



Analisis Main Determinants Of Contact Dermatitis Among Fishermen And Seaweed Farmers On Muna Island, Indonesia

***Irma¹, Listy Handayani², Harleli³, Adius Kusnan⁴, Swaidatul Masluhiya AF⁵, Wa Ode Nilam Febriyani⁶**

^{1,2}Department of epidemiology, Faculty of Public Health, Halu Oleo University, Kendari, Indonesia

³Department of nutrition, Faculty of Public Health, Halu Oleo University, Kendari, Indonesia

⁴Department of Nursing, Faculty of Medicine, Halu Oleo University, Kendari, Indonesia

⁵Faculty of Health Sciences, Tribhuwana Tungadewi University, Malang, East Java, Indonesia

⁶Public Health Study Undergraduate Program, Faculty of Public Health, Halu Oleo University, Kendari, Indonesia

Email : irmankedtrop15@uho.ac.id

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Abstract

In Indonesia, the prevalence of dermatitis is approximately 6.8%, with 90% of these cases classified as contact dermatitis. The objective of this study was to analyze the prevalence and primary determinants of the incidence of contact dermatitis in fishermen and seaweed farmers. This analytic observational study, employing a cross-sectional design, involved 222 participants who were methodically selected through an accidental sampling technique. Contact dermatitis status was determined by a competent physician. The data obtained from interviews and examinations were subjected to statistical analysis using a simple logistic regression test to ascertain the primary determinants of contact dermatitis. A number of

significant risk factors for contact dermatitis have been identified, including the duration of work ($p=0.001$), a history of infectious skin disease ($p=0.001$), the use of PPE ($p=0.001$), and personal hygiene ($p=0.001$). In contrast, factors such as age ($p=0.629$), gender ($p=0.399$), and the physical quality of the water ($p=0.322$) were found to have no substantial impact on the occurrence of contact dermatitis. The results of the simple logistic regression test obtained personal hygiene OR = 50.22 and $p=0.000$ (95 CI: 14.248-177.015); use of PPE with OR = 0.066 and $p=0.001$ (95 CI: 0.022-0.199); history of skin disease with OR = 0.056 and $p=0.001$ (95 CI: 0.019-0.171). The main determinant of contact dermatitis among fishermen and seaweed farmers is poor personal hygiene, which increases the risk by 50.22 times compared to those with good personal hygiene.

Keywords: *Contact dermatitis, determinant, fishermen, seaweed farmers*

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Introduction (Time New Roman 12 pt Bold)

Indonesia is a maritime country with most of its territory is water. Geographically, Indonesia is an archipelago with two-thirds more ocean area than land. Indonesia has 17,508 islands surrounded by a coastline of 81,000 km² with an area of about 5.8 million km² and an exclusive economic zone of 2.78 million km², with a coastal population of about 60 million Indonesians (Basri, Djunaidi & Suryono, 2023)

A study of coastal communities reveals that the primary business activities are fishing at sea, processing fishery products, fish ponds, and seaweed cultivation (Ramdhani K et al., 2022). Dermatitis is a prevalent health concern among individuals engaged in maritime occupations, such as fishing and seaweed farming. Dermatitis is a medical term for skin disorders that manifest as inflammation and irritation of the skin. The most prevalent form of dermatitis is contact dermatitis, which can be attributed to either allergic dermatitis or irritant dermatitis (Ntatamala, 2018; Usatine & Riojas, 2016). Contact dermatitis is a form of inflammation of the skin, characterized by spongiosis or intercellular edema of the epidermis, resulting from the interaction of external irritants or allergens with the skin. The etiology of contact dermatitis is multifactorial, involving both exogenous and endogenous factors. Exogenous factors include the duration of service, the presence of a history of skin disease, work history, environmental factors, and the nature of work. On the other hand, endogenous factors encompass age, gender, the utilization of personal protective equipment (PPE), and personal hygiene practices. (Lima, A.L., Timmermann, V., Illing, 2019).

