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Factors Associated with Irritant Contact Dermatitis Among Seaweed Farmers In Seppong Village, North Belopa District, Luwu Regency, South Sulawesi

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ABSTRACT

Irritant Contact Dermatitis is an immunological local inflammatory response of the skin characterized by redness and swelling after exposure to irritants such as solvents, detergents, and sawdust. This study aims to determine the relationship between age, gender, length of contact, personal hygiene, and nutritional status with symptoms of irritant contact dermatitis in seaweed farmers, using quantitative methods and cross-sectional study design on 139 respondents who work as seaweed farmers in Seppong Village, North Belopa District, which were selected using random sampling techniques using questionnaires and then analyzed using chi-square. The findings revealed significant associations between symptoms of irritant contact dermatitis and the following variables: age (p-value = 0.005), gender (p-value = 0.003), duration of contact (p-value = 0.006), length of service (p-value = 0.003), and personal hygiene (p-value = 0.002). In contrast, nutritional status was found to be unrelated (p-value = 0.147). The conclusion of this research is that age, gender, length of contact, length of service, and personal hygiene have a strong influence on irritant contact dermatitis, so it is recommended that seaweed farmers pay attention to personal health by maintaining personal hygiene and also avoiding direct contact with irritants by using complete and standard PPE.

Key Messages:

- Seaweed farmers are prone to irritant contact dermatitis due to frequent direct exposure to seaweed. Seaweed contains hydroids that can induce irritant contact dermatitis.
- By upholding personal hygiene, minimizing contact duration, ensuring adequate nutritional intake, and limiting direct interaction with seaweed through appropriate and standardized personal protective equipment, the risk of exposure to irritant contact dermatitis can be mitigated.

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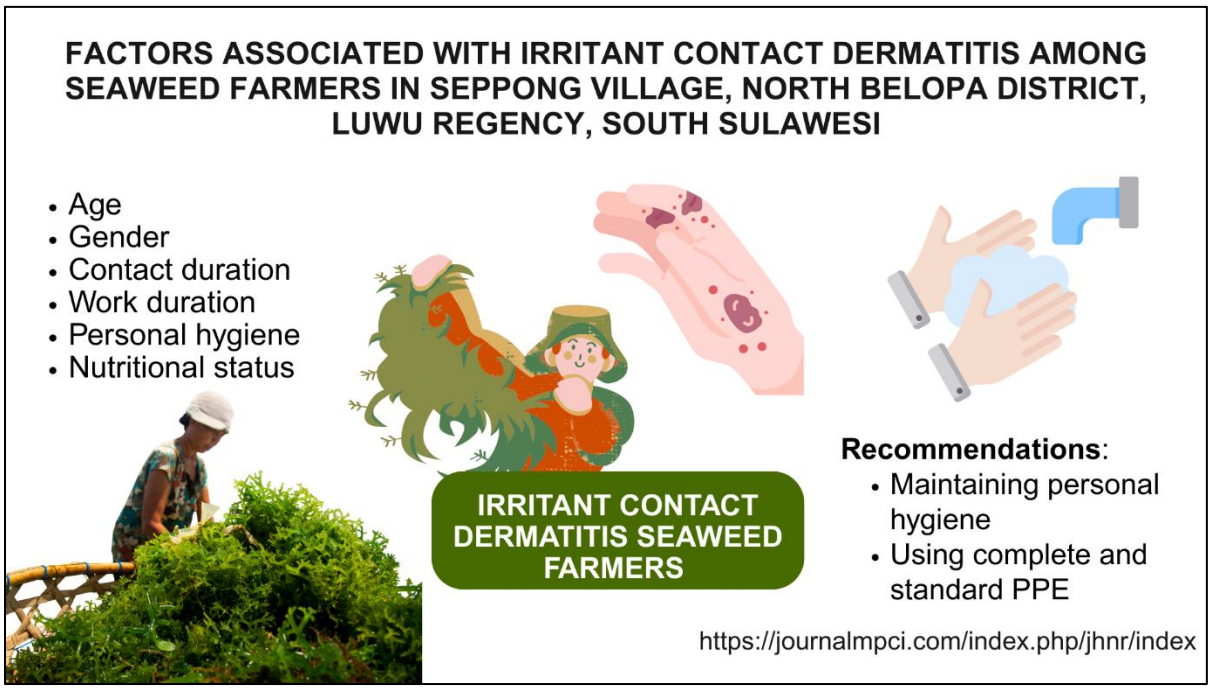
GRAPHICAL ABSTRACT



