

# Study of General Paralysis in Fishermen Divers Barrang Lompo Island Land Districts of Ujung Tanah Makassar City

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## ABSTRACT

*Pattingaloang Health Center is one of the main centers where the area covers the coastal area where the occupants are dominated by diver fishermen. Recorded data shows 60 cases of illness due to diving activity, 50% of them suffered paralysis with 10 people died. This observational research used Case Control Study approach. The population was divers who listed in the public health center Barrang Lompo Island. In the case group, samples were fishermen divers who suffered paralysis due to diving activity divers, while in the control group were who did not experience paralysis. Purposive sampling were used in this research, with sample size 60. Comparison of cases with controls group at 1 : 2. Data analysis was performed with univariate and bivariate test of odds ratio (OR). The results of this study show that firsts age diving (OR 5167; 95% CI 1616-16520), diving depth (OR = 9,14.95%. CI.1.10-75.98), diving frequency (OR 6231; 95% CI 1859-20878), diver medical examination (OR = 5:44% CI 1688-17565), and diver fishermen working period (OR = 5.40.95%. CI.1.09-26.61), is a risk factor of the paralysis incidence. This study suggests the*

*diver fishermen to have more concern about their first age diving before they become a diver since age affects their stamina. Divers who are too young considered as physically and mentally immature group, while the old diver consider their body resistance has decreased. For diver fishermen should perform routine health checks at least once every 3 months and any time they experiences health problems. Diver fishermen should know and apply the right technique for diving in order to avoid undesired event when they dive.*

**Key words-** *paralysis; diving; fishermen; medical, safety.*

## 1. INTRODUCTION

Pattingaloang Health Center is one of the health center where the work area covers the coastal area which mostly the resident are divers fisherman. Recorded data, 60 cases of illness due to diving, 50% of them have subsequently paralyzed and 10 people had died after suffering paralysis. Others have a hearing loss and vision as well as many more divers who suffer from diseases that have not been recorded as a result of the dives (PKM Pattingaloang, 2009).

Many cases of paralysis because of diving have not unidentified and addressed seriously. Research conducted by ST. Raodhah Barrang Lompo Island in 2005 found that lack of health care utilization in the divers fisherman as indicator of the high cases of paralysis due to diving.

Profession as dives have a very high risk of harm, so as to increase productivity of diving and implementation of professional diving ,therefore the knowledge of awareness about the possible dangers that occur in the environment of high pressure air is needed. The most important problems in the field of occupational health divers and hyperbaric medical workers under water (sport divers or recreational divers, non-professional and professional divers) are the linkages of divers with health problems or illnesses known as Decompression Sickness. The most serious impact of the disease is paralysis of the divers that result in decrease of productivity and often cause death.

Many related factors that affect the activity of paralysis divers, they are age, depth of dives, working period, frequency the divers to go up and down during the diving and the use of compressor as breathing aids while diving. The ideal age limit for diving activities are 16-35 years old, less than 16 years and more than 35 have a higher risk. The deeper the diving location from the surface of the water, the greater the pressure will be get<sup>20</sup>. Work period can determine the length of a person's exposure to hyperbaric pressure. The longer the exposure to a hyperbaric environment will be more likely due to the risk of someone getting bad effects of diving. The more often the frequency of

ascending and descending while diving, the more frequent the changes of pressure equalization<sup>23</sup>, consequently over time the body will be slower and slower in performing equalization so that the body cannot survive in a pressurized area. The divers who use air support through the compressor are at risk to get nitrogen poisoning (decompression sickness) nitrogen narcosis and decompression sickness in the divers were caused because stay too long in the water at a certain depth<sup>16</sup>.

This study will discuss the incidence of paralysis in fisherman-diver in Barrang Lompo Island, Ujung Tanah Makassar. The aim of the study is to determine the risk of age, the depth of the dive, the frequency of diving, health check-up, working period with the incidence of paralysis in working with fishermen divers of Barrang Lompo Island in Ujung Tanah district, Makassar. The results of this research may be one source of information for relevant agencies, especially for the Community Health Center to pay more attention to the condition of fishermen divers.

