due to workplace accidents and occupational diseases are 2.78 million workers. With 2.4 (86.3%) million caused by illness obtained by workers while working and 380,000 (13.7%) caused by workplace accidents. Costs incurred if young workers are injured can be more

when compared with adult workers. Considering the consequences of injury if young workers are experiencing these workers may become temporarily inactive and the education and training received cannot be maximally utilized. Therefore it is necessary to be able to understand and overcome the safety and health risk factors faced by young workers between the ages of 15 and 24 years.¹ Today the rate of work accidents in adult workers is lower than that of young workers. Based on data from Europe, the incidence of non-fatal accidents at work is more than 40% higher in young workers aged 18 and 24 than adult workers.² For the United States alone, young workers aged 15 and 24 are at twice the risk higher for non-fatal workplace accidents compared to workers aged 25 years and over.³

Based on data from Kementrian Kesehatan Republik Indonesia in 2015 workers who experienced accidents due to work increased significantly from 2011-2013. In 2011 there were 9,891 accidents due to work, in 2012 there were 21,735 cases and in 2013 there were 35,917 cases. Whereas in 2014 accidents due to work decreased, which recorded as many as 24,910 accidents. This figure will continue to grow if there is no special attention to the health and safety of workers.⁴ Meanwhile, according to the latest data released by the Center for Labor Data and Information (Pusdatinaker) the number of workers who had accidents in 2017 in Indonesia was 10,588 cases. 3,251 accidents recorded by type of accident A. Type of accident A is an accident caused by sharp and hard objects that can cause stabbing, being cut, scratched, etc. While in South Sumatra in

2017 there were 382 (3.6%) work accidents with the most types of accidents in type A were 229 work accidents.^{5,6}

Undang-Undang No. 1 Tahun 1970 can not only be applied in industry, but also in educational institutions which use technical tools. One of the educational institutions referred to in the law is the Vocational High School (SMK). Vocational School is a place to order skilled human resources so that they can prepare people who are able to meet industrial needs without ignoring occupational health and safety (K3) standards. Knowledge and skills regarding occupational safety and health must be provided at vocational high schools. It aims to anticipate work accidents when students carry out practical activities and as a provision of experience to enter the industrial world. So that in the implementation of work practices students can work safely and productively so that the end result is safe and healthy at work. The way to do this is by complying with standards or regulations in occupational safety and health.⁷ In 2011 it was discovered that accidents that had been experienced by workers often occurred in production areas or fields where workers directly came into contact with machines and followed the production process. Based on data from companies, workers who work in the production area are those with Vocational High School graduates. With this fact it can be concluded that work accidents are mostly experienced by workers with SMK graduates.⁸

According to research conducted by Andarini (2014) regarding occupational safety and health risk assessments at the SMKN 2 Kota Palembang motorcycle engineering laboratory unit, the hazards identified were 41 hazards including carbon monoxide gas, noise, explosive gases, sulfuric acid (H_2SO_4), chlorinated hydrocarbons, pinched, heat, dust and smoke, asbestos powder, cut, fire, electric shock, fatigue, heavy lifting, human error, used lubricating oil, hand entering the grinding machine, the equipment is

overheating, hair stuck to the machine and attracted, sharp edges / points, splashes of molds / workpiece sprays, sprained hands, ergonomic problems, slipped, crushed, hand cut off, equipment stability. The highest risk is in the significant risk category which consists of, noise, explosive gases, sulfuric acid (H_2SO_4), carbon monoxide gas, chlorinated hydrocarbon.⁹

Seeing the many work practices carried out by vocational students make them close to the dangers that can be threatening and at risk for workplace accidents. Makadari said that this study aimed to determine the relationship between K3 knowledge, unsafe actions (unsafe actions) and supervision with work accident incidents that happened to the XI grade students at SMK Pratiwi Kota Prabumulih.