INTRODUCTION

Contact dermatitis is an inflammatory skin reaction that may be acute or chronic, resulting from exposure to external irritants. This inflammation is often associated with the development of spongiosis or intracellular edema (1). Furthermore, contact dermatitis is a dermatological condition that can recur in individuals, manifesting as inflammation of the skin layers (epidermis and dermis) in response to both external (exogenous) and internal (endogenous) factors. The condition presents various symptoms, including erythema, edema, papules, vesicles, scales, and lichenification, often accompanied by pruritus (2).

Occupational contact dermatitis is affected by several factors, including the duration of employment, length of exposure, age, and practices associated with using Personal Protective Equipment (PPE). Short employment durations, particularly those under three years, are associated with a heightened risk of contact dermatitis due to insufficient experience managing irritants. The duration of exposure to irritants ranks as the second most critical factor, following the length of employment. Prolonged exposure to an irritant correlates with an increased exposure dose, elevating the likelihood of developing contact dermatitis(3).

The issue of irritant contact dermatitis is significant globally, as this condition is relatively standard. According to data from the World Health Organization (WHO), the prevalence of irritant contact dermatitis was ranked fourth in 2020, affecting 10% of the population. An annual survey of occupational diseases among the working population indicates that 80% of these cases are attributed to irritant contact dermatitis. The global prevalence is estimated at approximately 300 million cases annually(Hayati et al., n.d.-a).

Furthermore, a surveillance study in the United States indicated that 80% of work-related skin diseases can be classified as contact dermatitis. Irritant contact dermatitis prevails within this category, accounting for 80%, while allergic contact dermatitis ranks second, comprising between 14% and 20% (5).

In Indonesia, the prevalence of dermatitis exhibits considerable variation. According to data from the 2019 dermatologist meeting, approximately 90% of occupational skin diseases are classified as contact dermatitis, encompassing irritant and allergic types. Occupational contact dermatitis accounted for 92.5%, while around 5.4% resulted from skin infections, and 2.1% were attributed to other causes. Epidemiological studies further indicate that of the 389 cases identified in Indonesia, 97% were contact

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dermatitis, with 66.3% caused by irritants and 33.7% by allergies. (4). Epidemiological studies in Indonesia have disclosed data indicating that out of a total of 389 cases, 97% were instances of contact dermatitis. Among these, 66.3% were associated with irritant contact dermatitis, while 33.7% were linked to allergic contact dermatitis; the data presented indicates a significant incidence of occupational contact dermatitis, with the prevalence of skin diseases in South Sulawesi reaching 53.2%, a notable high figure (6).

Following initial observations conducted by researchers in Seppong Village, North Belopa District, Luwu Regency, it was discovered that farmers frequently exhibit symptoms of irritant contact dermatitis, including itching, spots, reddish rashes, dry skin, and blisters on areas of the skin that come into direct contact with irritants, specifically the hands and feet. Additionally, it was noted that farmers seldom utilize personal protective equipment that meets established standards.

Based on the initial data collection survey conducted in Luwu Regency, particularly within the jurisdiction of the North Belopa Health Center, it was determined that dermatitis ranks among the ten most prevalent diseases in the area. Furthermore, seaweed farmers are particularly vulnerable to irritant contact dermatitis due to their frequent direct contact with seaweed, which often harbors hydroids that induce itching. Hydroids are marine organisms that possess toxic nematocysts. Initial exposure to hydroids can result in a rash and, with prolonged contact, may lead to skin infections. Even after drying, hydroids frequently continue to provoke skin irritation. Despite the high prevalence of contact dermatitis among seaweed farmers, limited research has specifically examined the contributing factors in Indonesia. This study analyzes the association between demographic and occupational factors with irritant contact dermatitis among seaweed farmers in Seppong Village. This situation has motivated researchers to investigate the symptoms of irritant contact dermatitis in Seppong Village, North Belopa District, Luwu Regency.

