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**CORRELATION OF EQUALIZATION TECHNICAL TO BAROTRAUMA EVENTS
IN TRADITIONAL DIVERS VILLAGE KEDUNG COWEK, DISTRICT BULAK,
KENJERAN, SURABAYA**

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Abstract

Barotrauma is the most common problem in traditional divers, due to pressure differences. Pressure can be equated doing of equalization technique. The purpose of this study was to analyze the relationship of the technique of equalization to the incidence of barotrauma on traditional divers. The research design was analytic with Cross Sectional approach. Sample size 35 respondents, sample technique use probability sampling (simple random sampling). Data were collected use questionnaires and observation sheets. Data were analyzed using Spearman Rho test.

The result of this study use the technique of equalization performed by traditional divers using toynbee equalization technique, and the incidence of barotrauma on the traditional diver in the diver not equalize according to the procedure. In prove with the results of spearman rho test shows the value $p = 0.029$ ($p < \alpha = 0.05$). The implications of this research require the support of the traditional divers as the coordinator for traditional divers to change the traditional divers behavior in performing diving procedures.

Keywords: Equalization Technique, Barotrauma Occurrence, Traditional Diver

INTRODUCTION

Diving is a beneath water activity using a tool or without tools (Soepadmo, 1990 Abshor, 2008). Diving have a standard procedure that needs to be done, the procedure should be performed when the dive one is the equalization technique. Equalization is an engineering technique to equalize the outside and inside pressure of the body cavities. There are body cavities, ear, nose, lungs (LAKESLA, 2013). The Divers who do not comply with the procedure's can get health problems, especially on barotrauma's disease (PKHI, 2006). Barotrauma is the detriment one of body that occurs due to the difference in air pressure inside the hollow space with a pressure environment (Dwi Sumiarto Suhandi, Mes, 2015). Based on preliminary survey in kedung cowek and doing a live interview on traditional divers, mostly the divers did not do equalization techniques when diving and many divers are experiencing sharp

symptoms as like on barotrauma mark head, ear, full some illness on the ears, pain on chest. The data collected was recorded Sepim Kesma Health in 2008, from traditional divers find from 1026 divers, 93.9% of divers have experienced health problems as many dives problems, 39.5% experiencing Barotrauma, 29.8% experienced a Decompression, and 10.3% experiencing paralysis (Directorate General of disease control and environmental health of the 2008 Joon, 2009). Based on a preliminary study of about in kedung cowek of 5 traditional divers, 100% did not do equalization technique so the result is 3 or 60% of divers have experienced of pain symptoms with the mark 1 ear, vertigo and 2 or 40% of divers have experience of barotrauma, 0 signs symptoms of ear, dizziness. Barotrauma can be reduced if the traditional diver want to do techniques of equalization time on diving. The Government in this regard the Ministry of

marine and fisheries has made the law No. 7 year 2016 regarding about protection, empowerment of fishermen, fish farms and enterprises saltness. On section 30 says that the Central Government and local governments provide protection to the risk faced by fishermen when fishing On section 40 says that the Central Government and the obligation to organize health education and training to fishermen and families in accordance with the provisions of the Act (Act of the Republic of Indonesia No. 7, 2016). Marine and Fisheries Agency of the city of surabaya accompany with healthy department and Chairman of the fishermen of the coastal area to do health education on traditional divers. Health education especially the safety on while diving seeking fish, one of them concerning the technique of equalization in traditional scuba divers to avoid barotrauma and reduce the incidence of barotrauma in kedung cowek.

METODE

The design of this research is to analyze the relationship of events equalization technique of barotrauma on the traditional divers in cowek kedung surabaya by using observational analytic design and Cross Sectional approach. Sampling of this research uses a probability technique sample random sampling. This research was in the village Cowek, Kedung Bulak, Kenjeran. Data has taken on 06 April 2017, the population of this research is the traditional divers in kedung cowek, kenjeran surabaya with quantity population of 39 samples were obtained, and respondent amounted to 35 respondents.

