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Analysis of Mining Engineering Students' Knowledge, Attitudes and Practices on Occupational Safety and Health in Mining Industry Field

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ABSTRACT

The mining industry has booming all over the world including developing countries such as Indonesia. Occupational safety and health was the main issue related to mining industry workers. As mining engineering students who will work in the mining industry field, it was important to identify the readiness of the students work in the mining industry field. This study aims to investigate students' knowledge, attitude and practices on OSH in the mining industry field. This study conducted with a cross-sectional survey method, and mining engineering students who actively during the semester as the target population of the study. There are 56 students who participate in this study and all participants recruited voluntarily online. Data analyzed used the Chi-square and Mann-Whitney test. The study finding that there are 73.2% of participants have adequate knowledge, 96.4% have a positive attitude, and 51.8% have good practices on OSH. For the knowledge domain, the student's level (p=0.047), fieldwork experiences (p=0.040), interest in OSH issue for research (p=0.032), and webinar attendance (p=0.049) are significantly associated with students' knowledge on OSH. For the practice domain, fieldwork experiences (0.013), interest in OSH issue for research (p=0.021), and webinar attendance (p=0.022) are significantly affecting the students' practice on OSH. In conclusion, improving students' knowledge, attitude and practices on OSH in mining industry fields was crucial and essential in order to reduce work-related accidents and diseases.

Analisis Pengetahuan, Sikap dan Praktik Mahasiswa Teknik Pertambangan Mengenai Keselamatan dan Kesehatan Kerja di Kawasan Pertambangan

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ABSTRAK

Mining industry has booming all over the world including developing country such as Indonesia. Occupational safety and health was main issue related to mining industry workers. As mining engineering students who willllingness work in the mining industry filed it was important to identify thereadiness of the students work in the mining industry field. Tis study amis to investigate students knowledge, attitude and practices on OSH in miningn industry field. This study conducted with cross-sectional survey method, and mining engineering students who actively during the semester as target population of study. There are 56 students participate in this study and all participants recruited voluntary through online. Data analysed used the Chi-square and Mann-Whitney test. The study finding that there are 73.2% of participants have adequate knowledge, 96.4% have positive attitude, and 51.8% have good practices on OSH. The students level (p=0.047), fieldwork experiences (p=0.040), interest in OSH issue for research (p=0.032), and webinar attandance (p=0.049). For practice domain, fieldwork experiences (0.013), interest in OSH issue for research (p=0.021),

and webinar attendance (p=0.022) are significantly affecting the students' practice on OSH. In conclusion, improving students knowledge, attitude and practices on OSH in mining industry fiels was crucial and essential in order to reduce the work-related accidents and diseases.

INTRODUCTION

The development of the mining industry is in progress everywhere, to achieve higher efficiency, increased productivity, and also better working conditions (Elgstrand et al, 2017). In recent times, new health problems and psychosocial risks have emerged in workplace around the world (Koseoglu Ornek & Esin, 2015). There are some changes on the focus of occupational safety and health (OSH) during the last decade, where was physical health problems prevention to mental health problems (Koseoglu Ornek & Esin, 2015).

The OSH is an important aspect in working places, indoor or outdoor, including in mining industry (Hidayat & Wahyuni, 2016). Managing the OSH is a fundamental challenge for mining industry (Sinclair, 2012). However, the industry has made considerable effort in order to improve OSH performance, the incidence of fatality and accident have declined since the OSH management system implemented since 1990s. A study from Australia which focus on work-related traumatic mining facilities reported that poor work practice, lack of safe operating procedures, and inapropriate safe operating procedures were predominantly contributing factors to fatality (Wei et al, 2017).

During last two decades the number of companies both government and private owned which involve in mining industry are escalating in Indonesia (Silalahi, Susanto & Putra, 2016). The condition brings indonesia from agricultural country to industrial country. The nationwide industrialisation in Indonesia is the exacerbation of work injuries and occupational disease. Progressive industry have launched many initiatives to spread awareness on OSH among all stakeholders and to reduce OSH risks at workplace (Pingle, 2012). Thus, the OSH management system is getting more and more attention (Zhou et al, 2018).