METHODS

This study employs a quantitative methodology with a cross-sectional design, aiming to identify factors associated with symptoms of irritant contact dermatitis among seaweed farmers. The sampling technique utilized in this research is simple random sampling. According to Sugiyono (2014), simple random sampling is a method of selecting samples from a population or group in a specific manner, ensuring that each individual within the population has an equal opportunity to be chosen, as researchers provide members of the population the chance to be designated as sample respondents. In this study, sampling is conducted by compiling a list of all individuals in the population, placing their names into a container, and then drawing names one by one until the predetermined sample size is achieved.

In this study, the sample size can be calculated using the Slovin formula as follows:

$$n = N / (1 + N d^{“2”})$$

Description:

n = Number of samples

N = Population size or total population

d = Expected precision limit of 5% (0.05)

$$n = N/(1+N d^{“2”})$$

$$n = 215/(1+215 (0.05)^{“2”})$$

$$n = 215/(1+0,5375)$$

$$n = 139$$

This study employed a questionnaire as a data collection instrument developed by researchers based on theoretical concepts. A questionnaire serves as a method for gathering data by presenting a series of written questions for respondents to answer. It may consist of either closed or open-ended questions. Researchers crafted the questionnaire utilized in this study to assess the relationship between the duration of contact and the reported dermatitis symptoms among respondents.

The instrument utilized in this study comprises two sections. The first section includes individual characteristics such as name, age is the period of the farmer's life from birth to the time of the study, which is considered at risk if it is greater than or equal to 40 years. Not at risk if less than 40, and gender Biological

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differences between men and women are determined at birth, where women are more at risk and men are not.

The second section contains questions designed to identify the factors associated with symptoms of irritant contact dermatitis among seaweed farming workers, such as duration of contact is the duration of time when seaweed farmers interact directly with seaweed in a day, which is said to be at risk if working more than or equal to 8 hours a day is not at risk if less than 8 hours a day, length of service is the length of time seaweed farmers work from the first day of starting work until this research is conducted where it is said to be an old worker if he has worked more than or equal to 5 years, a new worker if he has worked for less than 5 years, personal hygiene is the habit of workers in cleaning themselves (bathing) and washing their hands before and after work following WHO standards in washing hands carried out with 8 steps. Cleaning hands using soap and running water, Rubbing both palms alternately, Rubbing the back of the hand, Rubbing between the fingers, Cleaning the fingertips alternately in an interlocking position, Rubbing and rotating both thumbs alternately, Drying hands after washing hands. Where it is said to be good if cleaning yourself (bathing) and wash your hands according to WHO standards, and bad If not clean yourself (bathing) and wash your hands according to WHO standards, nutritional status which is determined based on the Body Mass Index (BMI) value. BMI is obtained from the ratio of body weight to height squared. This nutritional status is categorized into Normal and abnormal nutrition, namely thin and fat. Where it is said to be normal nutrition if the BMI is 18.5 - 25.0, abnormal nutrition (thin) if BMI Weight <17.0, Light 17.0 - 18.4 (fat) if the BMI is Light 25.1 - 27.0 Heavy > 27, and symptoms of irritant contact dermatitis is a skin disorder in the form of itching, patches, reddish rashes on the skin, dry skin, and blistering of the skin area that is in direct contact with irritants, namely hands and feet, where it is said that there are symptoms if the score is more than or equal to the mean/median value, there are no symptoms if the score is less than the mean/median value.

CODE OF HEALTH ETHICS

Health Research Ethics Committee of Alauddin State Islamic University Makassar, ethical certificate number: B.109/KEPK/FKIK/VI/2024

RESULTS

According to Table 1, among the total of 139 seaweed farmers in Seppong Village, North Belopa District, Luwu Regency in 2024, 70 individuals (50.4%) exhibited symptoms of irritant contact dermatitis, while 69 individuals (49.6%) did not display such symptoms. .

