International Journal of Medical Toxicology & Legal Medicine **Volume 27, No. 5, 2024**
e-ISSN: 0974-4614
p-ISSN: 0972-0448
https://doi.org/10.47059/ijmtlm/V27I5/041

Strengthening Health Literacy For Improving Theory-Based Decompression Illness Prevention Behavior Health Action Process Approach

Sahmad[1]*, Andi Zulkifli Abdullah[2], Muh. Syafar[3], Indahwaty Sidin[4], Akhmad[5], Muhaimin Saranani[6], Anwar Mallongi[7]

[1]Phd student, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia, Email: sahmad hanisa@gmail.com
[2]Professor, Department of Epidemiology, Faculty of Public Health , Hasanuddin University , Makassar, Indonesia
[3]Professor , Department of Health behavioral science, Faculty of Public Health , Hasanuddin University, Makassar, Indonesia
[4]Professor , Department of Hospital Management, Faculty of Public Health , Hasanuddin University, Makassar, Indonesia
[5]Associated Professor, Department of Nursing, Polytechnic of the Ministry of Health Kendari, Kendari, Indonesia
[6]Associated Professor, Department of Nursing, Polytechnic of the Ministry of Health Kendari, Kendari, Indonesia
[7]Professor , Department of Environmental Health Department , Faculty of Public Health , Hasanuddin University, Makassar, Indonesia
*Corresponding Author

Received: 15.09.2024 Revised: 18.10.2024 Accepted: 09.11.2024

ABSTRACT
This study explores health literacy in improving decompression sickness prevention behavior among traditional divers of the Bajo tribe in Konawe Regency, Southeast Sulawesi, using the Health Action Process Approach (HAPA) theory. This study aims to understand the level of knowledge of traditional fishermen regarding decompression sickness and how health literacy can play a role in improving prevention behavior.
Methods: The method used in this study is the phenomenology method through in-depth interview techniques , and focus group discussions (FGD) on 22 informants which aims to explore informants' knowledge about decompression sickness. The study began in January-July 2024. Data collection using unstructured interview questionnaires. The main themes were arranged to explore the knowledge of traditional fishermen of coastal communities in the Bajo ethnic group about decompression sickness.
Results: The results of the study indicate that the knowledge of traditional divers of the Bajo tribe related to decompression sickness is still limited. The themes identified include knowledge of decompression sickness (Remember , Understanding, Apply), Sources of motivation, enabling factors , pre -action - self-efficacy , Self-efficacy coping .
Conclusions: The conclusion of the results of this study is that it is necessary to increase health literacy among traditional divers of the Bajo tribe through the application of HAPA theory to improve decompression sickness prevention behavior, so as to increase the awareness and productivity of diving fishermen.

Keywords: Decompression sickness, Health Literacy, Health Action Process Approach, Traditional Divers, Bajo Coastal Community

INTRODUCTION

Indonesia, as an archipelagic country with more than 17,508 islands, has more than 70% of its territory as ocean. [1] This geographical condition makes the majority of its population dependent on the fisheries sector, with many working as diving fishermen. Diving fishermen are individuals who carry out fishing activities by diving, and using compressors as air supplies. [2] A significant health risk for diving fishermen is decompression sickness, [3] which occurs when rapid pressure changes cause gas bubbles to form in the body, [4] potentially causing tissue

damage and serious health complications, including decreased productivity, severe morbidity, lifelong disability, paralysis, and even death [5 6 7 8 9]

The incidence of decompression sickness varies significantly across countries. In the United States, the incidence of type II decompression is 2.28 cases per 10,000 dives, while for type I many divers do not seek treatment so the data is not well recorded [10] . In Australia, the number of deaths due to drowning reaches 500-600 people per year, with the incidence of decompression sickness in commercial diving reported at 35.3 per 10,000 person-dives. [10] In Indonesia, the Ministry of Health reported that 59.2% of diving fishermen in 32 districts of 23 provinces experienced decompression symptoms after diving, with the most common complaints including dizziness, headaches, and joint pain [11]

The increasing incidence of decompression sickness in Indonesia is caused by the lack of public knowledge about the risks of diving, the implementation of diving procedures that do not comply with procedures, and the use of compressors. [12 13 14] Previous studies have shown that factors such as frequency, duration, depth of diving, and the health history of divers play an important role in the risk of decompression. [15 16 17 18] In this case, strengthening health literacy is an important solution to improve understanding and behavior in preventing decompression sickness among traditional diving fishermen, especially among the Bajo tribe [19 20 21 22]

Health literacy, according to Nutbeam and Kickbusch (2000), is an individual's ability to obtain, understand, and use health information to make informed decisions about their health. [23] The application of health literacy is very relevant to the Health Action Process Approach (HAPA) theory, which explains that changes in health behavior can occur through two phases: the motivational phase and the volitional phase. The motivational phase includes self-efficacy, risk perception, and outcome expectancies, which form intentions. After intentions are formed, the volitional phase involves planning and implementing health actions, which are then manifested in the form of real behavior. [24]

