



# Insufficient Fluid Intake during Fishing as a Determinant of Hypertension among Traditional Fishermen in Coastal Soropia

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<p><b>Track Record Article</b></p> <p>Revised: 12 March 2026 Accepted: 12 June 2026 Published: 20 June 2026</p> <p><b>How to cite :</b> Rosjidi, C. H., Umrana, S., Risnawati, &amp; Herman. (2026). Insufficient Fluid Intake during Fishing as a Determinant of Hypertension among Traditional Fishermen in Coastal Soropia. <i>Contagion : Scientific Periodical of Public Health and Coastal Health</i>, 8(2), 181–194.</p>	<p style="text-align: center;"><b>Abstract</b></p> <p><i>Hypertension is a major public health problem and an important risk factor for cardiovascular disease, particularly among informal workers such as traditional fishers who are exposed to harsh working conditions and limited healthy lifestyle choices. Coastal fishers generally work in hot environments, spend long fishing hours, smoke, and have limited access to safe drinking water during fishing activities. This study aims to analyze the association between sociodemographic characteristics, behavioral factors, and drinking patterns during fishing activities with hypertension among traditional fishers. A cross-sectional analytical study was conducted among 168 fishers in Soropia Regency, Southeast Sulawesi, Indonesia, recruited using proportional random sampling. Univariate analysis showed a high prevalence of hypertension (50.6%), with smoking behaviors and inadequate drinking patterns during fishing being the dominant factors. Bivariate analysis showed that age <math>\geq 50</math> years (<math>p=0.030</math>; <math>OR=2.30</math>; 95% <math>CI: 1.08-5.04</math>), education level (<math>p=0.025</math>; <math>OR=2.04</math>; 95% <math>CI: 1.09-3.83</math>), smoking behavior (<math>p=0.001</math>; <math>OR=3.62</math>; 95% <math>CI: 1.60-8.08</math>), and inadequate drinking pattern (<math>p=0.003</math>; <math>OR=2.60</math>; 95% <math>CI: 1.38-4.92</math>) were significantly associated with hypertension. Multivariate analysis confirmed that education (<math>p=0.040</math>; <math>OR=2.177</math>; 95% <math>CI: 1.034-4.584</math>), smoking (<math>p=0.005</math>; <math>OR=3.667</math>; 95% <math>CI: 1.476-9.111</math>), age <math>\geq 50</math> years (<math>p=0.019</math>; <math>OR=2.903</math>; 95% <math>CI: 1.196-7.046</math>), and inadequate drinking pattern during fishing activities (<math>p=0.001</math>; <math>OR=3.350</math>; 95% <math>CI: 1.628-6.892</math>) remained the dominant factors associated with hypertension. These findings call for structured, community-based preventive interventions in coastal fishing populations that are explicitly calibrated to the magnitude of the identified risks: smoking cessation programs are prioritized given the 3.7-fold increased risk among smokers (<math>OR=3.667</math>), while mandatory hydration protocols during fishing trips are warranted due to the 3.4-fold increased risk associated with inadequate fluid intake (<math>OR=3.350</math>). Furthermore, targeted blood pressure screening for fishers aged <math>\geq 50</math> years (<math>OR=2.903</math>) and context-sensitive health education for those with lower educational levels (<math>OR=2.177</math>) should be integrated into coastal primary health care programs to ensure comprehensive and proportional risk reduction based on evidence</i></p> <p><b>Keywords:</b> <i>Hypertension, Public Health, Fishermen, Coastal Areas, Inadequate Fluid Intake</i></p>
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## INTRODUCTION

Hypertension is one of the largest global public health problems and a leading risk factor for premature death from cardiovascular disease worldwide. According to the WHO Global Report on Hypertension, more than 1 billion people live with hypertension, with only 21% achieving adequate blood pressure control; this burden is particularly severe in the Asia Pacific and Southeast Asia, where cases increased by 144% during the same period (Kario et al., 2024). Often described as a silent killer, hypertension has a progressive impact and often goes undetected: approximately 70–80% of cardiovascular disease and premature death globally can be attributed to modifiable risk factors, including hypertension, abdominal

obesity, dyslipidemia, and hyperglycemia (Yusuf et al., 2020), underscoring the importance of identifying population-specific risk factors as the basis for effective prevention strategies (Roth et al., 2020). Individual-level factors such as consumption patterns, health knowledge, and attitudes have also been shown to significantly influence the risk of hypertension.