Table 1 Frequency Distribution of Dermatitis Symptoms Among Seaweed Farmers in Seppong Village

Symptoms of Dermatitis	n	%
There are indications	70	50,4
No Symptoms	69	49,6
Total	139	100

Table 2 Frequency Distribution of Dermatitis Symptoms Among Seaweed Farmers in Seppong Village

Variables	n	%
Age (years)		
At risk (≥ 40)	66	47,5
Not at risk (< 40)	73	52,5
Gender		
Man	43	30,9
Women	96	69,1
Contact Duration		
At risk (≥8 jam)	114	82,0

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Variables	n	%
Not at risk (<8 jam)	25	18,0
Working Hours		
Old (≥ 5 years)	123	88,5
Recent (< 5 years)	16	11,5
Personal Hygiene		
Bad	125	89,9
Good	14	10,1
Nutritional Condition		
Abnormal Nutrition	45	32,4
Normal	94	67,6
Total	139	100

A Chi-square analysis revealed significant associations between several demographic and occupational factors and the prevalence of irritant contact dermatitis among seaweed farmers in Seppong Village, North Belopa District, Luwu Regency. Specifically, age (p=0.005), gender (p=0.003), length of contact with seaweed (p=0.004), duration of employment (p=0.003), and personal hygiene (p=0.002) all demonstrated significant relationships with the presence of dermatitis symptoms, with at-risk age groups, females, those with prolonged seaweed contact, longer employment, and poor hygiene exhibiting higher rates of symptoms. Conversely, nutritional status (p=0.079) showed no statistically significant correlation with the occurrence of irritant contact dermatitis in this population.

DISCUSSION

Relationship Between Age and Symptoms of Irritant Contact Dermatitis Among Seaweed Farmers in Seppong Village.

Age in humans refers to the duration that has elapsed since birth. Human skin undergoes various changes as the aging process progresses. One notable change is reducing the fat layer on the skin's surface, resulting in increased dryness. This condition can elevate the risk of skin infections from certain irritants, potentially leading to dermatitis. Furthermore, human immunity diminishes with age, making individuals more vulnerable to diseases.

The results of the bivariate test analysis utilizing chi-square revealed a p-value of 0.005 ($p < 0.05$), indicating a significant relationship between age and symptoms of irritant contact dermatitis among seaweed farmers. This finding aligns with previous research Sholeha M et al (2021) (7)., which reported a p-value of 0.019, asserting that age is a primary risk factor contributing to skin disorders and significantly impacts skin disease issues. As individuals age, their bodily systems decline, including a diminished capacity to combat irritants or harmful substances. By approximately 40 years of age, the skin begins to undergo an aging process characterized by a thinning of the basal layer. This alteration hampers the skin's ability to retain moisture and leads to the accumulation of dead cells due to reduced sebum production and slower cell turnover.

Another study indicated that, according to the Indonesian Dermatologist and Venereologist Association in 2011, aging individuals experience a decline in bodily functions, including the capacity to combat toxic substances. This renders them more vulnerable to contact dermatitis, particularly as the aging process induces structural, physiological, and immunological alterations to the skin. Consequently, elderly workers face an elevated risk of developing contact dermatitis, even when exposed to low concentrations of irritants. (8).

This study diverges from the findings Kusworo NSR (2015) (10), which reported a P-value of 0.147 (> 0.05). Nonetheless, it was noted that aging increases the body's vulnerability to irritants. In older adults, dermatitis treatment frequently proves ineffective, potentially leading to chronic dermatitis. This indicates that the elderly are more prone to dermatitis. Additionally, it was highlighted that human skin deteriorates with age, reducing the subcutaneous fat layer. Consequently, the skin becomes drier and more susceptible to irritation, which may result in contact dermatitis.