This study aims to analyze the application of health literacy in strengthening decompression sickness prevention behavior based on HAPA theory in traditional divers of the coastal community of the Bajo tribe in Konawe Regency, Southeast Sulawesi Province. Increasing knowledge and application of health literacy is expected to increase awareness of the Bajo tribe of the dangers of decompression sickness, so that they can maintain their health and productivity better. This study has received ethical approval from the Faculty of Public Health, Hasanuddin University with the number: 5966/UN4.14.1/TP.01.02/2023

The novelty of this study lies in the application of the Health Action Process Approach (HAPA) theory to improve health literacy among traditional Bajo diving fishermen in preventing decompression sickness. This study not only identifies the low level of knowledge of fishermen about decompression sickness, but also develops a health literacy-based intervention that has never been specifically applied to traditional fishing communities in Indonesia, especially the Bajo tribe. This approach introduces a structured strategy through the motivational and volitional phases of the HAPA theory, which has not been widely explored in the context of coastal community health in Indonesia, thus providing a new contribution to the method of preventing decompression sickness based on health literacy that can be implemented in similar communities. [25]

RESEARCH METHODS

This study involved 22 informants, Informants were selected purposively. The instruments used in this study included unstructured interview questionnaires, focus group discussion (FGD) guides, recorders and pens and notebooks to document the interviews. This study used a qualitative approach with a phenomenological method. Data were collected through three main techniques: in-depth interviews , focus group discussions (FGD), and observation. Interviews were conducted individually to collect detailed information about the knowledge and experience of each informant related to decompression sickness. The interview duration for each informant was 30-45 minutes. FGDs were used to obtain perspectives from village officials on the risks and prevention of decompression sickness. Observations were conducted during the daily activities of fishermen to understand the social and cultural contexts that influence fishermen's diving behavior. Data analysis was carried out using NVIVO 12 Plus software through thematic analysis methods. Data obtained from interviews and FGDs were coded, then grouped into main themes that were relevant to the research objectives. [26] The analysis process began with the transcription of interview and FGD results, followed by careful reading to identify emerging patterns and themes. These themes were then compared with existing literature and used to develop recommendations for health literacy-based interventions that are appropriate to the cultural context of the Bajo tribe. [25]

Data analysis

Characteristics of informants

In this study, informants for in-depth interviews consists of 6 people traditional diver fishermen while the informants for Focus Group Discussion consisted of 6 village officials, 3 health workers for FGD informants, and 7 community leader informants so that the total number of informants interviewed was 22 people. The characteristics of the informants are presented in the table below:

Table 1. Characteristics of In-depth Interview Informants of Traditional Diving Fishermen of the Bajo Tribe, Konawe Regency in 2024.

Code Informant	Type sex	Age (Year)	Level education	Work	Length of work As a Fisherman
N 1	L	38	SD	Fisherman	15 years
N 2	L	48	JUNIOR HIGH SCHOOL	Fisherman	32 Years
N 3	L	31	SD	Fisherman	19 years old
N 4	L	30	JUNIOR HIGH SCHOOL	Fisherman	15 years
N 5	L	43	SD	Fisherman	24 years old
N 6	L	62	SD	Fisherman	40 years

Source: Primary data 2024

Table 1 shows 6 fishermen became informants in this study and all of them were male. The youngest age was 31 years old and the oldest was 62 years old. There were 2 fishermen with junior high school education and 4 fishermen with elementary school education. The length of service as fishermen was 15 years to 40 years.

Table 2: Characteristics of participants for focus group discussion (FGD) participants as a group of village officials in Konawe Regency in 2024.

Code Participant	Type sex	Age (Year)	Level Education	Work
P 1	L	50	Senior High School	Village head
P 2	L	52	Bachelor	Sub-district Secretary
P 3	L	45	Junior High School	RW Head
P 4	P	30	Senior High School	Village Secretary
P 5	P	34	Junior High School	Integrated service post cadres
P 6	P	35	Bachelor	Village Imam

Source: Primary data 2024

Table 2 presents the characteristics of FGD participants consisting of 6 people. 3 men and 3 women. Age range 30 – 52 years. The lowest education is junior high school and the highest is a bachelor's degree. The participants' occupations are village head, village secretary, sub-district secretary, village imam, posyandu cadre and RW head.

Table 3: Characteristics of Health Worker Informants and Community Leaders in Konawe Regency in 2024.

Informant code	Type Sex	Age	Level education	Work
Health workers				
Health worker 1	L	38	Bachelor degree	Head of Health Center
Health worker 2	P	26	Bachelor degree	Doctor
Health worker 3	L	38	Bachelor	Nurse
Public figure				
TM 1	L	39	Bachelor	Head of Bajo Harmony
TM 2	L	35	Bachelor	civil servant
TM 3	L	38	Senior High School	Village Head
TM 4	L	40	Senior High School	Village head
TM 5	L	40	Senior High School	Chairman of BPD
TM 6	L	41	Senior High School	Village Head
TM 7	L	40	Senior High School	Village head

Table 3 shows that there are 3 health worker informants. 1 person is female and 2 others are male. Age 26-38 years with the last education is a bachelor's degree and works as a civil servant with the profession of head of a health center, doctor and nurse. For informants who come from community leaders, there are 7 people, all of whom are men aged 35-41 years. The majority have a high school education and there are 2 people who have a bachelor's degree. 4 people work as village heads, 1 person is the head of the village harmony, 1 person is the head of the BPD and 1 is a civil servant.