The management system of OSH is a kind of advanced modern safety management method that mainly emphasizes the principle of systematic health and safety management (Bao, Johansson & Zhang, 2017). In order to improve the OSH outcome, the industry or company should provide OSH training and regular education program to equip the workers with the necessary knowledge and skills to recognize and manage safety hazard in workplace (Ng et al, 2019). Further, OSH should not begin at the workplace only, however introducing the OSH in university level is needed. Mostly Indonesian universities which offer mining engineering program for bachelor degree level provide OSH topic, even in some universities that topic already modified by combining with another topic such as OSH and Labour regulation (Univ Trisakti, 2021) and environmental and occupational health (Univ Lambung Mangkurat, 2021). Various OSH topics has been implemented in university level especially offer for engineering study program, the effectiveness of the topic to promote and prepare engineering students needs to be ascertained. Further, since the students who willingness to work in mining industry field, the investigation on students understanding on OSH is needed in order to evaluate the readiness of the students work in industry with highly safety protocol. This study aims to identifity and assess mining engineering students' knowledge, attitude and practices on OSH in mining industry field.

METHOD

This study applied A cross-sectional survey, and it was conducted from February 16 to Februari 26, 2021.

Participants

During this time of period, social gathering restriction was applied within the country. Conducting an investigation during the period was not feasible due to stay at home regulation still spread all over the country in include in Kolaka regency, and choosing online methods to collect data of the study. The social-networking app used to share the questionnaire to potential participants, namely WhatsApp. Population is university students who were actively registered during the period of semester, and the participant selected by using snowball sampling method. All participants were recruited meet inclusion criteria such as students were passed the occupational safety and health topic, were used information communication technology devices (mobile phones, computers neither desktop or laptop), and agreed to participate in the study by clicking the survey link and completed the whole questionnaire.

Procedure

The questionnaire distributed by students through private channels and group channels in the social-networking apps.

The participant needs to answer the yes-no question to confirm that the willingness to participate voluntarily in the study. Confirmation to agree to be a participant was followed by the fulfillment and completion of the self-reported questionnaire. All collected data were anonymous.

Socio-demographics variables included age (in year), gender, and semester enrolled level. An occupational safety and health KAP (knowledge, attitude, and practices) questionnaire was created and modified by the researchers. In the knowledge-related questionnaire had 14 questions, which consist of OSH principle and protocols. These questions were answered on a true/false basis with an additional "I don't know" option. Attitudes towards OSH were measured through 10 items. These questions were answered on an agree/disagree basis. Furthermore, the practices on OSH protocol were measured by 10 questions. These questions were responded to on an "Always/very often/sometimes" basis.

The correct answers of KAP domains were counted in frequencies. Comparison between KAP scores and demographic characteristics were analyzed with independent- samples *t*-test, one-way analysis of variance

(ANOVA), and Mann-Whitney and Kruskal-Wallis tests as an optional test when data/respondents undistributed normally.

This study approved by the Ikatan Ahli Kesehatan Masyarakat Indonesia Chapter Provinsi Sulawesi Tenggara with number decree 02/KEPK-IAKMI/II/2021, issued the ethical approval. The ethics committee approved the study protocol and procedure before the questionnaire delivered to potential participants as a formal online survey.

RESULTS AND DISCUSSION

To the best of our knowledge, this is the first study in Indonesia measuring and examining the KAP of Mining engineering students on OSH in mining industry field in Indonesia.

A total of 56 students who agreed to participate in this study, and it counted for 23% participation rate. There are 3 out 3 years level of students who involves in this study that makes 100% representative sample of the study within the student years level.