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Relationship Between Gender and Symptoms of Irritant Contact Dermatitis Among Seaweed Farmers in Seppong Village

Gender differences can be one of the triggering factors for contact dermatitis. There are differences between male and female skin, including the number of hair follicles, sweat glands, and hormones. Women's skin usually produces less oil, making it less effective in protecting and keeping the skin moisturized and drier than men's. In addition, women's skin also tends to be thinner, which makes it more susceptible to dermatitis (1).

Gender is a significant factor contributing to contact dermatitis. A report from the Aesthetic Surgery Journal highlights the differences between male and female skin, particularly in hair follicle density, sweat gland activity, and hormonal influences. Women's skin generally exhibits more significant dryness than men's due to lower oil production, essential for skin protection and moisture retention. Furthermore, women's skin is typically thinner than that of men, rendering it more vulnerable to dermatitis (9)

The results of the bivariate test analysis utilizing chi-square revealed a p-value of 0.003 ($p < 0.05$), indicating a significant relationship between gender and symptoms of irritant contact dermatitis among seaweed farmers. This finding aligns with the study conducted by Sholeha et al., which reported a p-value of 0.000 (< 0.05), suggesting that the incidence of irritant contact dermatitis is more prevalent in women than in men. Women are at a greater risk of developing skin diseases compared to men. The disparity between male and female skin can be attributed to the influence of male hormones, particularly androgens, which enhance sweat production and hair growth, whereas women's skin is generally thinner, rendering it more vulnerable to damage.

This study diverges from the research conducted by Irma et al (2024) (9), which reported a p-value of 0.399 (>0.05). However, it was noted that gender did not significantly influence the occurrence of contact dermatitis. Men who develop contact dermatitis are typically associated with prolonged work hours, the use of Personal Protective Equipment (PPE), the physical quality of water, and personal hygiene practices. Conversely, women experiencing contact dermatitis often face heightened exposure due to their roles as fishermen and seaweed farmers, in addition to performing household tasks such as dishwashing and laundry, which frequently involve chemicals like detergents. The findings of this study suggest that factors such as irritant exposure, PPE usage, and personal hygiene play a more critical role in the incidence of contact dermatitis than gender. In practice, women, particularly in coastal communities on small islands in the Muna Islands, Southeast Sulawesi, frequently encounter limited access to quality clean water sources and a lack of awareness regarding personal hygiene, both of which may contribute to the prevalence of contact dermatitis.

Relationship Between Contact Duration and Symptoms of Irritant Contact Dermatitis Among Seaweed Farmers in Seppong Village

Duration of contact refers to the number of hours farmers engage with irritants daily. Prolonged exposure to these irritants significantly increases the likelihood of skin irritation or inflammation, potentially leading to skin disorders. Continuous skin exposure to irritant chemicals or allergens over an extended period heightens the risk of contact dermatitis due to worker susceptibility. Prolonged contact with these irritants can result in skin inflammation or irritation, ultimately culminating in skin disorders. Workers exposed to chemicals or irritants often suffer damage to the outer layer of skin cells; the longer the exposure, the deeper the damage can penetrate the skin's layers, exacerbating the condition and promoting the onset of dermatitis. To mitigate this risk, limiting the amount and duration of contact with irritants is essential. One effective risk management strategy is establishing a time limit for exposure to chemicals or irritants(10).

The results of the bivariate test analysis utilizing chi-square revealed a p-value of 0.004 ($p < 0.05$), indicating a significant relationship between the duration of contact with symptoms of irritant contact dermatitis among seaweed farmers. This finding aligns with the research conducted by Rahmatika et al. (2020), which reported a p-value of 0.000 (< 0.05), suggesting that each worker experiences varying durations and frequencies of exposure to irritants and allergens (12). Increased exposure of an individual's skin to these materials heightens the likelihood of penetration and subsequent skin inflammation.

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Furthermore, the study indicated that farmers with a contact duration of ≥4 hours faced a threefold increased risk of dermatitis compared to those with a contact duration of <4 hours, evidenced by an Odds Ratio (OR) of 3.021 and a 95% confidence interval ranging from 1.656 to 5.512.

