

THE LEVEL OF KNOWLEDGE AND ATTITUDE OF TRADITIONAL FISHERMEN IN GUAERIA TOWARDS THE RISK OF EAR BAROTRAUMA

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ABSTRACT

Fishermen in a remote village use traditional methods for diving, which increases the risk of barotrauma due to the simplicity of the techniques and tools used, as well as the unmonitored depth and duration of the dives. One of the main factors of barotrauma is the lack of knowledge and training. The aim of this study was to assess the level of knowledge and attitudes regarding ear barotrauma among traditional fishermen in Guaeria Village. This study uses a cross-sectional design, where the population consists of all traditional fishermen in Guaeria Village, Jailolo District, West Halmahera Regency, North Maluku Province. The data collection technique used was total sampling. The results are Out of 41 samples, the majority were over 40 years old (68.3%), male (100%), had worked for more than 1 year (78%), dived less than 4 times a week (61%), had a normal body mass index (BMI) (73.2%), and had dive times of more than 30 minutes (70.7%). Most of them have a history of barotrauma with symptoms such as ear pain (90.2%), tinnitus (73.2%), ear bleeding (36.6%), nosebleeds (58.5%), dizziness (90.2%), and hearing loss (46.3%). Knowledge level is insufficient (78%) but attitude is quite good (68.3%). Conclusion is the majority of fishermen in Guaeria Village experience ear barotrauma. Although they have a fairly good attitude, their knowledge regarding the risks of ear barotrauma is still lacking, likely due to limited access to information and formal education related to diving health risks.

Keywords: Ear Barotrauma, Knowledge, Attitude, Tradisional Fishermen

1. INTRODUCTION

Indonesia is the largest archipelagic country in the world, consisting of more than 17,504 islands. The sea, coastlines, and rivers have become the lifeblood of this nation (Made and Sukardi, 2024). North Maluku is one of the provinces in Indonesia, which has 10 regencies within it. West Halmahera Regency, with its capital in Jailolo, is one of the regencies in North Maluku Province that has many fishermen. According to the Marine and Fisheries Office of West Halmahera Regency, in 2023, there will be 1,705 fishermen in the area (Dinas Kelautan and Perikanan Kabupaten Halmahera Barat, 2023). Guaria is the name of a village located in the Jailolo District, West Halmahera Regency, North Maluku Province. According to BPS data 2024, the population in the village is 366 people with an area of 30.00 km² (Badan Pusat Statistik, 2024). This area is dominated by the sea, so its climate conditions are greatly influenced by the sea. The

village of Guaeria, located on an island and far from the Jailolo Regency, has its economy predominantly based on fishing. Based on data obtained from the local village head, it was found that there are 94 fishermen, with 41 of them being traditional divers. It is known that traditional fishermen have never undergone formal diving education or training due to several limitations, despite having a very high risk to work safety. The risks that may occur include skin disorders, decompression sickness, and the most common issue resulting from diving errors is ear barotrauma (Pratiwi dan Diah, 2022; Rahmat *et al.*, 2022). Barotrauma is one of the health issues that is highly likely to occur in divers or traditional fishermen. Barotrauma is tissue damage that occurs due to changes in barometric pressure while diving or flying due to the complex function of the Eustachian tube; this trauma most often occurs in the middle ear (Paparella *et al.*, 2006). Research conducted in several countries is very diverse. One study conducted in Canada showed that 22% of military divers in open water conditions experienced middle ear barotrauma. The highest prevalence was found in a study of recreational divers in Brazil, where 71.5% experienced middle ear barotrauma (Rahmat *et al.*, 2022).

According to research in Indonesia conducted by Ishak Martinus in 2020, the incidence of barotrauma among traditional divers in Balaesang Tanjung District, Donggala Regency, Central Sulawesi Province, involved 78 divers. Of these, 41.0% or 32 traditional divers experienced ear barotrauma, 25.6% or 20 people experienced it in the right ear, and 24.4% or 19 people experienced it in the left ear. The most common condition was at degree V, which is the occurrence of a perforation in the eardrum, affecting 17.9% or 14 people (Martinus dan Hadisaputro, 2020). Regarding barotrauma data in North Maluku, according to the Ministry of Health and the North Maluku Health Office, there is none so far. This research is the first study conducted in North Maluku, thus supporting the North Maluku Health Office's data on the incidence of barotrauma while also understanding the level of knowledge and attitudes of traditional fishermen towards the occurrence of barotrauma in Guaria Village, West Halmahera.