## 2. METHOD

The research was conducted in Barang Lompo island, Ujung Tanah District, Makassar. The type of research is observational with Case Control Study approach, the population were divers that recorded in health centers of Barang Lompo Island. The sample was fisherman divers who suffered paralysis as a result of diving in the case group and divers who do not experience paralysis in the control group. Method of sampling using purposive sampling, with a

sample size of 60, where there were 20 cases and 40 control group with a ratio of 1: 2. Primary data were obtained through questionnaires that had been developed previously based on the objective of the research then conducted interviews with the respondents. Secondary data obtained by researcher from the data of divers that recorded in health centers in Barang Lompo Island. Data analysis was performed with univariate and bivariate test of odds ratios (OR).

### 3. RESULTS

#### 3.1 CHARACTERISTIC OF RESPONDENT

Characteristics of respondents can be seen in Table 1 which shows that the distribution of respondents based on age were mostly at the age group of 15-24 years, which the total number were 25 people (41.7%), while the lowest age group were in the age group  $\geq 45$  years which the total number were 3 people (5.0%). The level of education of Respondents is in elementary school, as many as 59 people (98.3%) compared with the junior high school level which only 1 person (1.7%). Respondents most widely recorded in RW 4 by 28 people (46.7%) and the least in RW 2 is 6 people (10.0%). many of divers who did not know that Knowledge about the ideal age to dive were 42 people (70.0%).

#### 3.2 DESCRIPTIVE OF RESEARCH VARIABLES

Table 2 showed the respondents first dives at no more than 16-20 years of age as many as 37 people (61.7%) and the least is 6-10 years

TABLE 1  
DISTRIBUTION OF RESPONDENT CHARACTERISTICS IN BARANG LOMPO ISLAND UJUNG TANAH DISTRICT, MAKASSAR

Characteristics	Number (n)	Percentage (%)
1. Age		
15 – 24	18	30,0
25 – 34	24	40,0
35 – 44	15	25,0
45 – 54	3	5,0
2. Level of Education		
Elementary	59	98,3
Junior High School	1	1,7
3. Respondent address		
RW 1	12	20.0
RW 2	6	10.0
RW 3	14	23.3
RW4	28	46.7
4. Knowledge of		
Ideal age	10	16.7
counseling	8	13.3
training	42	70.0

TABLE 2  
DISTRIBUTION OF RESPONDENT BASED ON DESCRIPTIVE OF RESEARCH VARIABLES ON FISHERMAN DIVERS PARALYSIS IN BARANG LOMPO ISLAND UJUNG TANAH DISTRICT, MAKASSAR

Research Variable	Number (n)	Percentage (%)
1. Age (year)		
6-10	1	1.7
11-15	20	33.3
16-20	37	61.7
21-25	2	3.33
2. Diving Depth (meter)		
5 – 9	14	23,3
10 – 14	2	3,3
15 – 19	9	15,0
20 – 24	21	35,0
$\geq 25$	14	23,3
3. Diving Frequency		
2 times/ a day	6	10.0
3 times/ a day	26	43.3
4 times/ a day	13	21.7
> 4 times/ a day	15	25.0
4. Health examination		
Regular	24	40.0
Non-Rgular	36	60.0
5. Working Period (year)		
1 – 4	17	28,3
5 – 9	16	26,7
10 – 14	10	16,7
15 – 19	7	11,7
$\geq 20$	10	16,7

by 1 person (1.7%). Most of diving depth is at a depth of 20-24 meters, that is, 21 people

(35.0%), while the least of diving depth was at a depth of 10-14 meters dive there are 2 people (3.3%). Diving frequency given there were 26 respondents (43.3%), who dive 3 times / day, while the least are the respondents who dive 2 times / day ie, as many as 6 people (10.0%). Respondents who do not regularly check their health before diving more than respondents who regularly check their health, namely, 36 people (60.0%). Diving working period with the group the most is the group working period 0-4 years (28.3%) while the diver with the group is working at least 15-19 years (11.7%)

**4. ANALYSIS OF RELATIONSHIP BETWEEN VARIABLES**  
**4.1 AGE OF FIRST DIVING**

Table 3 showed that the percentage of respondents who are diving at the ideal age of 39 (65.0%) is bigger than the non-ideal age of diving which is 21 people (35.0%). In the case group, most of the group of respondents who are in non-ideal age of diving which is 12 people (60.0%) compared with respondents who dive in ideal age were 8 people (40.0%), while the control group the most divers who diving in ideal age were 31 people (77.5%).