Relationship Between Work Duration and Symptoms of Irritant Contact Dermatitis Among Seaweed Farmers in Seppong Village

The length of service is how long the worker has been in the job starting from the first day of employment, and as the length of service and frequency of contact increase, the level of exposure will also increase. As a result, the likelihood of developing irritant contact dermatitis will also increase. In the case of occupational diseases such as irritant contact dermatitis, farmers who exceed the recommended working time and work every day have a higher risk of suffering from the disease due to prolonged exposure to seaweed (17).

The results of the bivariate test analysis utilizing chi-square revealed a p-value of 0.003 ($p < 0.05$), indicating a significant relationship between the duration of employment and the symptoms of irritant contact dermatitis among seaweed farmers. This finding aligns with research Netty, T. (2017) (16), which reported a p-value of 0.005, suggesting that workers with over two years of experience are more likely to encounter contact dermatitis incidents than those with less than two years of service. For workers with a tenure exceeding two years, the heightened risk of abrasions, friction, and pressure on the skin can vary significantly, thereby increasing their susceptibility to developing irritant contact dermatitis.

However, another study reported a p-value of 0.001 ($p < 0.05$) and noted that workers with two years or less of experience may lack sufficient proficiency in their roles. This inexperience can lead to frequent errors in chemical handling procedures, potentially heightening the risk of contact dermatitis among workers with a tenure of two years or less. The study indicates that employees with more than two years of service are more likely to experience irritant contact dermatitis than those with two years or less. This is attributed to their increased frequency and duration of irritant exposure, which can influence the incidence of irritant contact dermatitis. Each worker exhibits distinct resistance to acetic acid (16).

This study does not align with the findings of Rahmatika (2020) (12), which reported a p-value of 0.919 (> 0.05), indicating that farmers who work for five hours or more have a 1.2 times higher risk of dermatitis compared to those who work fewer hours. Experienced workers tend to exercise greater caution, minimizing their exposure to chemicals or irritants. Additionally, those with extensive work experience are generally more adept at performing tasks, resulting in superior work outcomes.

The Correlation Between Personal Hygiene and Symptoms of Irritant Contact Dermatitis Among Seaweed Farmers in Seppong Village.

Personal hygiene plays a crucial role in the prevention of dermatitis. A key indicator of personal hygiene is the practice of handwashing. If handwashing techniques are inadequate, irritants may remain on the skin, potentially leading to dermatitis. The selection of hand soap also influences the cleanliness and health of the skin. Furthermore, properly drying hands after washing is essential to prevent skin deterioration caused by excessive moisture.

The results of the bivariate test analysis utilizing chi-square revealed a p-value of 0.002 ($p < 0.05$), indicating a significant relationship between personal hygiene and symptoms of irritant contact dermatitis among seaweed farmers. This finding aligns with previous research Akbar H (2020) (13)., which reported a p-value of 0.015, emphasizing the critical role of maintaining good skin hygiene in preventing dermatitis. Practices such as washing hands and feet, bathing regularly, and changing clothes are essential in mitigating the risk of dermatitis. The significance of handwashing extends beyond mere cleanliness; it involves the use of soap and thorough cleaning between the fingers with running water. Additionally, bathing and changing clothes after work can further diminish the likelihood of dermatitis. Furthermore, washing hands with soap before and after work effectively removes germs and irritants while neutralizing the skin's pH, thereby preventing dermatitis. These habits are instrumental in effectively preventing skin diseases, including dermatitis.

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This study contrasts with the findings of Megantari G (2020) (8)., which reported a p-value of 0.259 (>0.05), indicating no significant relationship between personal hygiene and the incidence of irritant contact dermatitis. This conclusion stems from the observation that workers often neglect their personal hygiene, compounded by inadequate facilities that do not promote proper hygiene practices, such as handwashing stations. The provision of facilities by the factory owner significantly influences workers' personal hygiene. The presence of a handwashing station equipped with a running water tap, soap, and a drying cloth facilitates easy handwashing for workers after their shifts. While the practice of handwashing should theoretically mitigate the risk of dermatitis caused by irritant substances, the reality is that such risks persist. One contributing factor is the improper execution of the handwashing process, where insufficient care may leave irritants on the skin even after washing.

