

Irritant contact dermatitis determinants in fish cleaners: Occupational risk factors at paotere fish auction, Makassar

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ABSTRACT

Irritant contact dermatitis remains a common occupational skin disorder among workers exposed to repeated wet work and irritants, yet evidence on its determinants among fish cleaning workers in traditional fish auction settings remains limited; this study provides site-specific evidence from Paotere Fish Auction Site, Makassar. This study aimed to identify factors associated with symptoms of irritant contact dermatitis among fish cleaning workers. A quantitative cross-sectional study was conducted among all 118 fish cleaners using total sampling. Data were collected through structured questionnaires, observation sheets, and interviews. Univariate analysis was used to describe respondent characteristics, while bivariate associations were examined using the chi-square test and independent determinants were assessed using multiple logistic regression. Irritant contact dermatitis symptoms were reported by 66.1% of respondents. Age, working period, daily working duration, knowledge, use of personal protective equipment, and personal hygiene were significantly associated with symptoms in bivariate analysis ($p < 0.05$). Multivariate analysis identified age, working period, knowledge, PPE use, and personal hygiene as significant determinants, with knowledge emerging as the most prominent modifiable factor. These findings emphasize the need for occupational health interventions focused on worker education, appropriate PPE use, improved personal hygiene, and safer workplace conditions to reduce occupational skin disease among fish cleaning workers.

ABSTRAK

Dermatitis kontak iritan masih merupakan salah satu gangguan kulit akibat kerja yang umum terjadi pada pekerja yang sering terpapar pekerjaan basah dan bahan iritan. Namun, bukti mengenai faktor-faktor yang memengaruhinya pada pekerja pembersih ikan di lingkungan pelelangan ikan tradisional masih terbatas; penelitian ini memberikan bukti spesifik dari Tempat Pelelangan Ikan Paotere, Makassar. Penelitian ini bertujuan untuk mengidentifikasi faktor-faktor yang berhubungan dengan gejala dermatitis kontak iritan pada pekerja pembersih ikan. Penelitian kuantitatif dengan desain cross-sectional dilakukan pada seluruh 118 pekerja pembersih ikan dengan menggunakan teknik total sampling. Data dikumpulkan melalui kuesioner terstruktur, lembar observasi, dan wawancara. Analisis univariat digunakan untuk menggambarkan karakteristik responden, sedangkan hubungan bivariat dianalisis menggunakan uji chi-square dan faktor determinan independen dianalisis menggunakan regresi logistik berganda. Gejala dermatitis kontak iritan ditemukan pada 66,1% responden. Usia, masa kerja, lama kerja harian, pengetahuan, penggunaan alat pelindung diri (APD), dan higiene personal berhubungan secara signifikan dengan gejala dermatitis kontak iritan pada analisis bivariat ($p < 0,05$). Analisis multivariat menunjukkan bahwa usia, masa kerja, pengetahuan, penggunaan APD, dan higiene personal merupakan determinan yang signifikan, dengan pengetahuan sebagai faktor yang dapat dimodifikasi dan paling menonjol. Temuan ini menegaskan perlunya intervensi kesehatan kerja yang berfokus pada edukasi pekerja, penggunaan APD yang tepat, peningkatan higiene personal, serta kondisi tempat kerja yang lebih aman untuk mengurangi penyakit kulit akibat kerja pada pekerja pembersih ikan.

ARTICLE INFO

Keywords

dermatitis; fish cleaning workers; occupational health; personal protective equipment; personal hygiene

Article History

Submit : 23 June 2026

In Review : 05 July 2026

Accepted : 13 August 2026

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INTRODUCTION

Occupational diseases remain a major global public health concern because workers are continuously exposed to physical, chemical, biological, ergonomic, and psychosocial hazards that can impair health and reduce work capacity. The World Health Organization recognizes occupational diseases as health conditions resulting from workplace exposures that adversely affect workers' physiological functions and well-being (WHO, 2021). Globally, more than 2.93 million workers die each year from work-related diseases and occupational accidents, of which approximately 2.6 million deaths are attributable to occupational diseases and around 330,000 to occupational injuries (ILO, 2023). Among occupational health problems, work-related skin diseases are frequently reported, particularly among workers whose activities involve prolonged contact with water, biological materials, detergents, chemicals, or other irritants. Irritant contact dermatitis is therefore an important occupational health problem because repeated exposure may cause persistent skin inflammation, discomfort, reduced work performance, absenteeism, and deterioration in quality of life.