2. METHODS

The type of this research is observational research with a cross-sectional design. The population in this study consists of traditional fishermen in Guaeria Village. A total of 41 individuals was involved, using a total sampling technique. The data collection technique used in this study was through interviews using a questionnaire instrument used derived from previous research by Emiria Ahmad Pinto to determine the variables of knowledge, attitudes, age, gender, length of service, diving time, body mass index (BMI), diving frequency, and history of barotrauma.

The instrument used in this study was a structured questionnaire adapted from previous research. The questionnaire consisted of three sections, namely respondent characteristics, knowledge, and attitudes. The knowledge section consisted of 15 multiple-choice questions with four answer alternatives (a, b, c, d). Each correct answer was given a score of 1, and each incorrect answer was given a score of 0. The total knowledge score was calculated by summing all the correct answers, with a maximum score of 15. Next, the scores were converted into percentages using the formula: $\text{Knowledge score (\%)} = \frac{\text{Score obtained}}{\text{Score maximum}} \times 100$

The attitude section consists of 11 statements measured using a 4-point Likert scale, namely Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). For positive statements, scores are assigned as follows: SA = 4, A = 3, D = 2, and SD = 1. For negative statements, reverse scoring is applied, namely SA = 1, A = 2, D = 3, and SD = 4. The total attitude score is obtained by summing all statement scores, with a maximum score of 44. The score is then converted into a percentage using the formula: $\text{Score attitude (\%)} = \frac{\text{Score obtained}}{\text{Score maximum}} \times 100$

The knowledge and attitude scores were calculated by summing the item scores and converting them into percentage values. The percentage scores were then classified into three

categories, namely good, sufficient, and insufficient, to facilitate interpretation of the respondents' knowledge and attitudes toward barotrauma risk. The categorization thresholds were determined based on commonly used percentage score classifications in descriptive health research.

The data obtained were then presented in tabular form using Excel and then entered into SPSS for descriptive statistical analysis to determine the characteristics of respondents for each variable. The researcher has obtained an ethical approval letter to conduct the research with number 014/UN44/C9/KEP/2024.

3. RESULTS AND DISCUSSION

3.1. Respondent Characteristics

The characteristics of the fisherman sample in Guaeria Village in [Table 1](#) show that the majority of traditional fishermen are aged 40 years and older, with a total of 28 people (68.3%), and the least number are under 40 years old, with a total of 13 people (31.7%). Based on gender, the majority are male, with 41 people (100%). Most of them have worked for more than 1 year, which is 32 people (78%), and those who have worked for less than 1 year amount to 9 people (22%). For the time or duration of a single dive, it was found that the majority dived for more than 30 minutes, totaling 29 people (70.7%), while less than 30 minutes was recorded for 12 people (29.3%). For the frequency or number of dives per week, the majority were less than 4 days per week, with 25 people (61%) and those with less than 4 days per week were 16 people (39%).

Table 1. Respondent characteristics

Variable	Frequency (n=41)	Percentage (%)
Age (year)		
≥40	28	68.3
<40	13	31.7
Gender		
Man	41	100.0
Woman	0	0.0
Length of work		
≥ 1 year	32	78.0
< 1 year	9	22.0
Diving frequency		
≤ 4 days per week	25	61.0
> 4 days per week	16	39.0
History of barotrauma		
Yes	41	100.0
No	0	0

This study provides results that the majority of traditional fishermen in Guaeria Village have experienced barotrauma symptoms. Based on the most common age being 40 years or older. These results are consistent with previous research where barotrauma was most commonly experienced by those over 40 years old (Fatima, 2019), and the occurrence of tympanic membrane perforation was most frequently found in respondents aged over 35 years (Navisah *et al.*, 2016). Age is one of the risk factors for barotrauma due to diving, influenced by the body's physiological capabilities. Barotrauma usually occurs in individuals aged 40 and above, but it can also occur in those under 40 due to several accompanying factors experienced by the diver (Cialoni *et al.*, 2017).

The traditional fishermen of Guaeria Village are mostly male, with a total of 41 people (100%). The results of this study are in line with the research conducted by Prasetyo, where all of the traditional divers who experienced ear barotrauma recorded were male, totaling 24 individuals (100%) (Prasetyo and Soemantri, 2012), but there is also another study that found that besides men, there are 31 people (47%), there are also 2 women (3%) (Atrie *et al.*, 2023). Fishing is a profession dominated by men, as it is associated with the level of risk and danger

that may be encountered. Seen from the local sociocultural context where women are more involved in household activities.