In Indonesia, changing epidemiological patterns have resulted in non-communicable diseases becoming a leading cause of illness and death. Hypertension plays a significant role in this transition, accounting for approximately 70% of the disease burden. Factors such as high blood pressure, an unbalanced diet, high blood sugar levels, obesity, and smoking are the main causes of hypertension. (Wahidin, 2022). Lower socioeconomic groups, including coastal communities and traditional fishermen, tend to have a higher incidence of hypertension. This is due to their limited access to adequate health services and the nature of their work, which involves the sea, making them more susceptible to the disease.

Traditional fishermen generally experience quite demanding working conditions, including heavy physical workloads, irregular rest periods, and exposure to extreme environmental conditions such as high temperatures and excessive humidity. Furthermore, noise from ship engines and the marine environment can interact with physical stress and behavioral patterns, potentially disrupting blood pressure regulation (Bolm-Audorff et al., 2020). Studies have shown that such working conditions can exacerbate the body's physiological responses and increase the risk of cardiovascular disorders (Indrayani et al., 2023; Kivimäki et al., 2018). Previous studies have shown that heat exposure is a significant determinant of the health of outdoor workers in low- and middle-income countries, as it can exceed the body's physiological adaptive capacity, leading to increased core temperature, dehydration, and cardiovascular and metabolic stress. (Kjellstrom et al., 2009) stated that repeated heat stress in the workplace, particularly in workers with high physical activity and limited access to hydration and cooling, contributes to reduced work capacity and an increased risk of chronic health disorders. Empirical evidence in fishing populations reinforces this framework, with a cross-sectional study by (Doddamani et al., 2021) reporting a high prevalence of non-communicable diseases, particularly hypertension and diabetes, with significant risk factors including advanced age, increased waist circumference, poor dietary practices, substance use, high stress levels, and limited communication with family while at sea. These findings suggest that the characteristics of long-term sea work in hot environments, coupled with limited hydration and psychosocial stress, have the potential to accelerate the accumulation of cardiometabolic risks in artisanal fishers. Limited health literacy and low

utilization of preventive health services also exacerbate fishers' vulnerability to hypertension and other non-communicable diseases.

Heat exposure and dehydration are increasingly recognized as important factors contributing to cardiovascular stress in outdoor workers (Flouris et al., 2018; Kjellstrom et al., 2009; Venugopal et al., 2015). This concern is particularly acute in Southeast Sulawesi, a coastal province where temperatures consistently exceed physiological heat stress thresholds during fishing activities, and where climate vulnerability assessments have documented that coastal fishing communities face increasing exposure to rising temperatures, hydrometeorological hazards, and limited access to safe drinking water particularly during the dry season (DAI, 2018). The high humidity characteristic of this coastal environment further compounds heat strain by impairing the body's evaporative cooling capacity, increasing sweat-related fluid losses and elevating the risk of dehydration among outdoor workers engaged in prolonged physical activity at sea (Flouris et al., 2018; Kjellstrom et al., 2009). Limited access to safe drinking water during marine activities can potentially lead to inadequate fluid intake, which can impact blood pressure regulation through neuroendocrine mechanisms and renal function (Watso & Farquhar, 2019). Sankar et al. demonstrated that heat exposure while working outdoors without adequate hydration and rest leads to dehydration, increased physiological stress, and impaired renal function, contributing to an increased risk of non-communicable diseases (Sankar et al., 2024).