Irritant contact dermatitis is a non-infectious inflammatory skin condition caused by direct damage to the epidermal barrier following exposure to irritating substances. Clinically, it may manifest as erythema, itching, burning, dryness, scaling, fissures, or other inflammatory skin symptoms (Meilanda et al., 2022). The condition develops without requiring microbial infection or prior immune sensitization. Damage to the skin barrier activates innate immune responses and local inflammatory pathways, leading to irritation and epidermal dysfunction (Made et al., 2021). Patel and Nixon (2022) further explained that irritant contact dermatitis is characterized by keratin damage, disruption of epidermal lipids, and cellular stress resulting from repeated or excessive irritant exposure. In Indonesia, contact dermatitis represents a substantial proportion of reported skin disease, with irritant contact dermatitis accounting for a larger proportion than allergic contact dermatitis (Ministry of Health, 2021). The burden of skin disorders has also been reported to be high in South Sulawesi, indicating the continuing relevance of occupational skin disease prevention in the region (Risesdas, 2021; Health Office, 2022).

Fish cleaning workers constitute an occupational group potentially vulnerable to irritant contact dermatitis because their daily activities involve frequent wet work, repeated contact with fish, scales, mucus, blood, contaminated water, cleaning agents, and moist working environments. Repeated exposure may compromise the skin barrier, particularly when personal hygiene is inadequate or personal protective equipment is not consistently used. Previous studies have demonstrated that age, duration of work, personal hygiene, employment characteristics, and protective practices may be associated with dermatitis among fish workers and traders (Yanti & Allo, 2022; Sirait & Siregar, 2021). Consequently, prevention requires an occupational health approach that combines improvement of personal hygiene, consistent use of appropriate personal protective equipment, environmental sanitation, exposure reduction, worker education, and early recognition of skin symptoms. These measures are particularly important in traditional fish markets, where informal employment conditions may limit access to structured occupational health protection.

Personal hygiene is one of the principal modifiable factors associated with the prevention of irritant contact dermatitis. Appropriate hygiene practices include washing hands and feet with soap and running water, cleaning interdigital areas, changing contaminated clothing, and bathing after work activities (Alfat et al., 2020; Pane et al., 2022). Yanti and Allo (2022) reported that personal hygiene, age, and working hours were associated with dermatitis among fish traders, emphasizing the importance of regular cleaning practices after occupational exposure. Similarly, Amanah (2022) identified a significant relationship between personal sanitation and contact dermatitis among fishermen in Pontap Village, Palopo City ($p = 0.009$). These findings suggest that behavioral interventions targeting hygiene practices may reduce repeated skin exposure to irritants and potentially decrease dermatitis symptoms among workers in fisheries-related occupations.

In addition to personal hygiene, the use of personal protective equipment represents an important preventive strategy. Gloves, protective clothing, and waterproof boots can reduce direct contact between the skin and potential irritants when appropriately selected and consistently used. Sirait and Siregar (2021) found significant relationships between dermatitis and several occupational

and individual factors, including length of employment, personal protective equipment use, work history, personal hygiene, previous skin diseases, and allergy history among fish traders in a traditional market. These findings indicate that irritant contact dermatitis is likely influenced by multiple interacting determinants rather than a single exposure. Therefore, occupational health interventions should integrate worker behavior, environmental sanitation, availability and proper use of protective equipment, and periodic health monitoring.

Despite the available evidence, studies specifically examining determinants of irritant contact dermatitis symptoms among fish cleaning workers remain limited, particularly in the context of fish auction sites in Makassar City. Preliminary observations conducted on June 27, 2025, at the Paotere Fish Auction Site identified poor environmental sanitation, including accumulated waste and drainage channels obstructed by fish residues. Approximately 118 fish cleaning workers were also observed to have suboptimal personal hygiene practices and infrequent use of protective equipment such as gloves, protective clothing, and waterproof boots. These conditions indicate potential continuous exposure to occupational irritants and highlight the need for targeted preventive interventions.

The novelty of this study lies in assessing multiple determinants of irritant contact dermatitis symptoms within a specific high-exposure occupational group at the Paotere Fish Auction Site. By identifying modifiable factors associated with dermatitis symptoms, the findings are expected to support practical occupational health interventions, including improved hygiene behavior, appropriate use of personal protective equipment, workplace sanitation, and worker education. Accordingly, this study aimed to examine the variables associated with symptoms of irritant contact dermatitis among fish cleaning workers at the Paotere Fish Auction Site in Makassar City.