Methods

This research is quantitative research and uses descriptive analytic survey with cross sectional approach. This method is used to determine the relationship of the dependent variable that is work accident with an independent variable namely K3 knowledge, unsafe actions (unsafe actions) and supervision by means of data collection carried out simultaneously at a time. The population of this study were students of Pratiwi Vocational School Prabumulih. Samples were taken by simple random sampling using a different proportion of the hypothesis test. Based on the sample calculation results, 97 samples were obtained for this study.

The instrument used in this study to collect data is by using a questionnaire consisting of questionnaires for work accident variables, OSH knowledge, unsafe actions and modified supervision. Data analysis used univariate and bivariate analysis using chi-square statistical tests.

Results

The results of the data that has been collected and processed then, can be known distribution and characteristics of the

respondents. The following data are the characteristics of respondents:

Table 1. Data of Grade XI Students of Pratiwi Vocational School Prabumulih

No.	Characteristics of Respondents	Amount	Percent (%)
1.	Age (years)	1	1
	15	53	54.6
		35	36.1
	16	7	7.2
		1	1
	17	97	100
	18		
	19		
	Total		
2.	Gender of Male	97	100
	Total	97	100
3.	Grade	26	26.8
	XI. TKR 1	25	25.8
	XI. TKR 2	23	23.7
	XI. TKR 3	23	23.7
	XI. TKR 4		
	Total	97	100
4.	Majors	97	100
	Automotive	97	100
	Total :		

Source: Primary Research Data

Based on the table above it can be seen the frequency distribution for the characteristics of Pratiwi Vocational School students. Percentage of respondent's age 1 (1%) was 15 years old, 53 (54.6%) the majority were 16 years old, 35 (36.1%) were 17 years old, 7 (7.2%) were 18 years old and 1 (1%) 1%) is 19 years old. Percentage of sex 97 (100%) respondents were male. Percentage of class 26 (26.8%) the majority came from class XI TKR 1, 25 (25.8%) came from class XI TKR 2, 23 (23.7%) came from class XI TKR 3 and 23 (23.7%) came from class XI TKR 4 And the percentage of 97 majors (100%) of the respondents were students majoring in Automotive Light Vehicle Engineering.

A. Univariate Analysis

Table 2. Frequency Distribution of Occupational Accidents in Class XI Students of SMK Pratiwi Prabumulih City

Work Accident	F (n)	Percent (%)
Ever	63	64.9%
Never	34	35.1%
Knowledge of OHS	F (n)	Percent (%)
Low	28	28.9%
Enough	34	35.1%
High	35	36.1%
Unsafe Action	F (n)	Percent (%)
Unsafe	47	48.5%
Safe	50	51.5%
Supervision	F (n)	Percent (%)
Low	38	39.2
High	59	60.8

Source: Primary Research Data

Based on the table above it can be seen that as many as 63 respondents (64.9%) have experienced workplace accidents with the percentage of students who had an accident while practicum was 43 (64.3%) while the percentage of students who almost had an accident while practicum was 20 (31.7%) and 34 respondents (35.1%) have never had a work accident. As many as 28 respondents (28.9%) had low knowledge of occupational safety and health (K3), 34 respondents (35.1%) had sufficient knowledge and 35 respondents (36.1%) had good knowledge of occupational safety and health (K3). As many as 47 respondents (48.5%) had unsafe behavior during practicum and 50 respondents (51.5%) had safe behavior in carrying out practicum. And as many as 38 respondents (39.2%) stated if supervision conducted by the school was still low and 59 respondents (60.8%) stated if the supervision carried out by the school was already high.