The definition of operational from the research has at below:

The Research on the technique of equalization instrument using a detailed questionnaire.

Research on the instrument of barotrauma using observations containing about berotrauma examination of ear, sinus barotrauma, and pulmonary barotrauma

are observed directly by a physician. Implementation of the research begins from, first assemble the divers come in research place, second give explanation about the objectives, benefits and implementation research, as well asking to the divers to fill the inform consent after receiving the explanation. Traditional divers are requested fill the questionnaire has given by the researcher then the divers would examined using traditional otoskop to observe genesis of barotrauma on the traditional divers by examining the tympanic membrane, respondent. For All data collected are presented in the form of a table. The Data analysis using the method of test spearman rho.

RESULTS

This study was conducted on April 6, 2017, in the Village Kedung Cowek, Kenjeran, Surabaya. Respondents in this study is a traditional diver who totaled 35 people. Characteristics of respondents in this study include age, gender, education, religion, long dive, dive depth, dive frequency

1. General data

Table 1. Distribution Characteristics of Respondents by Gender

Gender	Frequency (f)	Percentage (%)
Man	35	100
woman	0	0
Total	35	100

Based on the traditional diver table 1 is obtained based on sex altogether 35 people (100%) male sex and there are no female gender as a traditional diver.

Table 2. Characteristics of Respondents by Age

Age	Frequency (f)	Percentage (%)
35-45	20	57.1
46-59	13	37.1
60-69	2	5.7
Total	35	100.0

According to the table 2 in a traditional divers get by age mostly aged 35-45 years

with a number of 20 persons (57.1%), almost half of 46-59-year-old with the number of 13 people (37.1%), and a small proportion aged 60 -69 years with the number 2 (5.7%).

Table 3. Characteristics of Respondents by Education

Education	Frequency (f)	Percentage (%)
SD	1	2.9
SMP	28	80.0
High School	6	17.1
Total	35	100.0

Based on Table 3 obtained by traditional divers divers terkhir traditional education is almost entirely a junior secondary education amounted to 28 (80%), high school educated fraction amounts to 6 people (17.1%) and a small elementary school education numbered 1 (2.9%),

table 4 Characteristics of Respondents Based on Religion

Religion	Frequency (f)	Percentage (%)
Islam	35	100
Total	35	100

Based on Table 5.3, obtained by traditional divers Moslem religion altogether totaling 35 people (100%)

table 5 Characteristics of Respondents Based on the Old Diving

Years of service	Frequency (f)	Percentage (%)
3-5 years	1	2.9
6-10 years	6	17.1
> 10 years	28	80.0
Total	35	100.0

Based on Table 5 obtained by the old traditional diver diving > 10 years of almost totaled 28 people (80%), 6-10 years old dive fraction amounts to 6 people (17.1%), 3-5 years old dive fraction totaled 1 people (2.9%).

table 6 Characteristics of Respondents Based on Depth Diving

Diving depth	Frequency	Percentage
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	(f)	(%)
<10 meters	25	71.4
10-30 meters	10	28.6
> 30 meters	0	0
Total	100	100

Based on table 6 obtained by traditional divers diving depth <10 meters largely amounted to 25 (71.4%), almost half of the traditional diver diving to a depth of 10-30 meters a number of 10 people (28.6%) and none diver dives with a depth > 30 meters.

table 7 Characteristics of Respondents Based on Frequency Diving

frequency Diving	Frequency (f)	Percentage (%)
Rarely	1	2.9
Sometimes	4	11.4
Often	4	11.4
Very often	26	74.3
Total	35	100

Table 7 shows that the most traditional divers with diving fekuensi 24-30 times a week some 26 people (74.3%), the fraction with a traditional diver diving frequency of 23-26 times a week 4 (11.4%), traditional diver small part of the frequency dive 8-15 times a week 4 (11.4%), and a small part of the frequency of 1-7 times a week a number of 1 (2.9%).