METHODS

Study Design and Setting

This study employed a quantitative observational-analytic design with a cross-sectional approach to identify factors associated with symptoms of irritant contact dermatitis among fish cleaning workers. The study was conducted in December 2025 at the Paotere Fish Auction Site (*Tempat Pelelangan Ikan* [TPI] Paotere), Makassar City, South Sulawesi, Indonesia. The cross-sectional design enabled simultaneous measurement of irritant contact dermatitis symptoms and potential individual, occupational, and behavioral determinants.

Population, Sample, and Sampling Technique

The study population consisted of all fish cleaning workers operating at TPI Paotere during the study period. A total sampling or census technique was applied, whereby all members of the accessible population were included as research participants. The final sample consisted of 118 fish cleaning workers.

The dependent variable was the presence of symptoms of irritant contact dermatitis. The independent variables included age, working period, daily working duration, knowledge, use of personal protective equipment (PPE), and personal hygiene. These variables were selected because they represent individual, occupational, and behavioral characteristics potentially associated with repeated exposure to irritants during fish cleaning activities.

Research Instruments and Data Collection

Primary data were collected using structured questionnaires, interview guidelines, and observation sheets. The questionnaire was used to obtain information regarding respondent characteristics, occupational history, working duration, knowledge related to occupational skin disease, PPE use, personal hygiene, and symptoms of irritant contact dermatitis. Interviews were conducted to support completion of questionnaire data, while observation sheets were used to assess relevant workplace practices and respondents' observable occupational conditions.

The materials and equipment used during data collection included questionnaire forms, observation sheets, stationery for recording responses and observations, a camera for study documentation, and a laptop equipped with statistical data-processing software for data entry and

analysis. Data collection was carried out directly at TPI Paotere. Respondents were interviewed using the prepared questionnaire, followed by observations of conditions relevant to occupational exposure, personal hygiene, and PPE use. Completed questionnaires and observation sheets were reviewed for completeness before data processing.

Data Processing and Statistical Analysis

Data processing consisted of checking questionnaire completeness, coding responses, data entry, cleaning, and tabulation. Statistical analysis was conducted in three stages. First, univariate analysis was used to describe respondent characteristics and the distribution of each study variable. Categorical variables were summarized using frequencies and percentages and presented in frequency distribution tables.

Second, bivariate analysis was conducted using the chi-square test to examine associations between each independent variable and irritant contact dermatitis symptoms. Variables evaluated included age, working period, daily working duration, knowledge, PPE use, and personal hygiene. Statistical significance was established at $p < 0.05$. Crude odds ratios and 95% confidence intervals were calculated to estimate the magnitude and direction of associations.

Third, variables considered relevant to the multivariable model were analyzed using multiple logistic regression to determine independent determinants of irritant contact dermatitis symptoms after adjustment for other variables. Adjusted odds ratios, 95% confidence intervals, and corresponding p -values were reported. This analysis was also used to identify the most prominent modifiable determinant associated with irritant contact dermatitis symptoms.

Data Presentation

Study findings were presented in narrative form and statistical tables. Frequency distribution tables described respondent characteristics and study variables, while cross-tabulation tables summarized bivariate associations. The final multiple logistic regression model was presented to identify independent determinants of irritant contact dermatitis symptoms among fish cleaning workers at TPI Paotere, Makassar City.

RESULTS AND DISCUSSION

Prevalence of Irritant Contact Dermatitis Symptoms and Worker Characteristics

The findings indicate that symptoms of irritant contact dermatitis were common among fish cleaning workers at the Paotere Fish Auction Site in Makassar. Of the 118 respondents, 78 workers (66.1%) experienced symptoms of irritant contact dermatitis, whereas 40 (33.9%) reported no symptoms. This finding answers the principal research question by demonstrating that occupational skin symptoms represent a substantial health problem among fish cleaning workers and that several individual, occupational, and behavioral characteristics are associated with their occurrence. Most respondents were aged ≥ 35 years (66.9%), had worked for ≥ 11 years (54.2%), had low knowledge regarding occupational health and dermatitis prevention (67.8%), did not use personal protective equipment (88.1%), and had poor personal hygiene (67.8%). These characteristics suggest that a substantial proportion of workers experience repeated occupational exposure under conditions that may increase susceptibility to skin irritation (see [Table 1](#)).

The high proportion of workers reporting symptoms is occupationally plausible because fish cleaning involves repeated wet work and direct contact with water, fish mucus, scales, biological residues, and a persistently damp working environment. Such exposure may disrupt the normal epidermal barrier, particularly when it occurs repeatedly over several years. The predominance of workers who did not use PPE and those with poor personal hygiene further indicates important opportunities for preventive intervention. These findings are especially relevant because irritant contact dermatitis is not caused by a single exposure alone; rather, repeated low-level irritation can gradually impair the skin barrier and produce inflammation.