**4.2 DIVING DEPTH**

Table 3 showed that the percentage of respondents who dive in the depths of  $\geq 10$  feet were 46 people (76.6%) it is more than those who dive in the depths of  $<10$  meters with 14 persons (23.3%). In the case group, most of the group of respondents dive in the depths of  $\geq 10$  feet were 19 people (95.0%) compared with the divers who dive in the depths of  $<10$  meters were 1 person (5.0%), while in the control group the most divers

TABLE 3  
 STATISTICAL OUTPUT BASED ON CASE CONTROL OF RESEARCH VARIABLES ON FISHERMAN DIVERS PARALYSIS IN BARANG LOMPO ISLAND UJUNG TANAH DISTRICT, MAKASSAR

Research Variables	Obj. Criteria	Paralysis		Am ong	Statistic CI 95% (LL – UL)
		Case	Contr		
First Age Diving	$< 16 / \geq 35$	12	9	21	OR = 5.167 (1.61-15.52)
Diving	16-35	8	31	39	
Diving	$\geq 10$ m	19	27	46	OR = 9,14 (1.10 – 75.98)
Depth	$< 10$ m	1	13	14	
Diving	$\geq 4$ t/d	15	13	28	OR = 6.23 (1.86 – 20.88)
Freq.	$< 4$ t/d	5	27	32	
Medical Exam	not routine	14	12	26	OR = 5.44 (1.69 – 17.57)
Working	$\geq 5$	18	25	43	OR = 5,40 (1,09-26,61)
Period	$< 5$	2	15	17	

who dive in the depths of  $\geq 10$  feet were 27 people (67.5%).

**4.3 DIVING FREQUENCY**

Table 3 showed that the percentage of respondents who dived  $< 4$  times / a day were 32 people (53.3%) it was more than those who dive  $\geq 4$  times / a day were 28 people (46.7%). Respondents who were diving  $< 4$  times / a day in the case group were 5 people (25.0%) less than the diver who dive  $\geq 4$  times / day, they were 15 persons (75.0%), whereas in the control group most of divers with the frequency of diving  $< 4$  times / a day were 27 people (67.5%).

**4.4 HEALTH EXAMINATION**

Table 3 showed that the percentage of respondents who regularly checked health were 34 people (56.7%), while respondents who do not regularly check their health were 26 people (43.3%). Respondents who do not regularly check their health in the case group were 14 (70.0%), it was more than those with

regular health check that there were only 6 people (30.0%), whereas in the control group the most divers who regularly check their health were 28 people (70.0%).

#### 4.5 WORKING PERIOD

Table 3 showed that the percentage of respondents who have working period  $\geq 5$  years were 43 people (71.7%), while respondents with no history of the disease were 17 people (28.3%). There were 18 (90.0%) respondents who have working period  $\geq 5$  years in the case group, it is bigger than divers who have a working period  $< 5$  years, which only 2 people (10.0%), whereas in the control group, most of divers who have working period  $\geq 5$  years were 25 people (62.5%).

### 5. DISCUSSION

#### 5.1 AGE OF FIRST DIVING

In this study indicated that the divers were diving at the age of 39 are ideal (65.0%) and divers are non-ideal at the age of 21 (25.0%). In the case group, most of the respondents were not diving at the non ideal age, as many as 12 people (60.0%) compared with the respondent who diving in ideal age of diving were 8 people (40.0%), while in the control group, most of divers who diving in their first time at the age of ideal age of diving were 31 people (77.5%). Based on the test odds ratio  $OR = 5,167$  values, it was obtained with the lower limit and upper limit =  $1.61 = 15.5$ . The lower limit and upper limit of 95% CI were not include the value 1, the null hypothesis was rejected. This means that at the age of first diving is one of factor for the incidence of paralysis.