According to data from the World Health Organization (WHO) in 2014, 50-90% of all skin diseases are attributed to occupational exposure to chemicals or to working in wet conditions. Research conducted in the United States has indicated that 80% of occupational skin diseases are classified as contact dermatitis. Of these cases, irritant contact dermatitis accounts for the highest proportion at 80%, followed by allergic contact dermatitis with 14-20% of cases (Octavariny, 2022). The prevalence of contact dermatitis in Indonesia varies widely. The results of basic health research on dermatitis based on complaints were 6.8% (Ministry of Health Republic of Indonesia, 2018). A substantial proportion of occupational skin diseases are classified as contact dermatitis, encompassing both irritant and allergic manifestations. Contact dermatitis accounts for an overwhelming majority of these cases, constituting 92.5% of all occupational skin diseases. A smaller percentage, approximately 5.4%, is attributed to skin infections, while 2.1% is attributable to skin diseases caused by other underlying factors. An epidemiological study conducted in Indonesia revealed that 97% of 389 cases were classified as contact dermatitis, with 66.3% being of the irritant variety and 33.7% being of the allergic type. A subsequent epidemiological study conducted by the Ministry of Health of the Republic of Indonesia in 2017 revealed that 97% of the 389 cases of skin diseases were contact dermatitis, with 66.3% being of the irritant variety and 33.7% being of the allergic type (Ministry of Health Republic of Indonesia, 2018; Zania et al., 2018).



The prevalence of contact dermatitis in Indonesia poses a significant public health concern, particularly among coastal communities such as fishermen and seaweed farmers. This phenomenon is attributable to a combination of factors, including inadequate health infrastructure, limited access to sanitation facilities, and a deficiency in the coastal communities' awareness regarding the prevention of contact dermatitis. (Sunarsih et al., 2024). This study aims to analyze the prevalence and main determinants of contact dermatitis in the community of fishermen and seaweed farmers on Muna Island, Indonesia.

Methods

Research type and design

This study employs an analytical observational study design, characterized by a cross-sectional study design. The population of this study comprised 526 individuals, from whose sample 222 subjects were selected through an accidental sampling technique in accordance with the predetermined sample criteria. The criteria included a resident who lives permanently in the study area and has a permanent job as a fisherman and seaweed farmer, and who performs these activities daily. The collection of data was facilitated by questionnaires, which underwent rigorous validity and reliability testing using SPSS. The effect variable in this study was the incidence of contact dermatitis, and the determinant variables examined included age, gender, duration of work, history of skin disease, physical quality of water, use of personal protective equipment (PPE), and personal hygiene. (Silman, Alan, J & Macfarlane, Gary, 1996). The determination of contact dermatitis is based on the results of the examination and diagnosis of the referring physician, who is a member of PERDOSKI, the Indonesian Skin and Sex Specialist Doctors association.

Data Collection and Analysis

The data were collected through interviews and direct observation of respondents using a questionnaire that had been tested for validity and reliability. The collected data were then analyzed in several stages. The first stage involved univariate analysis, which aimed to examine the frequency distribution and proportions of each dependent and independent variable. This was followed by bivariate analysis to determine whether there was a relationship between the dependent and independent variables. During this stage, a chi-square test was conducted with a confidence level of 95%. The formula for the chi-square test is $X^2 = \sum (f_0 - f_e)^2 / f_e$, where f_0 represents observed frequencies and f_e represents expected frequencies. The final stage was multivariate analysis, which aimed to assess the magnitude and strength of the influence between the dependent and independent variables while identifying the most dominant variable. This analysis employed simple logistic regression, chosen based on the continuous nature of the research data. Determinant variables included in the multivariate model were those that met the specified criteria, specifically variables with a p-value of less than 0.25.



Ethical considerations

This study was approved by the Health Research Ethics Commission of Halu Oleo University (Number: 180/UN29.17.13/ETIK//2023) and conducted in accordance with the Declaration of Helsinki and, all participants provided written informed consent.

Results (or Results and Discussion)

Respondent Characteristic

A total of 222 people participated in this study. All respondents lived in the coastal areas of the Muna archipelago of Indonesia and worked as fishermen and seaweed farmers. The respondents were characterized by age, gender, education level and marital status. The majority of respondents were aged 15-44 years (71.6%) and the average age of participants was 39.48 years with female gender (51.8%). The majority of participants were married (84.2%) and their income was low (82.9%). Meanwhile, the respondents' education level was high school (36.0%). Further characteristics of respondents are presented in table 1.