RESULT

Research population

In this study, the informants for in-depth interview consists of 6 people traditional diving fishermen using compressors. The key informants in this study were doctors at the Soropia District Health Center, the length of interviews with each respondent was 30 to 45 minutes, all informants were male.

Emerging themes

Results of data processing using Nvivo The 12 plus major themes that emerged are as follows:

Research questions	Subtheme	Theme
How much do fishermen know about decompression?	Signs & symptoms of decompression Causes of decompression Decompression risk Lay term decompression Types of decompression Health information	Remember (remember)
	Affected body parts Effects of decompression Diving behavior Decompression history Scene	Understanding (understanding)
	Handling Traditional medicine	Apply (to apply)
How do fishermen motivate themselves to prevent decompression sickness?	Motivation from within Motivation from family Motivation from friends	Source of motivation
	Economic factors Responsibility	Enabling factors
How confident are fishermen to prevent decompression sickness?	Trust Tradition	Pre action – self efficacy
	Prevention	Self-efficacy coping

Fishermen's knowledge of decompression sickness

Findings from the interview results show that fishermen's knowledge about decompression is still minimal, as can be seen from the description of the three themes found as follows:

a. Fishermen have not properly remembered the signs & symptoms, causes, risks, lay terms and types of decompression and have not been exposed to health information.

The main initial symptom of decompression according to fishermen is dizziness, as quoted from the fishermen's statement:

> "…the initial symptoms are dizziness, dizziness at first (N3)"
> "...symptoms of dizziness are commonly felt (N4)"
> "…if it takes too long, then there will be symptoms of dizziness (N5)"

The main cause of decompression according to fishermen is water, as quoted from the fishermen's statement:

> "…because if it takes too long, water will enter the pores (N1)"
> "...fatigue factor in the water, if it is above 20 fathoms the water is cold (N2)"
> "…the reason is that we were in the water too long (N3)"
> "...for a long time in the water, if you dive the water depth is (N4)"

The most common decompression risk according to fishermen is staying up late, as quoted from the fishermen's statement:

> "…those who stay up late and don't sleep normally are at risk (N2)"
> "...he is forbidden from staying up late, drinking alcohol is not allowed (N3)"

"…wanting to go down to sea we are forbidden from staying up late (N4)"

"…be careful not to stay up late, if we sleep too long we will quickly get cramps (N5)"

The lay term for decompression according to fishermen is cramps, with the following quote from the fishermen's statement:

"cramps occur when we dive for too long (N1)"

"...if the pressure is different from cramps (N2, N4, N5)"

The type of decompression according to fishermen is pressure with a quote from the fishermen's statement:

"…maybe there are two that I know of, pressure and cramps (N5)"

"...I don't know sir what type of disease it is, there are some who are under pressure too (N3)"

Health information contains the word officer which appears most frequently with a quote from a fisherman's statement:

"…the health workers have never explained it, never at all (N2)"

"...the officers have never had any information about pressure sickness, let alone from the health center (N4)"

b. Fishermen do not yet fully understand the body parts affected by decompression, diving behavior, decompression history, and the location of the incident.

The body part that is most affected when decompression sickness strikes, as fishermen understand, is the joints, as quoted from the fishermen's statement:

"…it's probably just in the joints where it is (N3)"

"...all joints feel sore, knee joints, elbow joints all hurt (N6)"

The consequences of decompression according to fishermen are paralysis and death, as quoted from the fishermen's statement:

"…if not paralyzed then dead, those are the only two (N1)"

"...basically he is paralyzed for life and sometimes he dies straight away (N3)"

"…getting paralyzed, sometimes people also die (N4)"

Diving behavior that must be observed according to fishermen is minutes with a quote from the fishermen's statement:

"…usually it takes up to 30 minutes, up to 40 minutes (N3)"

"...I usually dive for 30 minutes, that's a long time (N5)"

The history of decompression is identical to the word night with a quote from a fisherman's statement:

"The first time I was hit that night, I was immediately taken to the health center (N1)"

"...I have a son-in-law who has died, he had cramps at night (N6)"

According to the fisherman, the scene of the incident was on the ship, as quoted from the fisherman's statement:

"…we just got cramps on the ship and got (N1)"

"...we were on the ship, when we got on we felt the pressure of cramps (N4)"

c. Fishermen apply decompression treatment that does not meet the proper standards and traditional medicine that conflicts with medical treatment.

The initial decompression treatment carried out by fishermen is to return to the quote from the fishermen's statement:

"…on average, if we get cramps, we are taken back down to dive (N2)"

"...soak it again for 2 hours if we call it 'tasesapeh' (N6)"

The most effective traditional treatment is to follow the quote from a fisherman's statement:

"…fed pepper, wrapped and then massaged like that (N2)"

"...we will take him back to dive while he is in the water and massage him until his urine comes out (N3)"

Fishermen's motivation to prevent decompression sickness

The findings from the interview results show the sources of fishermen's motivation and the enabling factors for motivation to prevent decompression sickness as seen from the description of the two themes found as follows:

a. Fishermen are motivated to prevent decompression sickness. Motivation comes from within themselves, family and friends.