Table 1
Distribution of Frequencies in Fish Cleaning Workers

Variable	n= 118	%
Irritant Contact Dermatitis		
There are symptoms	78	66.1
No Symptoms	40	33.9
Age		
≥ 35 years old	79	66.9
< 35 years	39	33.1
Tenure		
≥ 11 Years	64	54.2
< 11 Years	54	45.8
Length of Work		
> 7 Hours/Day	49	58.5
≤ 7 Hours/Day	69	41.5
Knowledge		
Low	80	67.8
Height	38	32.2
Personal Protective Equipment		
Not Using	104	88.1
Using	14	11.9
Personal Hygiene		
Bad	80	67.8
Good	38	32.2

Table 2 showed a significant association between age and symptoms of irritant contact dermatitis ($p=0.001$). Older workers were more likely to experience symptoms than younger workers. Physiological aging may contribute to this relationship through reduced epidermal regeneration, alterations in lipid composition, decreased skin hydration, and progressive weakening of barrier function. These changes can make the skin less resistant to repeated exposure to water and irritant materials (Wahyuni, 2023). The finding is consistent with Yanti and Allo (2022), who also reported a significant relationship between age and dermatitis among workers in fish-related occupations. In the present analysis, the odds ratio below one reflects the direction of the reference-category coding; substantively, the observed distribution indicates that younger age functioned as a protective condition relative to older age.

Table 2
Bivariate Analysis of Factors Associated with Irritant Contact Dermatitis Symptoms in Fish Cleaning Employees

Variable	Yes (n=78)	%	No (n=40)	%	OR Crude (95% CI)	P-Value
Age						
≥ 35 years old	77	83.7	15	16.3	0.008	0.001
< 35 Years	1	3.8	25	96.2	(0.001-0.062)	
Tenure						
≥ 11 Years	59	92.2	5	7.8	0.046	0.001
< 11 Years	19	35.2	35	64.8	(0.016-0.134)	
Length of Work						
> 7 Hours/Day	41	83.7	8	16.3	4,432	0.000
≤ 7 Hours/Day	37	53.6	32	46.4	(1.814-10.828)	
Knowledge						
Low	62	77.5	18	22.5	4,736	0.000
Height	16	42.1	22	57.9	(2.064-10.869)	
Personal Protective Equipment						
Not Using	74	71.2	30	28.8	0.162	0.004
Using	4	28.6	10	71.4	(0.047-0.557)	
Personal Hygiene						
Bad	64	80	16	20	0.146	0.001
Good	14	36.8	24	63.2	(0.062-0.344)	

Working period was also significantly associated with irritant contact dermatitis symptoms ($p=0.001$). Among workers with ≥ 11 years of employment, 92.2% experienced symptoms. This finding supports the cumulative-exposure concept, in which repeated contact with irritants over many years gradually contributes to skin-barrier damage. Efendi et al. (2023) similarly emphasized that long-term occupational exposure increases cumulative irritation. These findings are also consistent with Pane et al. (2022) and Karnefi et al. (2022), who reported that longer employment duration was associated with an increased likelihood of occupational dermatitis. Workers who have cleaned fish for many years are repeatedly exposed to water, fish mucus, organic materials, and humid environmental conditions, making cumulative skin damage biologically plausible.

Daily working duration was significant in the bivariate analysis ($p=0.001$). Workers performing their activities for more than seven hours per day had higher odds of reporting symptoms than those working seven hours or less (crude OR=4.432; 95% CI: 1.814–10.828). However, working duration did not remain significant in the final multivariable model. This suggests that the apparent effect of daily working hours may be explained partly by other variables, including cumulative working period, knowledge, PPE use, and personal hygiene. Previous studies have similarly indicated that dermatitis risk is not determined solely by the number of hours worked but also by the frequency, intensity, and conditions of exposure (Rianingrum et al., 2022; Hafid et al., 2022). Repeated wet work and prolonged exposure to humid environments remain important mechanisms of skin-barrier impairment (Suryani & Shofwati, 2023; Schütte et al., 2023).

These results demonstrate that occupational exposure should be considered cumulatively rather than solely on a daily basis. The persistence of age and working period in the multivariable model indicates that long-term characteristics may better explain symptom occurrence than working hours alone. Practically, workers with long employment histories and older workers should be considered priority groups for periodic skin examination and preventive occupational-health programs. Interventions could include scheduled rest from wet work, skin-protection education, access to suitable gloves and protective footwear, and early referral for persistent dermatitis symptoms.

