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Research Article

Relationship of Noise and the Use of Ear Plugs with Hearing Disorders on Fishermen

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Abstract

Background and Objective: Fisherman is one type of high risk job. The ship engine provides noise exceeding maximum limit of 96 dB. This observation means to describe the relationship of noise, the use of earplugs and hearing disorders on Fishermen Association. This study aim to determine relationship noisy of boat engines and abandonment of earplug to hearing loss on fishermen. This study is an analytic observational with cross sectional approach. **Methodology:** The study sample is drawn using purposive sampling technique. Sample in this study were all Saijaan fishermen. The instruments using in this study are sound level meter, a tuning fork and questionnaire. Independent variables are noise and use of earplug, while the dependent variable is hearing loss. **Results:** The results showed that the number of respondents with a noise level exceeding the threshold value (>85 dB) amounted to 138 people (74.19%), respondents who did not use earplug that is numbered 172 (92.47%), the measurement results of normal hearing loss that is 112 (60.2%). Based on the analysis chi-square test with 95% confidence level showed that there was a significant relationship between noise ($p = 0.004$) with hearing loss and significant relationship between the use of earplug ($p = 0.046$) with the degree of hearing loss. **Conclusion:** In the study can be seen almost fishermen do not want to use earplug for reasons of inconvenience. Fishermen who experience hearing loss admit that they rarely maintenance their ship's engine, so the engine produces excessive noise.

Key words: Noise, earplugs, hearing loss, cross-sectional, fishermen

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Noise causes various disorders of the workforce, such as physiological disorders, psychological disorders, communication disorders and deafness¹. There are classified into the disturbances in the form of auditory disorder, for example, disruption of auditory and non-auditory disorder such as disrupted communications, safety hazards, decreased work productivity, fatigue and stress in workers².

Workers who suffered hearing loss as much as 29.8%. Results of bivariate analysis shows that there are three variables were significantly associated with hearing loss of workers, namely long exposure variable, a history of ear disease and the period of employment³. Multivariate analysis showed that the variables history of ear disease, duration of exposure and the period of employment are the disturbers of intensity level of noise relationship with hearing loss⁴.

Siregar study⁵, noise intensity measurements, from 18 locations were measured acquired 12 locations have noise intensity above the threshold limit value (85 dB). For examination hearing ability using audiometric, to the right ear of 18 people obtained 5 people have normal hearing, 12 people were deaf mild and one person suffered severe deaf, to the left ear of 18 people obtained 7 had normal hearing, 10 people were deaf mild and one person suffered moderate deafness. Results of Pearson Product Moment Correlation test showed that there is a relationship of noise with hearing ability in employment shown by $p = 0.044$ for the right ear and $p = 0.041$ for the left ear⁵.

People who are identified with hearing loss in the United States 40 million, with 10 million of these events are associated with hearing loss due to noise⁶. The National Institute on Deafness and Other Communication Disorders (NIDCD) states that Noise Induced Hearing Loss (NIHL) occur due to exposure to sound too high >85 dB in a period of 5 years. The NIHL is an important aspect of noisy dangerous because listeners are often not aware of the disruption in the function of hearing and ignore it⁷.

After multiple linear regression that there is influence tool use hearing protectors with hearing loss in workers⁸. The study was conducted at a palm oil mill PT. Amal Tani with the threshold value of noise over 85 dB. Population of more than 60 workers and after the inclusion of as many as 36 workers. Data obtained using sound level meter, audiometer, questionnaires and observation⁸.

Based on preliminary observations, boat engines are very noisy so when they were fishing, fishermen have difficulties in communicating, if fishermen ignore it, it will increase the risk of hearing loss.

This study is needed to explain the relationship of noise and the use of earplugs with hearing loss on fishermen in Saijaan Kotabaru district of Pulau Laut Utara of South Kalimantan.

MATERIALS AND METHODS

This study was observational analytic, the purpose is to determine the relationship of noise and the use of earplugs against the occurrence of hearing loss in the Saijaan fishermen. The study design was a cross-sectional. Cross sectional is a study with data collected at one time or a certain period and subject of study is only done once during the study⁹. Sample of this study were all Saijaan fishermen totaling 186 people. The study was conducted to examine the relationship of noise and the use of earplugs with hearing loss in Saijaan fishermen in Kotabaru district of Pulau Laut Utara of South Kalimantan.

The study instrument is a tool that is selected and used by researchers in activities to collect data for these activities become systematic and easy. The instruments used in this study are:

- Questionnaire contains biographical data of respondents associated with the information needed to study both personal data and statements using earplugs regularly or not
- Sound level meter, to measure intensity of noise
- Tuning fork to measure the function of fishermen hearing using a 512 Hz tuning fork

Statistical analysis: Data were collected and edited immediately to examine of data completeness and accuracy. Furthermore is, data tabulation and analysis using chi-square test with 95% degree of confidence to see the relationship of noise and the use of earplug with the hearing loss of fishermen.