Despite growing evidence on risk factors for hypertension in maritime workers, a critical research gap remains: to date, no study has specifically measured inadequate fluid intake during fishing activities as a determinant of hypertension in traditional fishers in coastal areas of Indonesia. Existing studies on fishing populations have largely focused on general behavioral factors such as age, smoking, diet, and physical activity (Doddamani et al., 2021; Sagaro et al., 2021), without considering the specific hydration behaviors that occur during prolonged sea voyages in hot environments. This gap is significant given that traditional fishers in tropical regions face a greater risk of dehydration due to heat exposure combined with limited access to safe drinking water at sea. The absence of a defined hydration threshold as a contextual, measurable, and modifiable risk variable represents a gap in both the epidemiological literature and the evidence base for occupational health interventions in coastal communities. Therefore, this study addresses this gap by examining inadequate fluid intake during fishing activities as a specific determinant of hypertension, alongside established sociodemographic and behavioral risk factors, among traditional fishers in Soropia Regency, Southeast Sulawesi.

Based on the description above, this study aims to: (1) identify the prevalence of hypertension in traditional fishermen in Soropia, (2) analyze the relationship between sociodemographic characteristics, behavior, and drinking patterns while at sea with the incidence of hypertension, and (3) determine the dominant factors contributing to hypertension. The research hypothesis is that there is a significant relationship between inadequate drinking patterns while at sea with the incidence of hypertension in traditional fishermen.

## **METHODS**

This is an analytical observational study with a cross-sectional design. The aim was to analyze the relationship between sociodemographic characteristics, health behavior factors, and fluid intake patterns during sea activities with the incidence of hypertension among traditional fishers. This study was conducted in six coastal villages in Soropia District, Konawe Regency, Southeast Sulawesi Province, from September to November 2025. The study locations were selected proportionally based on the number of active fishers in each village to ensure population representation.

The study population consisted of all active traditional fishers residing in the study area. Inclusion criteria included fishers who had been actively fishing for at least one year, aged 18 years or older, and willing to participate. Fishermen with acute illnesses that could affect blood pressure measurements were excluded. The sample size was determined using the proportion estimation formula in cross-sectional studies with a 95% confidence level and a 5% margin of error, resulting in a minimum of 160 respondents. A total of 168 fishers were recruited using a proportional random sampling technique. The dependent variable in this study was the incidence of hypertension, while the independent variables included age, education level, smoking status, physical activity, and fluid intake patterns during sea activities. Inadequate fluid intake during fishing is defined as a total fluid consumption of less than 4.5 liters per fishing trip. This threshold was established based on the following contextual parameters documented in the study area: (1) the average duration of a fishing trip among respondents was 8–12 hours; (2) fishing activities involved moderate to heavy physical exertion, including hauling nets and operating boat equipment; and (3) Soropia District is located in a tropical coastal zone characterized by high ambient temperatures, typically exceeding 32°C, conditions consistent with exposure to heat stress as defined by a Wet Bulb Globe Temperature (WBGT) threshold of  $\geq 28^{\circ}\text{C}$  for moderate work intensity (Flouris et al., 2018; Kjellstrom et al., 2009). Under these conditions, the estimated sweat rate for outdoor workers performing moderate to vigorous work ranges from 0.5 to 1.0 liters per hour (Armstrong & Johnson, 2018), resulting

in a total fluid replacement requirement of 4.0–12.0 liters for an 8–12-hour fishing trip. This 4.5-liter threshold represents the minimum adequate intake for an 8-hour trip under moderate heat stress, consistent with hydration guidelines for occupational heat exposure recommended by the National Institute for Occupational Safety and Health (NIOSH) and applied in previous field studies of outdoor workers in tropical environments (Sankar et al., 2024; Venugopal et al., 2015). Fluid intake was assessed through a structured recall of the type and quantity of beverages consumed during the most recent fishing trip, and responses were cross-checked with supporting questions provided by the enumerator to minimize recall bias. Hypertension is defined as systolic blood pressure  $\geq 140$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg according to World Health Organization guidelines. Data were collected through structured interviews using the WHO STEPwise Approach to Non-Communicable Disease Risk Factor Surveillance (WHO STEPS) instrument. Blood pressure measurements were taken using a calibrated digital sphygmomanometer with two readings in a sitting position after a minimum of five minutes of rest, and the average value was the average of the two readings.