2. Custom table

table 1 Diving equalization technique

doing equalization	Frequency (f)	Percentage (%)
No	18	51.4
Toynbee maneuver	17	48.6
Frenzel maneuver	0	0
Lowry Technique	0	0
Edmonds Technique	0	0
Valsavah maneuver	0	0
Total	35	100.0

Table 1 shows the most traditional diver who does not perform equalization were 18 people (51.4%), nearly half did equalization while diving using equalization techniques Toynbee maneuver amounted to 17 (48.9%), none of the divers who use the technique maneuver franzel , Lowry technique,

edmonds technique, and valsavah maneuver.

table 2 the incidence of barotrauma

	barotrauma	
	Frequency (f)	Percentage (%)
Yes		
Ear barotrauma	24	68.5
Nose barotrauma	1	2.9
pulmonary barotrauma	0	0
Dental barotrauma	0	0
No	2 10	28.6
Total	35	100

Based on Table 2 shows mostly traditional divers experience barotrauma total 25 persons (71.4%), with ear barotrauma number of 24 people (68.5%), barotrauma nose number 1 (2.9%), traditional divers almost half are not experience barotrauma of 10 people (28.6%).

table 3 Correlation Between equalization technique Genesis Against Ear barotrauma On Traditional Diver

equalizati on technique s	Barotrauma				Total	
	Yes		No		F	%
	f	%	f	%		
Yes (Toynbee)	8	32	9	90	17	100
No	17	68	1	10	18	100
Total	25	100	10	100	35	100

Spearman rho = 0.029 α = 0.05

Based on Table 3 shows the majority of traditional diver who does not perform equalization technique and experience barotrauma amounted to 17 (68%), a fraction of traditional diver who did not experience barotrauma equalization and number 1 (10%). Traditional divers who do not experience barotrauma equalization and almost seluruhnya totaled 9 (90%) and traditional divers who perform equalization Toynbee but suffered barotrauma almost halved number of 8 (32%). Based on statistical Spearman rho test that measures the level or the close

correlation between the two variables bersekala ordinal. Spearman rho test results obtained p value $< \alpha$ or $0,029 < 0,05$ so that H_0 refused and H_1 accepted, then there is a correlation between the incidence of barotrauma equalization techniques in traditional divers dikelurahan Kedung Cowek Surabaya.

DISCUSSION

1. Equalization Technique On Traditional Divers Village Kedung Cowek In Surabaya

Tabel 1 the results showed the use of equalization techniques in traditional divers dikelurahan kedung Cowek Surabaya most of which did equalization were 18 people (51.4%), Surabaya and medicine Faculty of Medicine, University of Hang Tuah Surabaya. This is because the majority of low-educated traditional divers proved by the data of divers who do not perform equalization technique with a secondary school education 16 (88.9%). According Rahayu (2015) education is a determining factor for every person in the act. The higher one's education, the better is also the person to keep his life in this case health. According to investigators traditional divers with low education affect a person's behavior in a positive action. Behavior like this makes traditional diver equalization technique does not assume a negative impact on health.

Old diving also influence individuals to perform the appropriate procedures such as equalization techniques that should be done when diving. The majority of traditional diver who does not perform equalization technique is an old diver diving has more than 10 years. This is evidenced by the data obtained by researchers of 18 people (68%) of traditional diver who does not perform equalization technique, almost entirely traditional diver who does not perform equalization with the long dive > 10 years amounted to 14 (77.8%). This is because the traditional with old diver diving > 10 years more experience and consider the

procedure dives is not too important. This is evidenced by the theory of adaptation of Lawrence Green is a change in behavior, according to Lawrence Green behavior is influenced three factors, predisposing factors which include knowledge and attitudes, traditions and beliefs, levels of education and the economy to health, the factors enabling covers the availability of facilities and infrastructure or medical facilities needed in the implementation of health behaviors, reinforcing factors include attitudes and behavior of families, health workers, community and religious (Nursalam, 2013). According to investigators with the old traditional diver diving > 10 years are familiar with the circumstances and already does not care about the procedures to be followed when diving. Traditional diver already accustomed to not doing equalization while diving and was not bothered by his health while new divers should be able to adapt to the environment by way of equalization techniques to equalize the pressure from the outside and adjust the pressure of the body so it does not happen a disease dives. Diving frequency can also affect a person does not perform equalization techniques proven by the data of traditional divers who dive 24-30 times / week the majority of some 15 people (83.3%) did not perform equalization techniques. Traditional divers dive with a frequency very often already familiar with do not perform equalization technique, because at the time of the dive do not feel a disturbance in the body when you do not perform equalization techniques.