The following is a quote from the informant's statement:

The source of motivation from within has the keyword self with a quote from a fisherman's statement:

"…yes, it came from within myself because I had thought about how many years I had not been able to move because of cramps (N1)"
"...from within myself, sometimes I think how long it will be like this (N3)"
"...I have realized it myself, just from the economic situation again (N4)"
"...really want it from inside me (N5)"

The source of motivation from the family has the keyword family with a quote from a fisherman's statement:

"…if support definitely comes from family, especially parents (N1)"
"...returning to family conditions because there is no other work besides going to sea (N2)"
"...the family often reminds us not to dive (N3)"
"...family, especially wives and parents, often tell people not to go down to the sea like diving (N4)"
"...the family told me to look for other activities (N5)"

The source of motivation from friends has the keyword friends with a quote from a fisherman's statement:

"My friends encouraged me not to dive with a compressor (N1) anymore"
"...a friend invited me to work on construction, but if I went down to dive again, I would also go down on the ship (N3)"
"...friends often motivate us not to have to work diving anymore because there are lots of other jobs (N4)"

b. Fishermen's motivation is influenced by enabling factors such as economic factors and responsibility.

The following is a quote from the informant's statement:

enabling factors that trigger fishermen's motivation have economic keywords with the following statement sentences:

"...the most fatal challenge is the economic situation. There is a difference between the results of going to sea and construction work (N3)"
"…we have realized it ourselves, only from the economic situation do we dive in (N4)"

enabling factors that trigger fishermen's motivation have the keyword responsibility with the following statement quote:

"...if working in construction the income is not that much then there are still a lot of responsibilities so go diving again (N3)"
"...the Bajo tribe's main livelihood is diving, which is our responsibility (N5)"

Fishermen's self-confidence to prevent decompression sickness

The findings from the interview results show that fishermen's self-confidence supports the concept of self-efficacy, namely pre-action and coping self-efficacy, this can be seen from the description of the two themes found as follows:

a. pre- action confidence to prevent decompression sickness built on trust and tradition.

The following is a quote from the informant's statement:

The belief most often expressed by fishermen in preventing decompression sickness is the word 'injection' with the following statement quoted:

"…a friend's experience told me not to get an injection, that day my friend was injected at the hospital and he didn't recover and died (N1)"
"...we have not been allowed to be injected because according to us the blood will not flow, it will clot. That is our belief (N2)"
"…it is forbidden to be injected, usually when we are injected, we can walk and suddenly become completely paralyzed (N4)"
"People rarely go to the health center because they are afraid of being injected. Those who are injected do not recover from their illness, instead they have swollen thighs (N5)"

The tradition of fishermen which is still part of the culture to prevent decompression sickness is represented by the word 'turun' with a quote from a fisherman's statement:

"…we want to avoid cramps, we have to go down slowly to reach the bottom of the sea (N4)"
"...if you just go straight down, you could get cramps (N5)"
"...the Bajo tribe cannot be separated from the sea, they have to be at sea from generation to generation (N2)"

Self-efficacy coping is a theme formed from the subtheme of preventing decompression sickness.

The following is a quote from the statement below:

"…if we want to avoid it, the main thing is not to rush, go down slowly to the bottom of the sea (N4)"

"…the first prevention is that the diving method must be careful, don't be too hasty in the water, it must be slow (N5)"

DISCUSSION

Fishermen's Knowledge About Decompression Sickness

Notoatmodjo (2018) , [27] explains that knowledge is the result of human knowledge obtained after a person senses a particular object. Sensing occurs through the five human senses, namely sight, hearing, smell, taste and touch. Knowledge is greatly influenced by several factors, namely level of education, information, culture, and experience. People who have understood an object or material must be able to explain, give examples, conclude, predict, to the object being studied, in this case fishermen can explain and understand the meaning, causes, prevention, and how to handle decompression sickness.

Based on data from in-depth interview results , it was found that public knowledge about decompression sickness is still lacking, this is due to the lack of Health literacy to coastal communities in Soropia sub-district, especially the Bajo tribe. Health literacy is The ability to obtain, process, and understand basic health information and services to make appropriate health decisions plays a critical role in promoting preventive health behaviors and improving health outcomes [28] . Improving health literacy can be a powerful tool to increase knowledge about the risks and preventive measures of decompression sickness. Research shows that health literacy has a significant impact on disease prevention behaviors across a range of health contexts, including the prevention of non-communicable diseases [29] Individuals with high levels of health literacy are more likely to engage in healthy lifestyle practices, adhere to preventive measures, and make informed decisions about their health. By increasing health literacy among traditional Bajo fishermen divers, it is hoped that this can be a means to promote a culture of prevention and proactive health management in coastal communities.