RESULTS AND DISCUSSION

Univariate analysis: In this study the research focus are the noise, the use of earplugs and hearing loss. Overview of noise, use of earplugs and hearing loss as follows:

- **Noise:** Based on the results of 186 respondents, the obtained distribution of the noise exposure level as follows:

Table 1 shows that the number of respondents who received exposure to the noise level exceeds the threshold

Table 1: Distribution frequency of noise exposure levels

Noise level (dB)	Total	Percentage
≤85	48	25.81
>85	138	74.19
Total	186	100.00

Table 2: Distribution frequency of the use of earplug by fishermen

Use of earplugs	Total	Percentage
No use earplug	172	92.47
Use earplug	14	7.53
Total	186	100.00

Table 3: Distribution frequency of hearing loss by fishermen

Hearing loss	Total	Percentage
Normal	74	39.8
Abnormal	112	60.2
Total	186	100.0

value (>85 dB) amounted to 138 people (74.19%). While the number of respondents who received exposure to noise levels corresponding threshold value (≤85) total 48 (25.81%). Noise causes various disorders of the workforce, such as physiological disorders, psychological disorders and communication disorders, disorders of balance and hearing loss¹⁰. Hearing loss is the most serious disorder because it can cause deafness¹¹. At first, the temporary and will soon recover if shied away from the source of noise but if continuous work in noisy places, hearing power will be lost permanently and will not be recovered.

- **Use of earplugs:** Based on the results of questionnaires from 186 respondents, the obtained distribution of respondents who use earplug as follows:

Table 2 shows that respondents are not using earplug that is numbered 172 (92.47%). While respondents who use earplug amounted to 14 people (7.53%). The main area of damage due to noise on human is hearing (inner ear), the control method by using a tool that can reduce the level of noise that enters the outer ear and the middle before entering into the inner ear¹². A person with high noise exposure without hearing protection tool will increase the risk of hearing loss¹³.

- **Hearing loss:** Based on the results of measurements on 186 respondents hearing loss, hearing loss distribution is obtained as follows:

Table 3 shows that respondents with the measurement results do not have a hearing loss, with 74 people (39.8%). While the results of measurements of the respondents with hearing loss total of 112 people (60.2%). Hearing loss is a

Table 4: Relationship between noise with the hearing loss

Noise	Hearing			p-value
	Normal	Abnormal	Total	
≤85 dB	44 (91.7%)	4 (8.3%)	48 (100%)	0.004
>85 dB	29 (20%)	109 (80%)	138 (100%)	

partial or total inability to hear sound in one or both ears¹⁴. Fishermen who experience hearing loss, occurs in workers who do not use earplugs. It is also working with hearing loss to noise exposure over a threshold value (>85 dB)¹⁵.

Bivariate analysis

Relationship of noise with hearing loss on fishermen:

Bivariate analysis was performed statistical tests to determine the relationship between noise (independent variable) on the occurrence of hearing loss on fishermen (the dependent variable). The test used is chi-Square test. Chi-Square test results between noise with hearing loss can be seen in Table 4.

From these data it appears that 138 respondents were exposed to noise exceeding the threshold value, there were 109 respondents (80%) who have a hearing loss. On the table also shows that the p-value 0.004<0.05 then Ho is rejected statistical decision. It means that there is a relationship between noise with hearing loss in the Saijaan fishermen.

Noisy influenced the fishermen, which can cause various health problems in general, such as hearing loss, other physiological and psychological disorders. Physiological disorders may include increased blood pressure, pulse rate acceleration, increased basal metabolism, vasoconstriction of blood vessels, decreased in intestinal peristalsis as well as increased muscle tension^{16,17}. The physiological effects caused by increased stimulation of the autonomic nervous system. The situation was actually the body's defend mechanism against the danger that occurs spontaneously. Psychological disorders can be additional stress if the sound is undesirable and disturbing, giving rise to unpleasant feelings and exhausting^{18,19}. It can cause sleep disturbance, emotional, communication disorders and impaired concentration which indirectly disturb the safety of the workforce^{20,21}.

To protect fishermen against harm caused by noise factors, risk criteria need to be made with the objective of determining the maximum permissible sound levels over a given period²², which if exceeded not only will lead to little change in noise-exposed auditory fishermen in the long term. Some risk factors that affect the degree of severity of hearing loss is noise intensity, frequency, duration of exposure per day, length of service, individual sensitivity, age and other factors which may cause deafness²³. Based on it being understood

that the amount of exposure to noise energy received will be proportional to the damage gained²⁴.

In Indonesia in particular and other countries generally, exposure to noise is considered quite safe is the average daily exposure to noise intensity does not exceed 85 dB for 8 h a day or 40 h a week²⁵.