Table 1. Characteristics of Respondents (n=222)

Characteristics	Category	n (%)
Age	15-44	168 (71.6)
Mean $\pm$ standard deviate (39.48 $\pm$ 8.290)	45-59	62 (27.9)
	60 and above	1 (0,5)
Gender	Male	107 (48.2)
	Female	115 (51.8)
Marital status	Married	187 (84.2)
	Single	35 (15.8)
Family Income (Rp)	Low	184 (82.9)
Mean $\pm$ standard deviate (1.908.108,11 $\pm$ 881.844,030)	High	38 (17.1)
Level of Education	Non Educational	7 (3.2)
	Elementary School	64 (28,8)
	Junior High School	69 (31.1)
	Senior High School	80 (36.0)
	Bachelor	2 (0.9)

Analysis of the Main Determinants of Contact Dermatitis in Fishermen and Seaweed Farmers

Univariat Analysis



The statistical analysis conducted to identify the primary determinants of contact dermatitis commenced with univariate analysis (Table 2), bivariate analysis (3), and multivariate analysis employing simple logistic regression (Table 4). All variables within the present study were subjected to univariate analysis (Table 2). The majority of respondents in this study experienced contact dermatitis (64.9%), with the majority of these respondents being adults/age 15-44 years (75.7%) and female (51.8%). Table 1 also shows that the majority of respondents had a work duration that was abnormal (92.7%) and had a previous history of skin disease (74.3%). Furthermore, the majority of respondents reported using water with qualified physical quality (87.4%) and not using PPE while working (70.7%), along with poor personal hygiene (77.9%). The univariate analysis results are further detailed in Table 2.

Table 2: Univariate analysis of study variables (n=222)

Variable	Category	n (%)
Contact Dermatitis	Yes	144 (64,9)
	No	78 (35,1)
Age	Adult	168 (75,7)
	Pre-elderly and elderly	54 (24,3)
Gender	Male	107 (48,2)
	Female	115 (51,8)
Work Duration	Abnormal	205 (92,7)
	Normal	17 (7,3)
Skin Diseases History	Found	57 (25,7)
	None	165 (74,3)
Physical Water Quality	Ineligible	28 (12,6)
	Eligible	94 (87,4)
Use of PPE	Incomplete	157 (70,7)
	Complete	65 (29,3)
Personal hygiene	Bad	173 (77,9)
	Good	49 (22,1)



Bivariat Analysis

Bivariate analysis is a data analysis used to determine the relationship or influence between two or more variables under study. From the results of chi-squared test with SPSS at 95% confidence level ($\alpha=0.05$), it was found that the risk factors that affect the incidence of contact dermatitis in fishermen and seaweed farmers include work duration ($P=0.001$); history of skin disease ($P=0.000$); use of PPE ($P=0.001$) and personal hygiene ($P=0.000$). Risk factors not associated with contact dermatitis included age ($P=0.629$), gender ($P=0.399$), and physical quality of water ($P=0.322$). Details of the results of the bivariate analysis are shown in Table 3. After the bivariate analysis, the next step was to select the variables to be included in the multivariate analysis stage (Table 4). The variables included in the multivariate analysis include duration of work, history of skin disease, use of PPE, and personal hygiene.

Multivariate analysis was conducted to ascertain the magnitude and closeness of the influence between the dependent and independent variables, and to determine which variable was the most dominant. Multivariate analysis in this study employed a simple logistic regression test. Multivariate analysis was conducted after bivariate analysis, and the variables included in the modeling for multivariate analysis were variables with a p value <0.25 . The results of the bivariate analysis and the candidate variables included in the multivariate analysis are presented in the Multivariate variable selection table that affects the incidence of contact dermatitis (Table 5). The findings of the multivariate analysis with logistic regression (table 5) indicate that among the variables examined, poor personal hygiene emerged as the predominant factor contributing to the occurrence of contact dermatitis in fishermen and seaweed farmers in the Muna Islands of Indonesia. The relative risk for individuals with poor personal hygiene compared to those with good personal hygiene was determined to be 50.22 times higher, with a p-value of $0.000 < 0.05$ and a 95% confidence interval of 0.022-0.199. The findings of the multivariate analysis with logistic regression are outlined in Table 5.