B. Bivariate Analysis

Table 3. The Relationship of Occupational Health and Safety to Occupational Accidents in Class XI Students of Pratiwi Vocational School Prabumulih

Knowledge	Work Accident				Total		p-Value
	Ever		Never				
	F	%	F	%	F	%	
Low	26	92.9	2	7.1	28	100	0.000
Enough	14	41.2	20	58.8	34	100	
High	23	65.7	12	34.4	35	100	
Total	63	64.9	34	35.1	97	100	

Source: Primary Research Data

Based on the table above shows that the incidence of work accidents in class XI students of Pratiwi Vocational School Prabumulih as many as 26 (92.9%) student knowledge is low, as many as 14 (41.2%) student knowledge is sufficient and as many as 23 (65.7%) student knowledge is high. As for students who have never had a work accident as many as 2 (7.1%) have low knowledge, 20 (58.8%) students have enough knowledge and 12 (34.4%) students have high knowledge. After analyzing the data using the Chi-Square statistical test p values (p-value) 0.000 <0.05. The results of this statistical test indicate that there is a significant relationship between occupational health safety knowledge and work accident events in class XI students of Pratiwi Vocational School Prabumulih.

Table 4. The Relationship between Unsafe Action and Occupational Accidents in Class XI Students of Pratiwi Vocational School, Prabumulih City

Unsafe Action	Work Accident				Total		p- Value
	Ever		Never				
	f	%	f	%	F	%	
Unsafe	36	76.6	11	23.4	47	100	0.034
Safe	27	54.0	23	46.0	50	100	
Total	63	64.9	34	35.1	97	100	

Source: Primary Research Data

Based on the table above shows that the incidence of work accidents in class XI TKR Vocational School Pratiwi Prabumulih City as many as 36 (76.6%) of respondents

acting in the practicum activities were not safe and 27 (54%) of respondents acting in practicum activities were safe. As for respondents who have never had a work accident as many as 11 (23.4%) of respondents take actions unsafe and as many as 23 (46%) of respondents take actions safely. After analyzing the data using the Chi-Square statistical test p values (p-value) 0.034 <0.05. The results of this statistical test indicate that there is a relationship between unsafe action (unsafe action) with work accident in XI grade students of Pratiwi Vocational School Prabumulih.

Table 5. Relationship between Supervision and Occupational Accidents in Class XI Students of Pratiwi Vocational School, Prabumulih City

Supervision	Work Accident				Total		p-Value
	Ever		Never				
	f	%	F	%	F	%	
Low	30	78.9	8	21.1	38	100	0.036
High	33	55.9	26	44.1	59	100	
Total	63	64.9	34	35.1	97	100	

Source: Primary Research Data

Based on the table above shows that the incidence of work accidents in class XI TKR Vocational School Pratiwi Prabumulih City as many as 30 (78.9%) respondents stated if supervision from the school was still low and 33 (55.9%) respondents stated if supervision was already high. As for respondents who have never had a work accident as many as 8 (21.1%) respondents stated that supervision from the school was still low and as many as 26 (44.1%) respondents stated that supervision from the school was already high. After analyzing the data using the Chi-Square statistical test, the p value (p-value) was 0.036 <0.05. The results of this statistical test indicate that there is a relationship between supervision with work accident events in class XI students of Pratiwi Vocational School Prabumulih.

Discussion

A. Relationship between Occupational Health Safety Knowledge and Occupational Accident in Class XI Students of Pratiwi Vocational School, Prabumulih City

Based on the results of the study, there is a relationship between occupational safety and health knowledge (K3) with workplace accidents in class XI students of Pratiwi Vocational School Prabumulih with p (p -value) $0.000 < 0.05$. this study can strengthen previous research conducted by Kurniawan, et al. that there is a significant relationship between occupational safety and health knowledge and occupational accidents.¹⁰ And in line with research conducted by Pratiwi, et al who concluded that there is a negative relationship between OSH knowledge and workplace accident nurses at risk units, which means the better the nurse's knowledge the lower the incidence of workplace accidents.¹¹ According to research from Martiwi, et al, it is known that most respondents have a low level of knowledge (56.5%). The results of this study indicate that respondents who have a low level of knowledge have a higher risk of experiencing work accidents.¹²