In addition to individual-level interventions, comprehensive health literacy communication training also needs to be carried out for health workers in coastal communities, because research results show that there is a positive relationship between training for health workers and individual-centered disease prevention [30] . Health workers play an important role in disseminating accurate health information, promoting preventive behaviors, and supporting individuals in making informed decisions about their health. Equipping health workers with good health literacy competencies will have an impact on improving the quality of care services provided to individuals at risk of decompression sickness. Providing health literacy is not enough to only be done in the coastal community and health workers but also needs to be done in schools so that school students are introduced to decompression sickness and its impacts from an early age. Health workers, community leaders and cadres who have received training can take a proactive approach to promoting preventive health behaviors from an early age. [31] . By integrating the concept of health literacy into the school curriculum, students can develop important skills and knowledge related to health promotion, disease prevention, and informed decision making.

The results of the study showed that there was a positive relationship between health literacy and knowledge, behavior, and health outcomes, by strengthening health literacy in individuals, families, communities, community leaders, village officials, health workers and school students who are at risk of decompression sickness and in traditional divers of the Bajo coastal community, it is hoped that this can improve their understanding of the meaning of decompression, causes and preventive measures that can be taken. The health literacy obtained can increase community knowledge so that it can empower individuals and families and coastal communities to make the right decisions about their health and take preventive measures to reduce the risk of decompression sickness [32]

Fishermen's Motivation to Prevent Decompression Sickness

Based on the results of in-depth interviews conducted with diving fishermen, it was found that there were three factors that influenced fishermen's motivation, namely: motivation that comes from within, motivation from family and motivation from peers .

a. Motivation from Oneself

Motivation from within oneself, or intrinsic motivation, includes the drive and personal desire to maintain health and safety. This intrinsic motivation is caused by an awareness of health risks. [33] Fishermen who understand the risks of decompression sickness and its consequences for health will be more motivated to prevent it. [34] This intrinsic awareness can arise from education, personal experience, or the experiences of others and information obtained from various sources. In addition, other factors that also influence this intrinsic motivation are the existence of strong personal goals, a sense of responsibility for oneself and pride in the ability to maintain health and safety. [35] Fishermen who have high self-esteem tend to be more disciplined in following diving procedures to avoid decompression sickness, such as wanting to stay healthy so that can continue to work and support their families and provide a good education for their children, as well as the desire to enjoy a peaceful old age without any serious health problems, can also be their motivation to follow safety procedures when diving. [36]

b. Motivation from Family

Family is a very strong source of motivation because of the emotional connection and responsibility for the welfare of family members. This motivation arises because of a sense of responsibility for the welfare of the family. As the head of the family, fishermen feel responsible for staying healthy and productive in order to meet the needs of the family. If a fisherman suffers from decompression sickness, this can interfere with the ability to work and will have an impact on the income and welfare of the family, especially if the fisherman is paralyzed, this will have a major impact on all aspects of life, both biologically, psychologically and spiritually [37] . Therefore, support and encouragement from family and family members, such as spouses and children, can be a very strong moral support to comply with safety procedures in diving. [38] This awareness must be firmly embedded in every family of fishermen through a sense of concern for their own health and safety. This can strengthen the motivation of fishermen to prevent decompression sickness. Another factor that motivates fishermen to avoid decompression sickness is so as not to become a burden on the family in terms of medical and care costs. Maintaining health means avoiding financial and emotional burdens for the family.

c. Motivation from Peers

Peers and co-workers can influence fishermen's motivation through social interaction and group support. There are several factors that play a role in peer motivation, namely first group norms, in a work group or fishing community, good safety norms and practices can encourage individuals to follow the same procedures. If peers consistently comply with safety rules, fishermen will be more motivated to follow the example. Second, peer support, peers can remind and support each other to comply with diving procedures to avoid decompression sickness, a sense of togetherness and caring for each other in the work group can increase compliance with safety practices. Third, there is social influence, healthy peers can be the best role models in increasing individual motivation. Rewards and recognition from peers for good safety practices can reinforce positive behavior in preventing decompression sickness [39] [37]

Fishermen's self-confidence to prevent decompression sickness

The findings from the interview results indicate that fishermen's self-confidence supports the concept of self-efficacy, namely through pre-action and coping self-efficacy. Self-efficacy or Self-efficacy, refers to an individual's belief in their ability to successfully carry out specific actions to achieve desired outcomes. Self-efficacy is not only about confidence in one's abilities but also about guiding actions through goal setting and planning, which can increase the perception of control over behavior and help in coping with stress more effectively [40]

According to Bandura, self-efficacy is a belief in one's ability to complete tasks in various situations. Still according to Bandura, someone who has good self-efficacy will be able to overcome various problems, and be able to manage challenging situations or situations that require heavy problem solving, and have strong self-confidence. This form of self-efficacy is very important in dealing with decompression sickness prevention, where individuals need to believe in their ability to make improvements or behavioral changes that are important to deal with challenges associated with decompression sickness [41]

In the effort to prevent decompression sickness, self-efficacy is very important in motivating divers to comply with safety protocols, practice proper diving techniques, and respond effectively in emergency situations. Strengthening self-efficacy in the coastal community of the Bajo tribe has an impact on increasing the confidence of fishermen in preventing decompression sickness, in addition it can also make it easier for traditional divers to adopt and maintain preventive behaviors. A person with high self-efficacy is able to minimize the impact of an event or incident that causes stress on their quality of life [42]