Table 1
Characteristics of respondents

Characteristics	n=56 (%)
Age Min-Max (17-25), SD (1.399)	
Group of Age (years old)	
17-20 y.o	4 (7.1)
21-25 y.o	52 (92.9)
Gender	
Male	47 (83.9)
Female	9 (16.1)
Students' Year of Study	
Second year	4 (7.1)
Third year	18 (32.1)
Fourth year	34 (60.7)
Fieldwork Experiences	
Have experiences	44 (78.6)
Have no experiences	12 (21.4)
Research Interest in OSH	
Interest	45 (80.4)
Uninterest	11 (19.6)
Webinar Attandance on OSH topic	
Have no attend	17 (30.4)
Have attend	39 (69.6)
Knowledge on OSH	
Poor	15 (26.8)
Adequate	41 (73.2)
Attitude on OSH	
Negative	2 (3.6)
Positive	54 (96.4)
Practices on OSH	
Poor	27 (48.2)
Good	29 (51.8)

Primary resource, 2021.

Respondents were participated in this study predominantly more than 20 years old which counted for around 92.9%, and the age range of participants from 17 to 25 years old. There are 47 respondents are men, while the women are the rest. Morethan 60% of students was at fourth level of study, and 78.6% out of all respondents were having fieldwork experiences in mining industry. It was interestingly to notice that around 80% of students were interest in OSH issue as research topic in the final year. The majority of students (69.6%)have attended webinar in OSH topics. According to knowledge, attitude and practices assessment among students who participate in this study, we found that there 73.2% have adequate knowledge, 96.4% have positive attitude, and 51.8% have good practices on OSH (see table 1).

Regarding to data analysis by using Chi-square and Mann-Whitney test, we found that there are some charactersitics show the significantly affect on knowledge among engineering students in OSH such as students level, fieldwork experiences, interest in OSH issue for research, and webinar attandance. While for attitude aspect, we identified that, even mostly students have shown positive attitude, however statistically counted that there is no significant affect all of these characteristics on students' attitude regarding OSH. For practice domain, fieldwork experiences, interest in OSH issue for research, and webinar attendance are significantly affecting the students' practice on OSH (see table 2).

To the best our knowledge, this study was the first investigation conducted among mining engineering students on OSH-related issue in Indonesia. In mining industry, OSH management it was a fundamental and principle aspect related to human concern in workplace. The OSH aims at an adaptation or working environment to workers for the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations include mining industry (Amponsah-Tawiah, Ntow & Mensah, 2016).

Putting the knowledge, attitude and practices is highly recommended among mining engineering students who willingness to work in mining industry. There are some aspects were identified these infulence students' knowledge, attitude and practices on OSH. Regarding to Maria and colleagues (2020) study, they were reported that knowledge was affected by some aspects such as education levels, information sources, socio-cultural, economic status, living environment, experience and age (Podgórski, 2010). Similarly, in this study we found that the students level, fieldwork experiences, interest in OSH issue for research, and webinar attendance were predominantly factors which improve students' knowledge.

As Podgórski (2010) emphasised that knowledge improvement could be enhanced through collecting data or information from experts by attending webinar. The statement is in line with this study where 50% of respondents who have a good knowledge were rountinely attended webinar. Further, Podgorski point out that invidual experiences contribute to building particular knowledge. It was interestingly to notice that mostly students who participate in this study and have a good knowledge were students in fourth years of study, and also have experiences in mining industry fieldwork. Additionally, De Jager and colleagues (2016) also reported that knowledge and experience are important components in the ability to promote OSH competence. All these individual experiences gathering to build and acquire the knowledge improvement on OSH.

Regarding to attitudes, Aigbkhaode and colleagues (2011) examined the attitudes among mining workers in Nigeria, they conclude that educational level or educational status was the main influence factor for better awareness on safety-related occupation. However this study found that none of all characteristics show statistically significant affect the students' attitude on OSH even the majority of respondents have positive attitude which counted for more that 90% of all respondents.