Table 3. Analysis of the influence of the independent variable on the dependent variable (N=222)

Research Variables	Contact Dermatitis				Total		P value
	Yes		No				
	Yes	%	Yes	%	N	%	
Age							
Adult	107	63,7	61	36,3	168	100	0,629
Pre-elderly	37	68,5	17	31,5	54	100	
Gender							
Male	66	61,7	41	38,3	107	100	0,399



Female	78	67,8	37	32,2	115	100	
Duration of Work							
Abnormal	144	70,2	61	29,8	205	100	0,001
Normal	0	0	17	100	17	100	
History of infectious skin disease							
Found	19	33,3	38	66,7	57	100	0,001
None	125	75,8	40	24,2	165	100	
Physical Water Quality							
Ineligible	123	87,4	71	36,6	194	100	0,322
Eligible	21	75	7	25	28	100	
Use of PPE							
Incomplete	128	81,5	29	18,5	157	100	0.001
Complete	16	24,6	49	75,4	65	100	
Personal hygiene							
Bad	136	78,4	37	21,4	173	100	0,000
Good	8	16,3	41	83,7	49	100	

Table 4. Multivariate variable selection (N=222)

Variabel	p value
Age	0,654
Gender	0,399
Duration of Work	0,001*
History of infectious skin disease	0,001*
Physical Water Quality	0,332
Use of PPE	0,001*
Personal hygiene	0,000*

*The following variables were included in the multivariate analysis (simple logistic regression):

Table 5. Multivariate Analysis of Major Risk Factors for Contact Dermatitis (n = 222).

Variable	B	p value	SE	Wald	Exp(B) (OR)	95% C.I. for Exp (B) Lower Limit Uper Limit	
Personal hygiene	3,916	0,000	0,643	37,124	50,22	14,248	177,015
Use of PPE	-2,712	0,001	0,56	23,437	0,066	0,022	0,199



History of infectious

skin disease

2,876

0,001

0,566

25,828

0,056

0,019

0,171

Discussion (Time New Roman 12 pt Bold)

Age

One of the characteristics that cannot be separated from the individual is age (Irma & Swaidatul Masluhiya AF, 2020). The degeneration of the skin, particularly the thickness of the skin layer and gland function, is a hallmark of the aging process. This degeneration results in the loss of the fat layer that protects the skin and contributes to its dryness. The aging process of the skin is theorized to commence from the age of 40. This process is accompanied by a decline in skin cell hydration, attributable to the thinning of the basal layer. Concurrently, sebum production experiences a marked decline, resulting in the accumulation of dead cells due to diminished cell turnover. (Dickel, 2023; Utami et al., 2021; Yusharyahya, 2021).

The results of this study reveal that there is no correlation between age and the prevalence of contact dermatitis among fishermen and seaweed farmers in the Muna Islands of Indonesia. This result indicates that contact dermatitis can affect individuals of all age groups. The observed demographic distribution of the study participants, with the majority (75.7%) in the adult range (aged 17-45 years), further substantiates the relevance of this observation. Anatomically and physiologically, human organs, including skin tissue, are in a condition where the body's organs are still in optimal condition and have not experienced function loss, and the skin barrier function is still running normally. (Anggowarsito, 2014; Polaskey MT, Chang CH, Daftary K, Fakhraie S, Miller CH, 2024; Yusharyahya, 2021).

Gender

Gender is one of the factors that can lead to contact dermatitis (Hamidi, 2022). According to the Aesthetic Surgery Journal, there are differences between male and female skin, including the number of hair follicles, sweat glands, and hormones. Women's skin produces less oil to protect and keep the skin moisturized, making it drier compare to men, and women's skin is thinner compare to men, which making it increases the risk of hand dermatitis (Lagacé et al., 2023).

The findings of this study indicated that there was no correlation between gender and the prevalence of contact dermatitis among fishermen and seaweed farmers. The researchers hypothesize that this phenomenon occurs because both men and women engage in similar activities as fishermen and seaweed farmers.