Students with extensive mastery of K3 material or knowledge will tend to have awareness to behave K3 because they know what risks they will get if they do not pay attention to K3. Students with mastery of material or knowledge of K3 are less likely to be aware of K3 behavior when practicing because they do not know exactly what risks will be faced if they do not pay attention to K3.¹³ The teacher must monitor the process of applying occupational health and safety (OSH), so that the application of OSH of each practitioner (student) can be monitored optimally in order to familiarize (civilize) the OSH in each of his work. K3 aspects regarding hazards, risks and solutions should be fostered continuously. Jobsheets that contain K3 must be clear and make it easier for students to live it. Learning in this way over a long period of time will make

students better understand K3.¹⁴ According to Temiz, et.al. Student knowledge about occupational health and safety needs to be improved and strengthened by using visual learning techniques and simulation application methods.¹⁵

B. Relationship between Unsafe Action and Occupational Accidents in Class XI Students of Pratiwi Vocational School, Prabumulih City

Based on the results of the study there is a relationship between Unsafe Action and the incidence of workplace accidents in class XI students of Pratiwi Vocational School Prabumulih with a p -value of 0.034 (p -value < 0.05). In line with previous research conducted by Ramdan, et al that there is a relationship between unsafe actions (unsafe act) with workplace accidents.¹⁶ This study is also in line with research that has been done by Zakaria, et al. that of the five variables studied namely stress and fatigue, unsafe actions, machinery or equipment, workplace design and training procedures there is a relationship with workplace accidents.¹⁷ Based on research conducted by Winarto, et al workers who take unsafe actions more work accidents than the group of workers who did unsafe actions but did not experience work accidents from the statistical test results obtained p -value 0.0001 (p -value < 0.05) means that there is a relationship between workers' actions with work accidents in the PT.X drilling unit .¹⁸ According to research conducted by Dahlan, M. regarding the analysis of the causes of work injuries at PT Pal Indonesia throughout 2013, there were 11 accident incidents caused by unsafe actions and conditions.¹⁹ According to Arli, et.al. in his research found nursing students who do not use needles and other sharp objects safely remember nursing students who have a high risk of injury by syringes and sharp objects.²⁰

Based on the Multiple Causation Theory developed by Petersen in 1971 that there are two factors causing occupational

accidents, namely Unsafe Action and Unsafe Condition. Unsafe Action (Unsafe Action) is when a person performs tasks without consideration of safety standards such as working without protective equipment or working while lacking sleep. Unsafe Condition (Unsafe Condition) is a condition where the workplace and environment are not safe according to safety and health standards, such as examples of scaffolding that is wrong.²¹ It is known that the cause of accidents that have occurred to date is caused by unsafe behavior that is not careful- liver, do not obey the rules, do not follow the standard work procedures, do not wear personal protective equipment and weak body condition.²²

C. Relationship between Supervision and Occupational Accidents in Class XI Students of Pratiwi Vocational School Prabumulih City

Based on the results of the study there is a relationship between supervision with work accident in XI grade students of Pratiwi Vocational School Prabumulih City with a p-value of 0.036 (p-value <0.05). The results of this study can strengthen previous research conducted by Ansari, et al. That there is a significant relationship between supervision with workplace accidents.²³ Based on research conducted by Ningsih, et al that respondents who have poor supervision have more work accidents and the results of statistical tests show there are the relationship between supervision and work accident events. One of the causes of work accidents is the weak level of supervision of this condition originating from the mistakes of supervisors who fail to ensure that the knowledge given to workers is really applied at work or not, if not then the supervisor must conduct more supervision of the worker.²²

A good supervision style has a negative relationship with unsafe behavior and accidents which means that if the supervision given is good then the unsafe behavior and accidents are reduced.²⁴ Effective supervision goes on and affects

workers who will be reluctant to commit violations and the feeling of security obtained by workers if supervision is conducted.²⁵ According to research conducted by Manik, et al perception of the existence of a safety officer as the supervisor of the implementation of SOPs in the company is good and has an influence on the practice of key informants to work according to the K3 aspects of CCAI Central Java, although sometimes there are still some of the key informants returned to neglect the K3 aspect after the safety officer no longer supervised the work carried out at the place.²⁶ The support provided by the leadership to carry out work in accordance with the Standard Operating Procedure (SOP) was already good because there can be oversight of the work performed. Such supervision can be in the form of a warning in the form of a verbal warning if there are jobs that do work not in accordance with the SOP and are reminded to work safely by the supervisor every day at the safety briefing.²⁷