Traditional diver nearly half did equalization techniques Toynbee maneuver a number of 17 (42.9%). According notoatmojo (2012) health behavior is a person's response to the stimulus or object-related illness and disease as well as the environment. Behavioral health for disease prevention, cure when sick, Working and health recovery. Changes in behavior can be seen from the thoughts and feelings of every

individual to a stimulus, the other person is the reference to commit an act of a person's mindset and attitude towards a particular stimulus. According to investigators, Toynbee equalization technique is mostly done by traditional divers for divers according to this technique is easily performed in water. Mechanical Toynbee maneuver can be performed by pinching the nose, swallowing hard.

2. The incidence of barotrauma On Traditional Divers Village Kedung Cowek In Surabaya

Tabel 2 research results obtained mostly traditional divers experience barotrauma total 25 persons (71.4%) most experienced ear barotrauma number of 24 people (68.5%). This is because when diving ears get bigger pressure than the other body cavity. Divers will more often experience recurrent ear pressure on the eardrum. Traditional diver who suffered barotrauma nose number 1 (2.9%), this is due to the relatively negative pressure due to contraction of the air in the nose that can occur bleeding at the nose. This is because most traditional divers ages 35-45 years old with the number of 14 people (56%) experienced barotrauma. Age is one of the individual characteristics that will influence the frequency of occurrence of disease because of the influence of the body's resistance to exposure, so the age can affect the durability of a traditional diver on the incidence of some diseases such as barotrauma. Increasing the person's age will decrease the body's resistance to disease. According to research Ekawati (2010), age > 40 years more experience barotrauma barotrauma especially ear and tympanic membrane perforation compared with age < 40 years. Ekawati research consistent with research from sowendro (2006) who said the cause of a person experiencing barotrauma due to the tympanic membrane thickening and stiffness that can lead to progressive hearing loss that is usually influenced by

the age of over 45 years. According to investigators the age factor can affect a person affected by barotrauma. Childbearing age can experience barotrauma more than older adults age because they aged <40 years has not yet adapted to the environment and other factors such as long dive also affect divers experience barotrauma. The majority of the traditional with old diver diving > 10 meters almost most experienced barotrauma proved by the data of 35 people, the traditional with old diver diving > 10 years were mostly experienced barotrauma of 20 people (71.4%). Traditional experienced divers due to long diving barotrauma due to diving too long done for many years and each day will give negative impact to our health, especially the ability of auditory function. According to the study of revelation (2012) proved that length of term of office associated with risk of middle ear barotrauma. The longer the term of office, then the risk of barotrauma is increasing, due to repeated exposure to changes in the pressure of increasingly frequent and Eustachian tube will often have exposure to changes in atmospheric pressure which can affect its function. The length of a person's work as a diver to be one cause of barotrauma in this case at the hearing, because the longer a person is exposed to a pressure difference, the risk for the occurrence of barotrauma greater. According to investigators the longer a person diving, the greater a person's risk of barotrauma occurs. The incidence of barotrauma is associated with a person's ability to adapt to exposure causes changes in pressure. Traditional divers were unable to equalize the pressure in the water will potentially experience barotrauma, repeated exposure to the pressures of increasingly frequent causes the body will often have exposure to changes in pressure that may affect its function, especially in eustahius tube function. Not only long dive, dive depth is also one factor affected by barotrauma divers. This is evidenced by