To minimize bias, data collection was conducted by trained enumerators using standard procedures. Data analysis included univariate and bivariate analyses using the chi-square test, and multivariate logistic regression analysis to identify dominant factors associated with hypertension. Results are presented as odds ratios (OR) with 95% confidence intervals. This study has obtained ethical approval from the Health Research Ethics Committee of the Indonesian Medical Association (PD IAKMI) of Southeast Sulawesi Province (No. 147/KEPK-IAKMI/VIII/2025), and all respondents signed informed consent prior to the study.

Characteristics	F	%
<b>Age</b>		
50 < Years	132	78.6
$\geq 50$ Years	36	21.4
<b>Marital Status</b>		
Married	154	91.7
Unmarried	8	4.8
Divorce	6	3.6
<b>Final Education</b>		
Elementary	101	60.1
Intermediate	67	39.9
<b>Monthly Income</b>		
< 1 million	80	47.6
1-2.5 million	70	41.7
2.5-5 million	18	10.7
<b>Total</b>	<b>168</b>	<b>100</b>

## RESULT

**Table 1 Characteristics of Respondents (n=168)**

Based on the demographic characteristics in Table 1, the majority of respondents were in the age group of <50 years, namely 132 people (78.6%), while respondents aged  $\geq 50$  years amounted to 36 people (21.4%). Most of the respondents were married, namely 154 people (91.7%). In terms of education level, the most dominant is elementary education, with 101 respondents (60.1%). Based on monthly income, the group with an income of <1 million rupiah was the largest, namely 80 respondents (47.6%).

**Table 2. Distribution of fishermen's seagoing behavior (n=168)**

<b>Fishermen's seagoing pattern</b>	<b>F</b>	<b>%</b>
<b>Drinking patterns while going to sea</b>		
Not enough	70	41.7
Enough	98	58.3
<b>Diet during sea</b>		
Instant Meals	22	13.1
Food is not instant	146	86.9
<b>Fishing Duration Pattern</b>		
Long sea	106	63.1
Normal sea	62	36.9
<b>Total</b>	<b>168</b>	<b>100</b>

The distribution of fishermen's seagoing behavior is presented in Table 2. The results showed that most of the respondents had an adequate drinking pattern during the sea trip, namely 98 people (58.3%), while 70 people (41.7%) had an insufficient drinking pattern. The majority of respondents consumed non-instant food while at sea (86.9%). Judging from the duration of going to sea, respondents with long hours at sea were the largest group, namely 106 people (63.1%).

**Table 3. Distribution of cardiovascular disease risk factors of fishermen (n=168)**

<b>Cardiovascular risk factors</b>	<b>F</b>	<b>%</b>
<b>Hypertension</b>		
Hypertension	85	50.6
Non-hypertension	83	49.4
<b>Blood sugar test results</b>		
Diabetes	22	13.1
No diabetes	146	86.9
<b>Cholesterol test results</b>		
Cholesterol	96	57.1
No cholesterol	72	42.9
<b>Results of obesity examination</b>		
Obesity	46	27.4
Not obese	122	72.6
<b>Smoking status</b>		
Smoking	131	78
No smoking	37	22
<b>Physical activity</b>		
Risky	82	48.8
No risk	86	51.2
<b>Total</b>	<b>168</b>	<b>100</b>

The distribution of risk factors for cardiovascular disease is shown in Table 3. Most of the respondents were active smokers, namely 131 people (78.0%). Respondents with hypertension amounted to 85 people (50.6%). The majority of respondents did not have diabetes mellitus (86.9%). In the cholesterol examination, respondents with high cholesterol levels amounted to 96 people (57.1%), as many as 48.8% of the physical activity of the respondents in the risk category, and the respondents who were not obese, as many as 122 people (72.6%).