The results of this study are consistent with research in BarangLompo and Kodingareng

which conducted by Muhammad Yusri in 2004, it showed that  $OR = 5.61$ , which is not ideal age for diving which 5.61 times greater risk of experiencing paralysis. In the case group, the percentage of divers who dive at age  $< 16$  years or  $> 35$  years more likely to have major health problems were 19 people (46, 3%) compared with the divers at the age of 16-35 years were 10 people (13, 3 %).

Age of first time diving was very influential on the health of a diver since age is the description of the physical health of human. Divers in young age are not ready to diving because their organs and body functions will receive heavy workload so it is very risky if you do not work in accordance with the portions nor the fishermen divers who had started in age that can be said is old or unproductive.

#### 5.2 DIVING DEPTH

The study indicated that respondents who dive in depths of  $\geq 10$  feet were 46 people (76.6%) more than those who dive in depths of  $< 10$  meters with 14 people (23.3%). In the case, most of the group respondents who dive in depths of  $\geq 10$  feet were 19 people (95.0%) compared with the divers who dive in depths  $< 10$  meters was 1 person (5.0%) whereas in the control group, most of the divers who dive in depths of  $\geq 10$  feet were 27 people (67.5%).

The statistical results showed that the depth of the dive is a risk factor for the incidence of paralysis. Respondents who diving scale depth of 10 meters were  $\geq 9.14$  times greater risk of experiencing paralysis compared to respondents who dive with depths of  $< 10$  meters.

The results of this study are consistent with research conducted Muhammad Yusri (2005) on the island of BarangLompo and

Kodingareng which indicated that the divers who dive in the depth of  $> 20$  m were 5.296 times more at risk of experiencing health problems compared with divers who diving in the depths of  $<20$  m.

The results of other studies conducted by DarryVirgiawan (2010) showed that there are 60% of divers who dive in  $> 9$  m experiencing hearing loss compared with a diving in  $<9$  m which 8.33%. This result suggested that the depth of the diving is the main factor to disruption of loss hearing experienced by divers.

The divers have to consider to the depth of the diving. Diving depth affects on the condition of the body which receive abnormal pressures of greater water pressure on the human body. The more diving depth is reached the more air pressure received by the divers. If the diving depth is more than 10 meters it is necessary to pay attention to the procedures decompression stop on the way up to the surface.

### 5.3 DIVING FREQUENCY

The human body is always adapting to environment. Pressure in the water is greater than pressure on the surface of water therefore human body would not resist to stay for long time in the water. The longer and the more a person diving will weaken the condition of the body due to the human body cannot stay in the water for long time<sup>17</sup>.

In the present study shows that the percentage of divers who dive  $<4$  times / a day were 32 people (53.3%) more than those who dive  $\geq 4$  times / a day, they were 28 people (46.7%). Respondents who diving  $<4$  times / day in the case group were 5 people

(25.0%) it is less than the diver who diving  $\geq 4$  times / a day, they were 15 persons (75.0%), whereas in the control group, most of divers with the frequency of diving  $<4$  times / a day were 27 people (67.5%). Based on the test odds ratio OR = 6,231 the values obtained with the lower limit and upper limit = 1.86 = 20.88. The lower limit and upper limit of 95% CI did not include the value 1, the null hypothesis is rejected. This means that the frequency of diving is a risk factor on the cause of paralysis.

The results of this study are consistent with research on theBarangLompo island and Kodingareng conducted by Muhammad Yusri 2004, the study showed OR = 2.46, diving greater / equal to 4 to 2:46 times greater risk of experiencing health problems. Therefore you should pay attention to fishermen divers dive frequency aspects in performing daily activities. Diving frequency is also associated with the condition of the divers' body, if their body is in good condition it will allow the diver to dive more but if the condition of the body is not good enough then do not force yourself to diving. But the reality on the location showed that more divers who experience health problems when diving more than 4 times a day. Thus the divers should not dive more than / equal to 4 times in 1 day.

### 5.4 HEALTH EXAMINATION

If the health condition of a diver not good enough then you should not dive until the diver in healthy condition if not it will give bad effects for the divers' health. If divers forced themselves to dive then they usually experienced disruption in their body such as disorders of the ear, brain, nosebleed

and ears bleed, cramps, etc <sup>17</sup>. The physical condition of the diver before diving is very important. Therefore, it is recommended for a diver to do a health examination before diving. According Indonesia Health Department 2002 diver should commit medical examination before and after the diving, routine examination at least once in 3 months, and special examinations whenever experiencing health problems caused by diving <sup>1</sup>.