Data shows that traditional fishermen in the village of Guaeria have been in this profession for quite some time, with the majority of them having more than or equal to one year of experience. This can also pose the risk of a barotrauma occurrence. The results of this study are in line with the research conducted by Fatima, where the group of fishermen experiencing barotrauma had a work period of > 1 year, totaling 82 people (47.1%), compared to fishermen with a work period of < 1 year, totaling 5 people (2.9%) (Fatima, 2019). One of the factors influencing the occurrence of barotrauma is the duration of employment as traditional fishermen. Barotrauma usually affects fishermen with more than one year of experience, but may also affect those with less. This depends on the total frequency of dives performed. The length of service influences the occurrence of diseases caused by work, as it increases the risk of exposure to both physical and chemical environmental factors, thereby reducing a person's work productivity (Atrie *et al.*, 2023).

This study found that the majority of traditional fishermen had a diving time of more than 30 minutes. Fatima's research aligns with these results, revealing that 59 individuals (33.9%) dived for more than 30 minutes, while 28 individuals (16.1%) dived for less than 30 minutes (Fatima, 2019). Normally, experts advise divers to perform a 5-10 minutes surface breathing process every time they reach a depth of 3-5 meters, particularly for those without breathing aids. Divers who do not use breathing aids for more than 30 minutes are at risk of barotrauma due to changes in atmospheric pressure at sea depth (Cialoni *et al.*, 2017). Results from the research indicate that traditional fishermen typically dive less than or equal to 4 days per week. The frequency of dives, typically conducted no more than twice a day, contributes to barotrauma, given the physical condition and diving environment. For divers who have more diving experience and conduct more than two dives a day, there is a risk of barotrauma occurring. However, the depth, the diver's physical condition, and the equipment used all play a role (Cialoni *et al.*, 2017; Jansen *et al.*, 2016; Navisah *et al.*, 2016).

3.2. Knowledge and Attitude

Based on the data in Table 2, it was found that the majority of traditional fishermen in Guaeria Village have insufficient knowledge, with 32 people (78.1%), while 8 people (19.5%) have sufficient knowledge, and only 1 person (2.4%) has good knowledge. Regarding attitudes, the fishermen showed sufficient attitudes with 28 people (68.3%), good attitudes with 11 people (26.8%), and 2 people (4.9%) with insufficient attitudes.

Table 2. The level of knowledge and attitudes of traditional fishermen

Variable	Frequency (n=41)	Percentage (%)
Knowledge		
Good	1	2.4
Sufficient	8	19.5
Insufficient	32	78.1
Attitude		
Good	11	26.8
Sufficient	28	68.3
Insufficient	2	4.9

This study indicates that the majority of traditional fishermen in Guaeria Village have insufficient knowledge regarding ear barotrauma (78.1%), while most respondents demonstrated a sufficient attitude (68.3%). These findings are consistent with the study conducted (Ahmad Pinto *et al.*, 2020), which also reported low knowledge levels among traditional divers who did not receive formal diving education. The similarity of findings suggests that lack of structured training and limited access to occupational health information remain significant issues among traditional diving communities.

The low level of knowledge observed in this study may not only be attributed to formal educational background but also to contextual factors. Guaeria Village is geographically remote

and separated from the regency center, which may limit exposure to health promotion programs and diving safety education. Traditional diving practices are generally inherited across generations without standardized training, leading fishermen to rely primarily on experience rather than scientifically based preventive knowledge. This situation increases vulnerability to unsafe diving practices and repeated exposure to barotrauma risk.

Interestingly, despite insufficient knowledge, most respondents demonstrated a sufficient attitude toward barotrauma risk. This finding differs from (Harisa *et al.*, 2023) who reported that 98% of divers had a positive attitude. The difference may be influenced by variations in community education exposure and local health interventions. In the present study, attitude formation may be shaped more by experiential learning rather than theoretical understanding. Repeated exposure to symptoms such as ear pain, dizziness, and tinnitus may increase individual awareness and caution during diving activities, even in the absence of adequate formal knowledge.

From a public health perspective, the coexistence of low knowledge and relatively positive attitudes is concerning. Adequate knowledge is essential for the correct application of safe diving techniques, including pressure equalization and controlled ascent procedures. Without sufficient understanding, positive attitudes alone may not effectively reduce the incidence of barotrauma. Considering that all respondents reported a history of barotrauma symptoms, strengthening knowledge through structured community-based education and occupational safety training is urgently needed to reduce long-term auditory complications and improve work safety among traditional fishermen.

3.3. History of Barotrauma

Based on Table 3, it was found that traditional fishermen in Guaeria Village have experienced barotrauma incidents with symptoms of ear pain in 37 people (90.2%), tinnitus in 30 people (73.2%), nosebleeds in 24 people (58.5%), ear bleeding in 15 people (36.6%), dizziness in 37 people (90.2%), and hearing loss symptoms in 19 people (46.3%).