Noise can cause a lot of implications. Noise not only affects our hearing capacity but also the functions of the body. The influence of noise on the same body as the effect of stress on the human body, sleep disturbances, impaired conversation, feeling disorders, etc²⁶.

Noise also disrupts attention and implementation of tasks, think is hard to do as well as the concentration is usually lose. Noisy distract the concentration and mental alertness decreases²⁷. High intensity of the noise and the longer time noise exposure experienced by a person, the more severe hearing loss induced²⁸.

Other source states that a person who works in noisy environments, especially who have worked more than 5 years will most likely be affected by the disease deaf cochlear nerve that can't be cured²⁹. This shows that there is a close relationship between the level of intensity noise with the hearing loss.

Deafness due to noise is a result of repeated exposure over a long period of time. Deafness caused by noisy illustrate inner ear damage varies widely from minor damage to the hair cells to total damage organ of corti. The process of the incident certainly is not fully known but rather excessive stimulation by noise in the long term lead to metabolic and vascular changes that eventually lead to degenerative changes in cell shape³⁰.

Relationship earplugs with hearing loss in the fishermen:

Bivariate analysis was performed statistical tests to determine the relationship between the use earplug (independent variable) on the occurrence of hearing loss in workers processing part (Dependent variable). The test used is chi-square test. Chi-Square test results between the use of earplug with the hearing loss can be seen in Table 5.

From these data it appears that 172 respondents who do not use earplugs, there were 112 respondents (65.2%) who have a hearing loss. In Table 5 also shows that the p-value $0.046 < 0.05$ then H_0 is rejected statistical decision. It means that there is a relationship between the use earplug with hearing loss in the Saijaan fishermen.

The cause of the complaints among of the workers which there are some workers who do not use ear protective equipment regularly. This means in doing his job sometimes earplugs are detached by itself or accidentally removed for some reason³¹.

Table 5: Relationship between the use of earplug with the hearing loss

Use of earplug	Hearing		Total	p-value
	Normal	Abnormal		
No earplug	60 (34.8%)	112 (65.2%)	172 (100%)	0.046
Use earplug	14 (100%)	0 (0%)	14 (100%)	

The use of ear protection is influenced by several things: The workers knowledge on the function of ear protective devices, attitudes toward health and safety. It is also the training of educational facilities will have a learning experience that eventually lead to changes in behavior³².

In addition there are some things that cause the worker is not using PPE, when working among others, is the unavailability of PPE in the workplace and also because they feel uncomfortable when using PPE³³.

In addition, the behavior of workers who are mostly reluctant to wear earplugs for reasons such tools disturb activity in the work, lazy, bad/uncomfortable and they use if they are working in a very noisy environment. Such behavior by the workers' working conditions are very noisy will easily cause hearing loss or disorders or complaints from workers³⁴.

Complaints caused by exposure to noise can cause hearing loss, especially when communicating, because a person can only speak using a loud voice, all this happened because the workers do not use ear protective device like an earplug properly while at workplace. Earplug can reduce the intensity of noise up to 5 dB³⁵. Meanwhile, according to Schulz³⁶, earplugs can reduce the intensity of the noise by 10-15 dB.

The use of ear protective devices is one of the measures to cope with noise on workers. The use of ear protective devices to reduce the noise level by a few decibels, depending on the type and rate of noise reduction ear protection equipment used³⁷.

The use of personal protective equipment (personal protective equipment) to reduce noise such as earplugs. Control depends on the selection of the right equipment for a certain noise level, eligibility and how to take care of the equipment³⁸.

Intensity of sound reaching the tympanic membrane can be reduced by using hearing protectors. Tools earplug hearing protectors can be adapted to the ear canal or foam earplug³⁹. Based on the explanation noise control can be done with the use of ear protection, health screening/hearing power periodically. As well as the expected workforce should use ear plugs (earplug) is continuously considering the effects of noise on health⁴⁰.

CONCLUSION

The results showed that the number of respondents with a noise level exceeding the threshold value (>85 dB) amounted to 138 people (74.19%), respondents who did not use earplug that is numbered 172 (92.47%), the measurement results of normal hearing loss that is 112 (60.2%). Results of analysis chi-square test with 95% confidence level showed that there was a significant relationship between noise ($p = 0.004$) with hearing loss and a significant relationship between the use earplug ($p = 0.046$) with the degree of hearing loss.

SIGNIFICANT STATEMENT

Fishermen in Indonesia is one of the professions that have a high risk of hearing loss. This is due to the average fishermen does not want to use earplugs because it was used by the noise generated by the engine of the ship. In fact unconsciously fishermen decreased hearing function gradually. In one catch of fishermen usually spend more than 8 h by the average noise produced by ship engines for more than 90 dB.

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