The present study showed that the percentage of respondents who regularly check their health with 34 people (56.7%), while respondents who do not regularly check their health were 26 persons (43.3%). Respondents who do not regularly check their health in the case group were 14 (70.0%) more than those with regular health check were 6 people (30.0%), whereas in the control group the most divers who regularly check their health were 28 people (70.0%). Based on the test odds ratio  $OR = 5.44$  value obtained with the lower limit and upper limit  $= 1.69 = 17:56$ . The lower limit and upper limit of 95% CI did not include the value 1, the null hypothesis is rejected. This means diving medical examination is a risk factor on the incidence of paralysis.

These results are also in line with the descriptive survey research conducted by Mary in 2005, the study obtained information that the request (demand) against public health services is lower than 17 respondents found that 11 people (64.7%) of respondents are less in demand for health services due to lack of knowledge.

Based on the results of this study, it is recommended that the health services coordinator should be more intensive to follow up and get more information in the paraplegic patients and the provision of information that needs to be done regularly in order to improve knowledge about the health of fishermen divers. In addition, the

fishermen divers should also regularly check their health in order to avoid unwanted health problems in order to meet the needs of everyday life.

## 5.5 WORKING PERIOD

The longer a person works in one place the more likely they were exposed to environmental factors both physical and chemical work which can cause health problems / occupational diseases that will result in loss of efficiency and productivity of the work <sup>23</sup>.

This study indicated that respondents who have working period  $\geq 5$  years were 43 people (71.7%), while respondents with no history of the disease were 17 people (28.3%). Respondents who have working period  $\geq 5$  years in the case group were 18 (90.0%) it is bigger in number than the divers who have a working period of  $<5$  years, they were only 2 people (10.0%), whereas in the control group, most of the divers who have working period  $\geq 5$  years were 25 people (62.5%).

Statistical analysis showed that respondents who had working life  $\geq 5$  years had a 5.4 times greater risk of experiencing paralysis compared with respondents who have working period of  $<5$  years. This is due to the longer a person works as a diver, the greater the likelihood of exposure to a hyperbaric environment that can cause health problems to paralysis. Future work can determine the length of a person's exposure to the risk factor, the longer the exposure based on the working period the more likely someone will get the risk factors to get paralysis.

The results of this study are consistent with the study conducted by Muhammad Yusri (2005) on the Barang Lompo island and Kodingareng, it was found that divers working period > 5 years were 17 persons (28.3%) who experienced health problems and there were 43 people (71.7%) who do not experience health problems. While in the working period of  $\leq 5$  years there were 12 persons (21.4%) divers who experience health problems and there were 44 individuals (78.6%) who did not experience health problems.

This study is also in support the research conducted by Tuti Ekawati (2005), the results of her research states that work for a long time may cause risk 1:05 on the incidence of tympanic membrane disruption for the divers.

Because the longer a person works as a diver the more exposure of high air pressure the diver get. So divers should more often check their health condition before and after the diving.

## 6. CONCLUSION

The results of this study showed that the age of first diving (OR 5,167; 95% CI 1616-16520), the depth of the diving (OR = 9,14.95%. CI.1.10-75.98), diving frequency (OR 6,231; 95% CI 1859-20878), diver health examination (OR = 5.44% CI 1688-17565), and the working period (OR = 5.40.95%. CI.1.09-26.61), a risk factor for the incidence of paralysis.

## 7. SUGGESTION

Divers were expected to pay attention to the standard rules of gooddiving. The diving in the depth of  $\geq 10$ -meter should be

adjusted to the duration of appropriate procedure of diving.

Health workers should be more active in deal with the incidence of paralysis and provide more counseling to fishermen divers and divers must regularly check their health and pay attention to the frequency of diving. For fishermen divers who dive frequently ( $\geq 4$  times / a day) should reduce the frequency of diving activity or must obtain approval to diving  $\geq 4$  times / a day from local health service center.

Fisherman divers who worked more than 5 years should pay more attention to his physical condition and should always perform routine health examination at local health center institution.

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