The number of male and female participants in this study shows significant variation. The difference in the number of respondents between men and women causes a disparity in the



proportion between the two groups, resulting in a higher percentage of women affected by contact dermatitis. The analysis revealed there is no correlation between gender and the prevalence of contact dermatitis among fishermen and seaweed farmers. This finding is consistent with the results of previous research, which also identified gender as a significant factor in the development of contact dermatitis. The researchers attribute this discrepancy to differences in exposure patterns between the sexes, particularly with regard to the agents or materials that cause contact dermatitis and the intensity of contact with allergens and irritants among male and female workers. (Cristine Sianturi et al., 2024; Mauro et al., 2021).

Duration of Work

Work duration is determined by the number of hours that workers spend engaged in fishing and seaweed farming activities each day. The duration of work has been demonstrated to influence the prevalence of contact dermatitis. The duration of exposure to irritants or allergens has been shown to result in skin inflammation or irritation, potentially leading to damage to the deeper layers of skin cells. (Alluhayyan et al., 2020; Yulia, A., Adha & Lailatul, 2016).

The results of this study indicate that work duration affects the incidence of contact dermatitis in fishermen and seaweed farmers in coastal communities in Muna Regency Indonesia. From the results of interviews and direct observation at the research location, it shows that fishermen and seaweed farmers work more than the normal duration of work in Indonesia (6-8 hours). On average, fishermen and other seaweed farmers in Muna Regency Indonesia work more than 8-10 hours a day. This causes them to have longer contact with irritant or allergenic materials such as seawater, fish and other seafood and seaweed.

Contact dermatitis in workers is influenced by various factors, including the duration of exposure, the frequency of contact, and the nature of the irritant or allergen. (Enggalhardjo et al., 2024; Kaur et al., 2023). Fishermen who are in daily contact with salt water or sea products such as seaweed can trigger contact dermatitis (Dewi et al., 2023).

History of Skin Disease

In general, skin that has experienced previous health complications or infections is susceptible to developing new health concerns. This phenomenon can be attributed to a decrease in physiological functions, particularly those related to protection. Additionally, skin that has experienced recurrent health problems or diseases may become vulnerable, potentially interfering with treatment outcomes (Eka Yuliana et al., 2021; Rubins et al., 2020; Tramontana et al., 2023).

The results of this study indicated that a history of skin disease has a significant impact on the prevalence of contact dermatitis among fishermen and seaweed farmers. In accordance with



theoretical frameworks, individuals with a history of skin disease, particularly contact dermatitis, are expected to exhibit heightened sensitivity to diverse irritants and allergens. This heightened sensitivity, particularly to allergic contact dermatitis, is a well-documented consequence of a prior history of skin disease. This heightened sensitivity is attributed to an augmented immune response. Furthermore, suspicion of immunological factors can also occur in cases of atopic dermatitis (Bahamon, I., Strassner, J.P. & Ko, 2023; Mesjasz et al., 2023).

Workers with a history of or currently suffering from non-occupational dermatitis show an increased susceptibility to occupational contact dermatitis. This phenomenon can be attributed to the compromised skin barrier function, a consequence of prior skin diseases. (Lima, A.L., Timmermann, V., Illing, Elsner, 2019; Mesjasz et al., 2023).

Physical Water Quality

One of the environmental factors that has been identified as having a significant impact on human life is the need for water. The quantity and quality of clean water are strongly related to the health status of humans or families. Ensuring adequate personal hygiene necessitates access to sufficient clean water. (Eloista et al., 2023; Srisantyorini & Cahyaningsih, 2019).

The results of this study indicated that environmental sanitation, defined as the physical quality of water, influenced the incidence of contact dermatitis. The results of interviews and observations conducted at the research location indicated that the population in the study area, including those who participated in the study, experienced limitations in accessing quality water. The limited access to clean water, which is essential for personal hygiene, including bathing, is a major concern. The scarcity of clean water further compels respondents to forgo bathing, as they lack access to sufficient quantities of uncontaminated water.

According to the results of previous studies on the subject, the incidence of contact dermatitis is correlated with a number of factors, including environmental sanitation such as water sources, bathing behavior and the quenching of clean water (Cristine Sianturi et al., 2024; Eloista et al., 2023; Wulandari & Saftarina, 2023).