Pre-action self-efficacy refers to a person’s belief in their ability to carry out a particular action before engaging in the actual action. The concept of pre-action self-efficacy is particularly relevant in the context of behavior change models, where self-efficacy plays an important role in distinguishing between the pre-action and action stages. Pre-action self-efficacy is an important component of self-efficacy that influences a person’s readiness to engage in a particular behavior. Coping self-efficacy, on the other hand , is concerned with a person’s belief in their ability to manage and overcome challenging or stressful situations. This involves a person’s confidence in their capacity to respond to stressors by using problem-focused coping strategies, seeking support from others, and regulating emotions to reduce psychological distress in the face of adversity. Coping self-efficacy is particularly important in dealing with behavioral change, where divers need to believe in their own ability to make behavioral changes in the face of new behavioral challenges that are formed to avoid decompression sickness. [43] [44]

Coping self-efficacy consists of various aspects in it such as problem solving, emotional regulation, and seeking social support. Individuals with high coping self-efficacy are more likely to be actively involved in coping behaviors, such as problem solving and seeking information, while someone with low coping self-efficacy prefers to use passive coping strategies, such as avoiding and diverting attention. Coping self-efficacy has a significant role in accepting the impact of stress due to changes in mental health [45] [46]

In addition, coping self-efficacy also influences cognitive, emotional, and behavioral adaptation of individuals to challenging circumstances or situations. Coping self-efficacy functions as self-regulation that can influence a person's well-being and emotional health. Coping self-efficacy is very important in health care settings, especially during diagnosis and treatment, to adjust appropriate psychosocial care and support services based on the individual's perception of their ability to cope with situations in their environment. [47-56]

Limitations

The time constraints of the research which only lasted for a few months (January to July 2024) is not sufficient to capture long-term behavioral changes or knowledge developments among diving fishermen. Behavioral changes and improvements in health literacy typically take longer to manifest and to measure accurately. In addition the unique culture and society of the Bajo tribe not fully applicable to other fishing communities in Indonesia. Therefore, the application of the results of this study to other populations must be done with careful consideration of cultural differences.

CONCLUSION

The conclusion of this study is that the level of knowledge of traditional Bajo diving fishermen in Konawe Regency about decompression sickness is still low, which contributes to the high risk of decompression sickness. This study shows that it is necessary to improve health literacy among diving fishermen through the application of the Health Action Process Approach (HAPA) theory. This approach can help improve knowledge, motivation, self-efficacy, and planning as well as effective preventive behavior in preventing decompression sickness. Thus, strengthening health literacy based on HAPA is expected to increase awareness and preventive behavior of decompression sickness, thereby supporting the health and productivity of traditional Bajo diving fishermen. This study also emphasizes the importance of interventions tailored to the cultural context to achieve greater success in disease prevention programs in coastal communities.

REFERENCES

1. Mallapiang, F., Syarfani, S. & Aeni, S. Trust and Occupational Safety Behavior Related to Decompressive Diseases on Bajo Ethnic Divers. Divers. Dis. Prev. Res. Integr. **3** , 69–78 (2023).
2. Mallapiang, et al. Factors Related to Hearing Disorders in Traditional Divers in Barrang Lompo Island, Ujung Tanah District, Makassar City in 2015. Al-Sihah Public Heal. Sci. J. **7** , 153–165 (2015).
3. Kim, D. Women Divers. (2022).
4. Cha, SG, Byun, YS, Jeon, MJ & Sakong, J. Diving patterns and decompression sickness among South Korean fishery divers. J. Occup. Health **61** , 143–153 (2019).
5. Arieli, R. & Marmur, A. A biophysical vascular bubble model for devising decompression procedures. Physiol. Rep. **5** , 1–11 (2017).
6. Chikih, C., Suryokusumo, G. & Sulistomo, A. Effect of acute submaximal physical exercise before decompression dive on tumor necrosis factor alpha concentration among male trained divers. Int. J. Public Heal. Sci. **10** , 289–297 (2021).
7. Of, Q., With, L. & Sickness, D. Diving Exposure Effect on Traditional Divers'S Quality of Life With Decompression Sickness. Int. J. Public Heal. Clin. Sci. **6** , 94–106 (2019).
8. Flatmo, F., Grønning, M. & Irgens, Å. Musculoskeletal complaints among professional divers. Int. Marit. Health **70** , 107–112 (2019).
9. Honěk, J. et al. High-grade patent foramen ovale is a risk factor of unprovoked decompression sickness in recreational divers. J Cardiol. **74** , 519–523 (2019).
10. Ladd, G., Stepan, V. & Stevens, L. Original articles decompression illness. **32** , 124–128 (2002).
11. Tosepu, R. et al. Diseases in Coastal Communities in Indonesia: a Review. Public Heal. Indonesia. **2** , 141–148 (2016).
12. Kongkamol, C., Kongkamol, P., Phanlamai, C., Sathirapanya, P. & Sathirapanya, C. Role of health locus of control in preventing occupational decompression sickness among deep-sea fisherman divers. Heal. Psychol. Behav. Med. **11** , (2023).
13. Ulrich, N.H. et al. Incidence of Revision Surgery after Decompression with vs Without Fusion among Patients with Degenerative Lumbar Spinal Stenosis. JAMA Netw. Open E2223803 (2022) doi:10.1001/jamanetworkopen.2022.23803.
14. Garrido, M.A., Mark, L., Parra, M., Nowak, D. & Radon, K. Executive function among Chilean shellfish divers: A cross-sectional study considering working and health conditions in artisanal fishing. Int. J Environ. Res. Public Health **18** , (2021).
15. Jusmawati, Arsin, AA & Naiem, F. Risk Factors for Decompression Sickness on Saponda Island. J. MKMI **12** , 63–69 (2016).
16. Lee, S.W., Shim, S.S., Choi, J. & Kim, Y. 잠수병에 The best 폐부종 . **31** , 30–33 (2013).
17. Chabibah, N., Mayasari, AC, Rachmawati, DS & Said, FBM The Impact of Frequency and Duration of