**Table 4. Bivariate test between demographic factors, behavioral factors, and hypertension**

Variable	Hypertension		Total	X <sup>2</sup>	P	OR	95%CI
	Yes	No					
<b>Age</b>							
≥50 yrs	24	12	36	4.73	0.030	2.3	1.08 – 5.04
< 50 yrs	61	71	132				
<b>Education</b>							
Intermediate	41	26	67	5.00	0.025	2.04	1.09 – 3.83
Elementary	44	57	101				
<b>Smoking Status</b>							
Smoking	75	56	121	10.5	0.001	3.62	1.6 – 8.08
No	10	27	37				
<b>Sugar Blood</b>							
High	13	9	22	0.73	0.39	1.5	0.6 – 3.6
Normal	72	74	146				
<b>Cholesterol</b>							
High	59	37	96	10.58	0.001	2.8	1.5 – 5.3
Normal	26	46	72				
<b>Obesity</b>							
Yes	30	16	46	5.4	0.020	2.28	1.1 – 4.6
No	55	67	122				
<b>Physical Activity</b>							
Risky	49	33	82	5.38	0.020	2.06	1.1 – 3.8
No risk	36	50	86				
<b>Drinking Patterns</b>							
Less	45	25	70	8.99	0.003	2.6	1.38 – 4.92
Enough	40	58	98				
<b>Fishing Duration</b>							
Old	53	53	106	0.41	0.84	0.94	0.51 – 1.76
Average	32	30	62				
<b>Diet</b>							
Instant	12	10	22	0.2	0.69	1.2	0.49 – 2.95
Non-instant	73	73	146				

The results of bivariate analysis (Table 4) showed that the age of ≥50 years ( $p=0.030$ ;  $OR=2.30$ ; 95% CI: 1.08–5.04), education level ( $p=0.025$ ;  $OR=2.04$ ; 95% CI: 1.09 – 3.83), smoking status ( $p=0.001$ ;  $OR=3.62$ ; 95% CI: 1.60–8.08), physical activity ( $p=0.020$ ;  $OR=2.06$ ; 95% CI: 1.10–3.80), and inadequate drinking patterns ( $p=0.003$ ;  $OR=2.60$ ; 95% CI: 1.38–4.92) were significantly associated with the incidence of hypertension.

**Table 5. Multivariate analysis of demographic relationships, drinking patterns, smoking, obesity, and high cholesterol with hypertension**

Variable	P	OR	95%CI
Age	0.019	2.903	1.196– 7.046
Education	0.040	2.177	1.034 - 4.584
Smoking	0.005	3.667	1.476 - 9.111
Drinking patterns	0.001	3.350	1.628 – 6.892
Obesity	0.057	2.376	0.976 – 5.784
Cholesterol	0.081	1.992	0.918 – 4.319

Multivariate logistic regression identified four independent determinants of hypertension among traditional fishermen (Table 5). The overall fit of the model was confirmed to be adequate using the Hosmer–Lemeshow goodness-of-fit test ( $\chi^2=6.241$ ;  $df=8$ ;  $p=0.620$ ), indicating no significant discrepancy between observed and model-predicted outcomes. The Nagelkerke  $R^2$  value of 0.312 suggests that the model explains approximately 31.2% of the variance in hypertension incidence, which is acceptable for a community-based cross-sectional study of this nature. From a public health perspective, the findings reveal a convergence of aging, occupational behavioral exposures, and modifiable lifestyle factors as the dominant determinants of hypertension in this coastal population, each carrying distinct implications for preventive intervention. Age  $\geq 50$  years was a significant independent predictor ( $p=0.019$ ;  $OR=2.903$ ;  $95\%CI: 1.196-7.046$ ), reflecting cumulative vascular aging processes compounded by decades of occupational heat stress and physical strain unique to maritime work. This near-threefold excess risk underscores the public health urgency of integrating routine blood pressure screening for older fishermen into coastal primary healthcare programs. Secondary education level was also independently associated with hypertension ( $p=0.040$ ;  $OR=2.177$ ;  $95\%CI: 1.034-4.584$ ). The higher odds in secondary-educated fishermen compared to those with elementary education may reflect lifestyle transitions linked to socioeconomic changes including altered dietary patterns and increased sedentary time suggesting that hypertension prevention programs should not exclude this group based on perceived lower risk.