Use of PPE

Personal protective equipment (PPE) is defined as a set of tools used by workers to protect part or all of their bodies from the potential hazards of accidents or occupational diseases. A correlation has been found between the utilization of PPE and the incidence of contact dermatitis. Consequently, the absence of PPE utilization by workers during their employment exposes them to the risk of developing contact dermatitis (Alayyannur et al., 2024; Badriah & Heriana, 2020).

This study also shows the influence of PPE use on the incidence of contact dermatitis. The observed influence of PPE utilization can be attributed to the fact that the majority of respondents do not implement the complete PPE protocol during their activities.



A previous study on health problems and the risk of injury in female fishermen indicated that one of the factors associated with the incidence of occupational diseases in fishermen, such as skin problems, is the use of PPE. It has been observed that female fishermen frequently do not utilize PPE during their work activities (Halder et al., 2024).

Personal Hygiene

Personal hygiene can be defined as an individual or group effort to maintain cleanliness through personal hygiene by controlling environmental conditions. Personal hygiene is defined as a set of practices aimed at enhancing overall health, maintaining personal cleanliness, and preventing the onset of diseases. Maintaining optimal skin health is to keep the skin clean and well-groomed (Iva Japundžić et al., 2023; Menaldi et al., 2017).

The results of this study indicated that personal hygiene is one of the factors that correlated with the prevalence of contact dermatitis. The results of the data analysis indicated that the majority (78.4%) of the respondents lacked adequate personal hygiene standards. The correlation between personal hygiene and the prevalence of contact dermatitis in this study can be explained by the substandard personal hygiene standards within the community. The results of field observations indicate that seaweed farmers should maintain their personal hygiene by bathing at least twice a day. However, due to limited access to clean water, they are unable to adhere to this routine. This situation places workers at an increased risk of developing contact dermatitis.

From the results of further analysis with simple logistic regression test, it was found that personal hygiene factor was the most dominant factor influencing the incidence of contact dermatitis. A person with poor personal hygiene has a 2.61 times higher risk of developing contact dermatitis compared to fishermen and seaweed farmers who have good personal hygiene. The results of direct interviews with participants showed that after finishing work and contact with the source of contact dermatitis, fishermen and seaweed farmers do not immediately bathe, wash their hands and change clothes. Usually, respondents rest or relax, which prolongs contact with the source of allergy or irritant. In addition, workers reported that they have very limited access to clean water, which has led to a lack of attention to personal hygiene (bathing) by participants. Respondents also said that they sometimes use water that is not physically suitable, for example, they use water that is slightly salty because it comes from dug wells in coastal areas. Previous research has also shown that there is an association between water source, water quality and water source infrastructure and contact dermatitis (Sedeh, F.B., Michaelsdóttir, T.E., Jemec, 2023).

Furthermore, fishermen and seaweed farmers reported experiencing tiredness after their activities, often returning home in the evening and immediately retiring for the night without bathing or washing their hands. Observations revealed that the majority of respondents



experiencing contact dermatitis had it on their hands and feet, as these areas are in constant contact with irritants such as sea bait, fish, and seaweed that have been recently collected from the sea. The results of this study indicate that the lack of access or limitations to personal hygiene facilities is a primary factor leading to the occurrence of contact dermatitis. This aligns with the findings of previous research, which also identified various significant contributing factors, including the infrast ructure of clean water sources and personal hygiene facilities (Avila Evi Kustanti et al., 2024; Tolera et al., 2023).

Conclusion and Recommendation

Contact dermatitis represents a significant health concern among fishermen and seaweed farmers on Muna Island, Indonesia. Risk factors for the incidence of contact dermatitis in these populations include length of service, personal hygiene, use of personal protective equipment (PPE), and history of skin disease. The main determinant of the incidence of contact dermatitis in these communities is poor personal hygiene, with a risk of 50.22 times greater for individuals with poor personal hygiene compared to those with good personal hygiene. Further research is needed on the incidence of contact dermatitis in fishermen and seaweed farmers by looking at the types of exposure to chemicals that cause dermatitis in fishermen and seaweed farmers.

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