According to research conducted by Nabilah, et al the supervision of teachers on K3 was good for students of Mechanical Engineering at SMK N 7 Semarang. However, the absence of sanctions for students who have unsafe behavior causes the behavior of students is still not good towards K3 despite proper supervision, it happens because as many as 51.6% of students have a negative attitude towards K3, so that their awareness to work by applying norms K3 norms are still low even though they have been monitored. For this reason, it is necessary to continuously improve supervision over the implementation of K3 including conducting inspections by workshop staff or teachers when students are working practices, reminding about K3 signs, and checking students' PPE completeness when practicing. In addition to supervising K3 behavior, the application of K3 regulations and guidance in the form of sanctions for students who have insecure behavior must

be carried out firmly so as to create students who are consistent and truly aware of applying K3.²⁸

Education at the vocational secondary level prioritizes the development of the ability of students to carry out certain types of work.²⁹ So that at SMK (Vocational High School) many practicums can support the expertise of students. The role of supervision here is very much needed to ensure that practicum can be carried out according to the work procedures contained in the manual so that it can reduce the risk of accidents while carrying out the practicum in the school workshop.

Conclusions

1. The results of univariate analysis for work accident variables are known 63 (64.9%) respondents have had work accidents, occupational safety and health knowledge variables (K3) are known 28 (28.9%) respondents have low knowledge, unsafe actions (unknown actions) are known 47 (48.5%) of respondents had unsafe behavior when carrying out the practicum, and supervision was known 38 (39.2%) of respondents stated that supervision that had been carried out by the school was still low.
2. The results of bivariate analysis there is a relationship between K3 knowledge and work accident events in class XI students of Pratiwi Vocational School Prabumulih City with a p value (p-value) 0,000 <0.05.
3. The results of bivariate analysis there is a relationship between unsafe action (unsafe action) with the incidence of workplace accidents in class XI students of Pratiwi Vocational School Prabumulih with a p-value of 0.034 <0.05.
4. The results of bivariate analysis there is a relationship between supervision with work accident events in class XI

students of Pratiwi Vocational School Prabumulih with p (p-value) 0.036 <0.05.

Suggestions

1. To minimize the risk of accidents for students, the school can increase K3 again by cultivating K3 in activities at school such as installing K3 signs that are not only in the workshop but also in the school environment such as classrooms, bulletin boards and outside the workshop
2. To increase OHS knowledge, schools can involve teachers in OHS management in schools, namely by increasing teachers' understanding of OHS and developing teachers' practical skills in providing risk education to students and conducting safety briefings in advance to revive students' memories of danger what is around the workshop and the risk they will get if they practice inadvertently.
3. To increase student awareness in caring for equipment in the workshop and the use of PPE that is appropriate to the type of danger is to include students in care by creating a group that will conduct care at the equipment after practice and this group there is a change in subsequent practicums and for PPE students must understand what PPE must be used for each practicum.
4. To increase student awareness in caring for equipment in the workshop and the use of PPE that is appropriate to the type of danger is to include students in care by creating a group that will conduct care in equipment after practice and this group there is a change in subsequent practicums and for students' PPE must understand what PPE must be used for each practicum.
5. To give a warning about a hazard, students must be trained to identify

the danger that is around them first, after students carry out the practice ask students to write down one hazard that they found in the practicum, so students understand about the danger and can give a warning to friends if you are doing risky practices.

6. To reduce the joke when practicum, the teacher can create a practice group with different group friends in each practicum.
7. To further increase supervision at Pratiwi Vocational School on practicum activities by making the practice chair of the students themselves each will carry out the practicum so that students can provide reports from other students because this can train students to identify hazards that are around them when practicum.

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