Smoking emerged as the strongest independent risk factor in the model ( $p=0.005$ ;  $OR=3.667$ ;  $95\%CI: 1.476-9.111$ ), conferring more than a threefold excess risk of hypertension. This finding carries substantial public health implications: with 78.0% of respondents being active smokers a prevalence markedly higher than the national average targeted smoking cessation programs represent the highest-yield preventive intervention available for this population. The established mechanisms underlying this association include nicotine-driven

sympathetic nervous system activation, endothelial dysfunction, and accelerated arterial stiffening. Inadequate fluid intake during fishing was likewise a significant and practically important independent predictor ( $p=0.001$ ;  $OR=3.350$ ;  $95\%CI: 1.628-6.892$ ). The magnitude of this association closely approaching that of smoking highlights the epidemiological significance of occupational dehydration as a hypertension risk factor in tropical maritime settings. Physiologically, chronic inadequate hydration activates the renin-angiotensin-aldosterone system and elevates plasma osmolality, both of which raise blood pressure. This finding directly supports the implementation of structured hydration protocols during fishing trips, including mandatory provision of adequate clean water, as a feasible and low-cost occupational health intervention.

Although obesity ( $OR=2.376$ ;  $p=0.057$ ) and hypercholesterolaemia ( $OR=1.992$ ;  $p=0.081$ ) did not reach statistical significance in the multivariate model, their odds ratios remain clinically meaningful and their attenuation in the presence of behavioral variables likely reflects partial mediation both conditions may represent downstream metabolic consequences of smoking, poor diet, and physical inactivity rather than independent causal pathways to hypertension. Their retention in the final model nonetheless strengthens the comprehensiveness of the cardiometabolic risk profile presented and provides a fuller picture of the determinants of hypertension in this occupational group. Future studies with larger sample sizes may be better powered to detect independent effects of these variables after controlling for behavioral confounders.

## DISCUSSION

The findings of this study expand our understanding of the determinants of hypertension in fishers by highlighting adequate hydration during fishing activities as a specific and modifiable risk factor. This approach complements previous research that has generally focused on general metabolic and behavioral factors and emphasizes the importance of an occupational health perspective in controlling non-communicable diseases in fishing communities.

The results indicate that hypertension in traditional fishers is influenced by a complex interaction between sociodemographic factors, health behaviors, and coastal working conditions. These findings align with approaches to the social determinants of health, which emphasize that non-communicable diseases, including hypertension, are influenced not only by biological factors but also by the work environment and behaviors formed within specific social contexts. (Roth et al., 2020; WHO, 2021).

Advanced age is one factor associated with hypertension among traditional fishers. Ismah's research developed a lifestyle-based hypertension prediction model. Age  $\geq 45$  years (OR = 3.04) and obesity (OR = 2.28) were the dominant predictors (Ismah et al., 2021). Theoretically, the aging process is theorized to contribute to increased arterial stiffness, decreased blood vessel elasticity, and disruption of blood pressure homeostasis mechanisms, which have been associated with an elevated risk of hypertension (Benetos et al., 2019). These findings are consistent with various studies in coastal communities and maritime workers showing that the risk of hypertension increases with age due to the accumulation of long-term physical work exposure and environmental stress (Muthukrishnan et al., 2018; Sagaro et al., 2023).

Education level has also been found to be associated with hypertension. Although education is generally associated with increased health literacy, in fishing communities, this relationship is not always protective. Previous research has shown that in coastal communities, economic pressures, work culture, and limited behavioral options often outweigh health knowledge in determining individual health status. (Isbandiyah et al., 2024). Thus, higher formal education is not always followed by healthy lifestyle practices if it is not supported by a conducive environment and social structure, although these findings contradict previous research in which lower education was associated with hypertension. (Felix, 2018).