Diving Activities on the Occurrence of Decompressive Sickness. Malaysian J. Nurs. **14** , 75–81 (2022).
18. Fitriasari, E., Sri Dewi Untari, NK & Annisa Fitra, N. Risk Factors for Decompression Sickness. J. Multidisciplinary Indones. **3** , 3806–3818 (2024).
19. Vechiu, C. & Mosqueda, AI Health Literacy. Handb. Evidence-Based Prev. Behav. Disord. Integr. Care A Stepped Care Approach **15** , 439–458 (2021).
20. Abdullah, A., Liew, SM, Ng, CJ, Ambigapathy, S. & V. Paranthaman, PV Health literacy experiences of multi-ethnic patients and their health-care providers in the management of type 2 diabetes in Malaysia: A qualitative studies. Heal. Expect. **23** , 1166–1176 (2020).
21. Buzzacott, P. et al. A new measure of decompression sickness in the rat. Biomed Res. Int. **2014** , (2014).
22. Ninomiya, K. et al. An autopsy case of decompression sickness: Hemorrhages in the fat tissue and fat embolism. Rom. J. Leg. Med. **21** , 23–26 (2013).
23. Nutbeam, D. & Kickbusch, I. Advancing health literacy: A global challenge for the 21st century. Health Promoter. Int. **15** , 183–184 (2000).
24. Schwarzer, R., Lippke, S. & Luszczynska, A. Mechanisms of Health Behavior Change in Persons With Chronic Illness or Disability: The Health Action Process Approach (HAPA). Rehab. Psychol. **56** , 161–170 (2011).
25. Schwarzer, R. et al. On the assessment and analysis of variables in the health action process approach: Conducting an investigation. Berlin: Freie Universeitat Berlin (2003).
26. Bingham, AJ From Data Management to Actionable Findings: A Five-Phase Process of Qualitative Data Analysis. Int. J. Qual. Methods **22** , 1–11 (2023).
27. Notoatmodjo, S. Health Research Methodology . (Rineka Cipta, Jakarta, Indonesia, 2018).
28. Arrighi, E. et al. Scoping health literacy in Latin America. Globe. Health Promoter. **29** , 78–87 (2022).
29. Liu, L., Qian, X., Chen, Z. & He, T. Health literacy and its effect on chronic disease prevention: Evidence from China's data. BMC Public Health **20** , 1–14 (2020).
30. Kaper, MS et al. Positive outcomes of a comprehensive health literacy communication training for health professionals in three European countries: A multi-centre pre-post intervention study. Int. J Environ. Res. Public Health **16** , (2019).
31. Schulenkorf, T., Krah, V., Dadaczynski, K. & Okan, O. Addressing Health Literacy in Schools in Germany: Concept Analysis of the Mandatory Digital and Media Literacy School Curriculum. Front. Public Heal. **9** , 1–9 (2021).
32. Chimezie, RO Health Awareness: A Significant Factor in Chronic Diseases Prevention and Access to Care. J. Biosci. Med. **11** , 64–79 (2023).
33. KOÇ, A., HANÇER TOK, H., TAŞTEKİN, N. & ENSARİ, H. Relationship Between Mental Health Literacy Level and Treatment Motivation in Alcohol and Drug Addicts. Psychiatr. Güncel Yaklaşımlar **15** , 429–438 (2023).
34. Putri, SM & Rahmi, A. The Role of Family in Increasing Children's Learning Motivation After Online Learning. Educ. J. Educator. **2** , 1–13 (2022).
35. Kusnanto, K., Wabula, LR, Purwanto, B., Arifin, H. & Kurniawati, Y. Safety behavior and healthy diving: A qualitative study in the traditional diverse fishermen. Int. Marit. Health **71** , 56–61 (2020).
36. Chen, WQ, Wong, TW & Yu, ITS Association of occupational stress and social support with health-related behaviors among Chinese offshore oil workers. J. Occup. Health **50** , 262–269 (2008).
37. Ibrahim, SS 'Atiqah S., Ismail, H. & Hussain, TPRS The relationship between self-skills and efforts among traditional fishermen in Kuala Perlis, Malaysia. Nurture **17** , 585–594 (2023).
38. O'Brien, M., Freitas, C., Venzo, P. & Francis, P. Fostering ocean literacy through informal marine education programs. Mar. Pollut. Bull. **193** , (2023).
39. Locke, EA & Latham, GP Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. Am. Psychol. **57** , 705–717 (2002).
40. Hayat, AA, Shateri, K., Amini, M. & Shokrpour, N. Relationships between academic self-efficacy, learning-related emotions, and metacognitive learning strategies with academic performance in medical students: A structural equation model. BMC Med. Educ. **20** , 1–11 (2020).
41. Galabasa, NN, Vibal, JCT & Apohen, SL Academic Self-Efficacy of College Freshmen in Relation to English Language Competency. Int. J. Multidiscip. Appl. Bus. Educ. Res. **3** , 1693–1702 (2022).
42. Striberger, R., Zarrouk, M., Kumlien, C. & Axelsson, M. Illness perception, health literacy, self-efficacy, adherence and quality of life in patients with intermittent claudication – a longitudinal cohort study. BMC Nurs. **22** , 1–12 (2023).
43. Seyedi-Andi, SJ, Bakouei, F., Rad, HA, Khafri, S. & Salavati, A. The relationship between self-efficacy and some demographic and socioeconomic variables among Iranian medical sciences students. Adv. Med. Educ. Pract. **10** , 645–651 (2019).
44. Xu, T. et al. Psychological distress and academic self-efficacy of nursing undergraduates under the normalization of COVID-19: multiple mediating roles of social support and mindfulness. BMC Med.