the data of traditional divers with diving dikedalaman <10 meters mostly experienced barotrauma evidenced by the data of 18 people (72%). According Darjo in Indriati (2010) deeper dive respondents, will get greater pressure, it means the greater the effect on the health of divers. The human body gets the water pressure at depth will adjust to this pressure. When the body can not adjust to these pressures, it can happen squeeze / trauma. Squeeze / trauma generally can occur in 10-meter dives and decompression dives can occur at 12.5 meters. According to investigators traditional divers who dived <10 meters is not at risk of barotrauma, because traditional divers dive is not too deep. Frequency can also affect one's diving experience barotrauma evidenced by the data of traditional diver who dives frequency of 24-30 times / week largely mengalamii barotrauma 18 men (72%). According to Fatmawati (2015) a diver who often divers will more often traumatized repeated pressure on the eardrum. This will result in the balance organ in the inner ear tissue swelling and blockage of the Eustachian tube to perforate the tympanic membrane can even cause bleeding and torn eardrum. According to researchers respondents with frequency dive very often have a long working period and not carry out the procedure dive right that many traditional diver who suffered barotrauma especially ear barotrauma. Another thing that can affect is the physical condition at the time of the dive. From the interview at the time of the study obtained information that sometimes divers are forced to do the dives even though they feel unwell usually fixed divers to dive at the time of the flu.

3. Correlation Between equalization technique Against Genesis barotrauma On Traditional Divers Village Kedung Cowek In Surabaya

The results of the study Table 3 is obtained between engineering equalization on the incidence of barotrauma is of 18

people (78%) divers traditional, which does not perform equalization and experience barotrauma number of 17 people (68%), while divers who do not perform equalization and did not experience barotrauma number 1 (10%). Traditional diver who does not perform equalization, because there are still many traditional diver who do not know a good dive procedures, there is also a traditional diver who already know the procedures to be followed when diving but do not comply with the recommended procedure dives. According to the law Boyle (1662) in Yupiteri (2012) which states that the volume of gas is inversely proportional to pressure. A decrease or increase in environmental pressures will increase or depress a volume of air in a confined space. At the time down from an altitude, atmospheric pressure will rise and the gas pressure in the middle ear will fall. The air will not enter the middle ear spontaneously, auditory tube must be opened with a yawn movement or other maneuver that often goes unnoticed, which occur every minute, or more frequently. According to investigators traditional diver who dives will put air cavity filled with a gas such as the ears and lungs can occur barotrauma. Barotrauma most often affected by novice divers because of not knowing how to perform equalization during the dive and dive lack of control theory and new environmental factors also affect novice divers experience barotrauma. Barotrauma the process begins when divers started diving makes the outer ear canal causing water to get into the open air replaces. The ear canal may be hampered by earwax or earmuffs will cause disturbed balance ear pressure and bleeding in the ear. Complaints are usually emerge that sense of fullness in the ear, ear pain to occur vertigo if the diver is exposed ear barotrauma. The situation can be resolved by Toynbee equalization technique which is easily done by divers traditional on during a dive.

Diver traditional techniques equalization and did not experience barotrauma number 9 (90%), this is because at the time diving outside pressure will press so that the body's response will equalize the pressure by means of equalization, so that the pressure between the outside and inside of the body will equal and there is no barotrauma. According Ekawati (2010) traditional divers who perform procedures in accordance with the given has a small risk of barotrauma or illnesses likely to occur more dives. The dives procedure should be done by performing equalization techniques such as Toynbee or Valsalva because this technique is often used when performing equalization divers. Divers on the way up to the surface should be slowly and not rush on the way up because it can cause barotrauma. According to researchers obedience person in performing a procedure dives will also affect the health. Traditional divers who perform the appropriate procedures, will minimize the occurrence of diseases such as barotrauma diving. Prevention of traditional diver dives to avoid diseases such as barotrauma, the diver must be able to perform equalization techniques before the dive. Many traditional diver who can perform equalization techniques Toynbee surface before diving by pinching the nose and then swallowed performed simultaneously. Equalization procedure is very important for all divers, especially traditional and divers should be trained regularly in order to carry out the procedure properly.

CONCLUSION

The use of equalization techniques have a significant correlation to the incidence of barotrauma on traditional divers in the Village Kedung Cowek Surabaya

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