The results of this study indicate that smoking was significantly and independently associated with hypertension, consistent with the findings of a community-based cross-sectional study of 415 fishermen and fish workers in Kerala, which showed a very high burden of hypertension (57.8%) (Sankar et al., 2024). Smoking behavior is a significant determinant contributing to hypertension in traditional fishers. (Lesmana et al., 2022). High smoking prevalence rates among fishermen have also been reported in various previous studies and are often associated with coping mechanisms for fatigue and work stress at sea. (Frantzeskou et al., 2016; Grappasonni et al., 2019), suggesting that smoking cessation interventions in fishers require culturally and occupationally sensitive approaches. The main novelty of this study is the identification of inadequate fluid intake during fishing activities as an independent determinant of hypertension. Studies in outdoor workers have confirmed that the combination of heat stress and repeated dehydration is an important factor in cardiovascular disorders, strengthening the evidence that hydration is a relevant and modifiable behavioral factor in fishermen. (Flouris et al., 2018; Kjellstrom et al., 2009; Venugopal et al., 2015).

Furthermore, although metabolic factors such as obesity and hypercholesterolemia were found in some respondents, their influence became less dominant after controlling for behavioral and sociodemographic variables. This suggests that in traditional fishers, behavioral

factors and occupational exposures play a stronger role than metabolic factors alone, as reported in a study of coastal and maritime worker populations (Sagaro et al., 2023). However, the results of the Stufano study showed a high prevalence of cardiovascular risk factors, including hypertension, abdominal obesity, and dyslipidemia (Stufano et al., 2024). Similarly, Rahaman's research, in a large-scale study (n = 1,202 fishers), showed that obesity indicators were significantly associated with hypertension. Fat and oil intake were positively correlated with increased blood pressure, confirming the role of dietary composition in regulating blood pressure in fishers (Rahaman et al., 2024).

From a public health perspective, this study provides an important contribution to the development of community-based strategies for preventing hypertension in coastal areas. Interventions focused on improving hydration at sea, controlling smoking behavior, and regular blood pressure checks in coastal areas have the potential to significantly reduce the risk of hypertension. A cross-sectoral approach involving primary health care, public health services, and the fisheries sector is essential to ensure the sustainability of these interventions. (WHO, 2023).

The strengths of this study lie in its focus on a group of traditional fishermen who have received relatively little attention in hypertension research, and in its study of drinking patterns at sea as a specific and contextual determinant of behavior. However, limitations of this study include its cross-sectional design, which does not allow for causal inferences, and the reliance on self-reported fluid intake rather than objective hydration measurements such as urine specific gravity or urine osmolality, and the absence of direct environmental heat exposure assessment using instruments such as the Wet Bulb Globe Temperature (WBGT). Therefore, further research using longitudinal or interventional designs, incorporating objective hydration biomarkers (e.g., urine specific gravity, serum osmolality) and standardized environmental heat exposure measurements, is recommended to strengthen the scientific evidence.

## CONCLUSION

This study concluded that the incidence of hypertension among traditional fishers in coastal areas was significantly associated with a combination of sociodemographic factors and health behaviors closely related to fishing characteristics. Age  $\geq 50$  years, secondary education level, smoking, and inadequate drinking habits during fishing activities were each independently associated with an increased risk of hypertension, with smoking (OR=3.667) and inadequate fluid intake (OR=3.350) being the two most strongly modifiable risk factors. A key contribution of this study is the identification of inadequate fluid intake during fishing as

an independent, context-specific, and modifiable determinant of hypertension—strengthening the evidence base for integrating occupational health approaches into noncommunicable disease prevention in coastal communities.

Based on these findings, it is recommended that hypertension prevention programs in coastal communities prioritize three evidence-based actions: ensuring adequate fluid intake during fishing trips, implementing targeted smoking cessation programs, and establishing routine blood pressure screenings at coastal health posts. Cross-sectoral collaboration between health, fisheries, and local government agencies is crucial to sustain these efforts. Further research using longitudinal or intervention designs is recommended to assess the direction of this relationship and evaluate the effectiveness of hydration and smoking cessation interventions on the incidence of hypertension in traditional fishermen, incorporating objective hydration assessment tools such as urine specific gravity or urine osmolality, and direct environmental heat exposure measurements using validated instruments such as WBGT.

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