Educ. **23** , 1–10 (2023).
45. Hamilton, K. & Hagger, MS Effects of Self-Efficacy on Healthy Eating Depends on Normative Support: a Prospective Study of Long-Haul Truck Drivers. Int. J. Behav. Med. **25** , 265–270 (2018).
46. Astuti, R.D.P., Mallongi, A., Amiruddin, R. et al. Hexavalent chromium contamination in groundwater and its implication to human health: a Monte Carlo model approach in Indonesia. Sustain. Water Resour. Manag. **9**, 22 (2023). https://doi.org/10.1007/s40899-022-00806-x
47. Rachman W. O. N. N, Syafar M, Nasir S, Amiruddin R. Ahmad A. K, Abdullah M. T, Mallongi A, Jafar N, Indriani C, Rahmadhania W. O, Nurdin N, Yani A. Drugs Abuse Behavior Prevention Model through Family Approach in Adolescents in Kendari City. Biomed Pharmacol J 2022;15(3).
48. Mallongi A, Ernyasih. Assessment of low-cost mercury absorbent to minimize the mercury environmental and health effects in Makassar coastal areas. J Adv Pharm Edu Res. 2022;12(4):32-8. https://doi.org/10.51847/XfBn7cm7wH
49. Ernyasih, E., Mallongi, A., Daud, A., Palutturi, S., Stang, S., Thaha, R., Ibrahim, E., & Al Madhoun, W. (2023). Health risk assessment through probabilistic sensitivity analysis of carbon monoxide and fine particulate transportation exposure. Global Journal of Environmental Science and Management, (), -. doi: 10.22034/gjesm.2023.04.18
50. Mallongi, A.; Stang S.; Astuti, R.D.P.; Rauf, A.U.; Natsir M.F., (2023). Risk assessment of fine particulate matter exposure attributed to the presence of the cement industry. Global J. Environ. Sci.Manage., 9(1): 1-16. DOI: 10.22034/gjesm.2023.01
51. Astuti RDP, Mallongi A, Choi K et al (2022) Health risks from multiroute exposure of potentially toxic elements in a coastal community: a probabilistic risk approach in Pangkep Regency, Indonesia. Geomat Nat Hazards Risk. https://doi.org/10.1080/19475705.2022.2041110
52. Anwar Mallongi, Ezra Limbong, Furqaan Naiem, Hasanuddin Ishak, Syahrul Basri, Muh. Saleh, Aminuddin Syam, Laode Asrul, Health risk analysis of exposure to mercury (Hg) and cyanide (CN) in Kayeli village communities Teluk Kayeli district Buru regency, Enfermería Clínica, Volume 30, Supplement 4, 2020, Pages 427-430, ISSN 1130-8621, https://doi.org/10.1016/j.enfcli.2020.03.007.(https://www.sciencedirect.com/science/article/pii/S1130862120302424)
53. Rauf, A.U., Mallongi, A., Hatta, M. et al. Integrating dynamic modeling into health risk analysis to reduce the exposure of potentially hazardous elements. Int. J. Environ. Sci. Technol. (2024). https://doi.org/10.1007/s13762-024-05537-4
54. Kristi L. Stringer, Bulent Turan, Lisa McCormick, Modupeoluwa Durojaiye, Laura Nyblade, Mirjam-Colette Kempf, Bronwen Lichtenstein, and JMT乳鼠心肌提取HHS Public Access. Physiol. Behav. **176** , 139–148 (2017).
55. Ohly, S., Plückthun, L. & Kissel, D. Developing students' creative self-efficacy based on design-thinking: Evaluation of an elective university course. Psychol. Learn. Teach. **16** , 125–132 (2017).
56. Chirico, A. et al. Oncotarget 36800 www.impactjournals.com/oncotarget A meta-analytic review of the relationship of cancer coping self-efficacy with distress and quality of life. Oncotarget **8** , 36800–36811 (2017).