Table 2.
Analysis of characteristics and KAP on OSH

Characteristics	Knowledge		p value	Attitude		P value	Practice		p value
	Adequate (%)	Poor (%)		+ve (%)	-ve (%)		Good (%)	Poor (%)	
Age of Group (y.o)									
17-20 y.o	3 (5.4)	1 (1.8)	0.071[a]	4 (7.1)	0	0.086[a]	2 (3.6)	2 (3.6)	0.066[a]
21-25 y.o	38 (67.9)	14 (25)		50 (89.3)	2 (3.6)		27 (48.2)	25 (44.6)	
Gender									
Male	34 (60.7)	13 (23.2)	0.054[a]	45 (80.4)	2 (3.6)	0.070[a]	24 (42.9)	23 (41.1)	0.054[a]
Female	7 (12.5)	2 (3.6)		9 (16.1)	0		5 (8.9)	4 (7.1)	
Students' Level									
Second year	3 (5.4)	1 (1.8)	0.047[b]	4 (7.1)	0	0.051[b]	2 (3.6)	2 (3.6)	0.073[b]
Third year	15 (26.8)	3 (5.4)		18 (32.1)	0		8 (14.3)	10 (17.9)	
Fourth year	23 (41.1)	11 (19.6)		32 (57.1)	2 (3.6)		19 (33.9)	15 (26.8)	
Fieldwork experiences									
Have experiences	33 (58.9)	11 (19.6)	0.040[a]	42 (75)	2 (3.6)	0.061[a]	25 (44.6)	19 (33.9)	0.013[a]
Have no experiences	8 (14.3)	4 (7.1)		12 (21.4)	0		4 (7.1)	8 (14.3)	
Research interest in OSH									
Interest	34 (60.7)	11 (19.6)	0.032[a]	43 (76.8)	2 (3.6)	0.064[a]	25 (44.6)	20 (35.7)	0.021[a]
Uninterest	7 (12.5)	4 (7.1)		11 (19.6)	0		4 (7.1)	7 (12.5)	
Webinar attandance									
Have no attend	13 (23.2)	4 (7.1)	0.049[a]	16 (28.6)	1 (1.8)	0.051[a]	7 (12.5)	10 (17.9)	0.022[a]
Have attend	28 (50)	11 (19.6)		38 (67.9)	1 (1.8)		22 (39.3)	17 (30.4)	

Primary resource, 2021

In practice aspect of OSH, our study conluded that there are 3 characteristics affect the OSH practice among mining students were fieldwork experience, research interest in OSH and regular attend webinar about OSH. These characteristics contributed to 50% of good practices on OSH in mining fieldwork among students. As Schulte and colleagues (2005) point out that one of strategies to stimulate and improve OSH awareness and practices among students was providing OSH education through specific course or topic in educational and company institutions. It was relevant with this study because all participants were students already completed OSH topics and nearly 80% of them have experiences in mining industry fieldwork. Thus, we assummed that all characteristics gathering and elaborating in enhancing students knowledge, attitudes and practices on OSH. Since 2010, the number of young workers increasing significantly include in mining industry, it was important to offers a required course such as OSH topics to enhance students' knowledge and skills in order to prevent or reduce fatality accidents, hazardous exposures, and increased awareness of personal protective equipment (PPE) in workplace (Balanay et al, 2014).

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, this study finding inform us where students level, fieldwork experiences, interest in OSH issue for research, and webinar attandance contributes to knowledge, attitude and practices improvement among mining engineering students on OSH in mining industry fieldwork. To offers highly validity and reability data related to students knowledge, attitude and practices OSH investigation in large number of respondents and institutional education is highly recommended.

Since limited study was investigated the students' knowledge, attitude and practice on OSH in mining industry this affect the lack of evidence in this field of study. This study limitation was the number of participants were too small, in order to increase the validity of research finding and conducting research in large number of participants is highly recommended.

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Declaration of Conflicting Interests

The authors declared that no potential conflicts of interests with respect to the authorship and publication of this article.

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