The Correlation Between Nutritional Status and Symptoms of Irritant Contact Dermatitis Among Seaweed Farmers in Seppong Village.

Nutritional status is a critical factor influencing the overall function of the body, including the immune system. The immune system is essential for safeguarding the body, particularly in preventing infections caused by microorganisms. It plays a vital role in thwarting skin infections, such as irritant contact dermatitis. One mechanism by which the immune system prevents irritant contact dermatitis is through the release of cytokines. Cytokines are a diverse family of inducible glycoproteins produced by various cell types, mediating both local interactions and long-distance communication among the cellular components of immune and inflammatory responses. The primary mechanism employed by epidermal cells in immune and inflammatory skin reactions is the production of cytokines and their responses. In the epidermis, keratinocytes serve as the principal source of cytokines, alongside Langerhans cells and melanocytes. Cytokines can function directly as triggers and regulators of cell growth, division, and differentiation, as stimulators of cell movement and migration, and as controllers of cellular function and interaction through induced alterations in the expression of adhesion molecules and receptors for cytokines (15).

Based on the results of the bivariate test analysis utilizing chi-square, a p-value of 0.079 ($p > 0.05$) was obtained, indicating no significant relationship between nutritional status and symptoms of irritant contact dermatitis among seaweed farmers. Analyzing the data reveals that out of 139 respondents, 94 (67.6%) exhibited normal nutritional status, while 45 (32.4%) had abnormal nutritional status, suggesting a higher prevalence of normal nutritional status. Among the 94 respondents with normal nutritional status, a greater number, specifically 52 (55.3%), did not exhibit symptoms, compared to 42 (44.7%) who did. Conversely, among the 45 respondents with abnormal nutritional status, a larger proportion, 28 (62.2%), presented with symptoms, while 17 (37.8%) did not. This indicates that while the study aligns with existing literature, it does not establish a definitive relationship due to the influence of other dominant factors.

To identify these factors, an in-depth analysis was conducted, revealing that among the 42 respondents (44.7%) with symptoms of irritant contact dermatitis despite having normal nutritional status, the majority did not utilize personal protective equipment (PPE) adequately, with 41 respondents (90.6%) exhibiting poor personal hygiene. Additionally, 41 respondents (90.6%) had a work history of over five years, 37 respondents (88.1%) had a contact duration exceeding eight working hours, 32 respondents (76.2%) were female, and 25 respondents (59.5%) were over 40 years of age. Furthermore, among the 17 respondents (37.8%) with abnormal nutritional status who did not exhibit symptoms, 14 respondents (82.3%) were found to be of an age not considered at risk.

A person's health is shaped by various factors, including the absence of disease or disability, favorable socio-economic conditions, a healthy environment, and optimal nutritional status. Individuals with good nutritional status are generally less susceptible to both infectious and degenerative diseases. Nutritional status is a critical determinant of achieving optimal health. Nevertheless, our society continues to witness instances of diseases associated with malnutrition. The repercussions of malnutrition include stunted growth, reduced energy production leading to diminished productivity, weakened immune defenses resulting in increased vulnerability to diseases such as skin conditions and degenerative diseases, particularly infectious diseases due to insufficient antibodies, and impaired cognitive function. Conversely,

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the consequences of excessive nutrition can precipitate the onset of degenerative diseases such as hypertension, diabetes, heart disease, and others (16).

CONCLUSION

This study shows a relationship between age, gender, length of contact, length of service, and personal hygiene with symptoms of irritant contact dermatitis. There is no relationship between nutritional status and symptoms of irritant contact dermatitis in seaweed farm workers, so based on the results above, it is hoped that seaweed farmers will pay attention to the duration of work, personal hygiene or personal hygiene and also continue to use PPE according to standards in order to reduce the risk of developing health problems such as symptoms of irritant contact dermatitis.

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CONFLICTS OF INTEREST

The author reports no conflicts of interest.

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