Table 3. History of Barotrauma

Variable	Frequency (n=41)	Percentage (%)
Ear pain		
Yes	37	90.2
No	4	9.8
Tinnitus		
Yes	30	73.2
No	11	26.8
Ear bleeding		
Yes	15	36.6
No	26	63.4
Nosebleed		
Yes	24	58.5
No	17	41.5
Dizziness		
Yes	37	90.2
No	4	9.8
Hearing loss		
Yes	19	46.3
No	22	53.7

This study provides results that the majority of traditional fishermen in Guaeria Village show incidents of barotrauma, with the most frequently experienced symptoms being ear pain, dizziness, ringing in the ears, nosebleeds, deafness, and ear bleeding. These findings are also consistent with the research conducted by Emiria in Tekonea Raya Village, Konawe Islands Regency, where the most commonly experienced barotrauma symptom among fishermen was ear pain, affecting 25 people (33.33%). The symptoms that can occur due to barotrauma include blood

or mucus coming from the nose, headaches, ear pain, vertigo, and ear bleeding, as well as deafness (Edmonds *et al.*, 2013). The finding that all respondents reported a history of barotrauma symptoms (100%) indicates a significant occupational health concern. This extremely high prevalence suggests repeated exposure to unsafe diving practices and insufficient preventive measures. Continuous exposure to pressure changes without proper equalization techniques or protective equipment may increase the risk of chronic middle ear damage, including tympanic membrane perforation and long-term hearing impairment. If not addressed, this condition may reduce work productivity and negatively affect the economic stability of fishermen and their families.

3.4. Level of Knowledge and Attitude of Traditional Fishermen length of work in Guaeria Village

Based on Table 4, it was found that the majority of traditional fishermen in Guaeria Village who have insufficient knowledge have worked for >1 year, namely 25 respondents, and the majority who have sufficient knowledge have worked for >1 year, namely 21 respondents.

Table 4. Level of Knowledge and Attitude of Traditional Fishermen Towards Working Hours in Guaeria Village

Variable		Towards Working		
		<1 year	>1 year	Frequency
		n	n	
Knowledge	Good	0	1	1
	Sufficient	2	6	8
	Insufficient	7	25	31
Attitude	Good	2	9	11
	Sufficient	7	21	28
	Insufficient	0	2	2

Traditional fishermen who have a low level of knowledge, the majority have a working period of >1 year. According to researchers, this is because access to education is very limited, so the quality of education and training on traditional diving techniques provided is very limited. As a result, this has an impact on the knowledge of the community in Guaeria Village regarding health and safety when diving without using diving equipment. Therefore, the diving techniques used still maintain inappropriate diving methods even though they have worked for a long time. A person who has a high level of knowledge will influence that person in their learning process, and as age increases, the experience gained will also be greater (Ahmad Pinto *et al.*, 2020). Long working periods can have a positive impact on a diver, because the longer the working period, the more skills and experience will be gained, but besides that, working periods can also have a negative impact if fishermen do their work poorly and unsafely which can endanger the diver's body (Atrie *et al.*, 2023).

From a public health perspective, these findings highlight the urgent need for occupational health interventions among traditional fishermen. Ear barotrauma is not only an individual health issue but also a community-level concern, as it may contribute to disability, reduced income, and increased healthcare burden. Preventive strategies such as community-based education programs, basic diving safety training, and periodic ear examinations are essential to reduce the incidence and severity of barotrauma. Collaboration between local health authorities and fisheries agencies is necessary to integrate occupational health promotion into coastal community development programs.

Strengthening knowledge through structured education while reinforcing positive attitudes through practical training may significantly reduce the risk of barotrauma. Future studies should also explore intervention-based approaches to evaluate the effectiveness of educational and preventive programs in improving diving safety among traditional fishermen.

4. CONCLUSION

Based on descriptive findings, traditional fishers in Guaeria Village show a high prevalence of barotrauma symptoms. Although they have a fairly good attitude, their knowledge about the risks of ear barotrauma and how to prevent it is still lacking. This is made possible by the lack of access to information, formal education, and the availability of facilities related to diving health risks. A limitation of this study is that the history of barotrauma was based on symptoms reported during the study and was not verified through clinical examination. The history of barotrauma in this study was based on reported symptoms and was not verified by clinical examination.

5. AUTHOR DECLARATION

The author greatly contributed to this research, not only was responsible in the field during the research but was also responsible for compiling the results to the conclusion of the research that was carried out.

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