Knowledge, PPE Use, and Personal Hygiene

Knowledge was significantly associated with irritant contact dermatitis symptoms in both bivariate and multivariable analyses. Among workers with low knowledge, 77.5% experienced symptoms compared with 42.1% among those with higher knowledge. In bivariate analysis, workers with low knowledge had approximately 4.7 times the odds of symptoms (OR=4.736; 95% CI: 2.064–10.869). After adjustment for other variables, knowledge remained strongly associated with symptoms (adjusted OR=6.808; 95% CI: 1.655–28.008; $p=0.008$), making it the strongest positively associated modifiable factor in the final model.

Workers with limited occupational-health knowledge may not fully recognize irritant hazards, early dermatitis symptoms, correct hygiene procedures, or the importance of consistently using appropriate PPE. Similar relationships have been reported by Siregar et al. (2022) and Hayati et al. (2022), who emphasized the influence of knowledge on occupational dermatitis prevention. Fajriyani (2019) also reported that insufficient knowledge can contribute to inadequate preventive behavior and increase vulnerability to occupational disease. The present findings extend this evidence to fish cleaning workers, for whom routine contact with water and biological materials makes practical knowledge particularly important.

PPE use was significantly associated with symptoms ($p=0.004$ in bivariate analysis and $p=0.049$ after adjustment). Only 11.9% of workers reported using PPE, illustrating a substantial gap in occupational protection. Workers using PPE showed lower odds of symptoms in the multivariable analysis (OR=0.140; 95% CI: 0.020–0.999), suggesting a protective effect. PPE may reduce direct contact between the skin and potential irritants, particularly when gloves, waterproof boots, and protective clothing are appropriate for wet fish-processing activities (Anggrain & Utami, 2022). This finding is consistent with Meilanda et al. (2022). However, other studies have reported no significant association when PPE was unsuitable, poor in quality, or inconsistently used (Rasyid et al., 2023;

Alayyannur et al., 2024). Thus, providing PPE alone may be insufficient without ensuring appropriate selection, availability, correct use, and replacement.

Personal hygiene also showed a significant relationship with irritant contact dermatitis symptoms. Among workers with poor hygiene, 80.0% reported symptoms, compared with 36.8% among those with good hygiene. Personal hygiene remained significant in multivariable analysis (OR=0.225; 95% CI: 0.053–0.958; $p=0.044$), indicating that good hygiene practices were associated with lower odds of symptoms. Appropriate hygiene can reduce the duration for which irritants remain in contact with the skin. Practices such as washing hands and feet with clean running water, adequately cleaning interdigital spaces, changing contaminated clothing, and bathing after work may therefore contribute to prevention (Pane et al., 2022; Yanti & Allo, 2022).

The present study reinforces previous findings that occupational dermatitis among fisheries-related workers is multifactorial. The significant relationships involving knowledge, PPE use, and personal hygiene indicate that behavioral and preventive factors remain important even after individual and occupational characteristics are considered. This provides an important advantage over assessments focusing only on demographic characteristics because several identified determinants are modifiable through occupational-health intervention.

The strong relationship between knowledge and symptoms deserves particular attention. In contrast to age and cumulative working period, which cannot be modified, knowledge can be improved through structured education. Increasing workers' understanding of irritant exposure, appropriate skin care, early symptoms, correct PPE use, and hygiene procedures may influence multiple risk pathways simultaneously. Knowledge therefore represents not merely an informational factor but a potential upstream determinant of safer occupational behavior.

The findings support a combined intervention strategy rather than a single preventive measure. Occupational-health education should be accompanied by adequate PPE, practical demonstrations of correct glove and boot use, availability of clean water and washing facilities, improved waste disposal and drainage, and routine supervision of hygiene practices. Interventions should prioritize workers with long employment periods and older workers because these groups may have greater cumulative susceptibility to irritant exposure.

Final Multivariable Model

Table 3 show that multiple logistic regression identified age, working period, knowledge, PPE use, and personal hygiene as variables independently associated with irritant contact dermatitis symptoms. Age remained significant ($p=0.001$), as did working period ($p=0.002$), knowledge ($p=0.008$), PPE use ($p=0.049$), and personal hygiene ($p=0.044$). Daily working duration did not remain in the final model, indicating that its bivariate association was attenuated after adjustment for other determinants.

Among the variables retained, knowledge showed the largest positive adjusted odds ratio (OR=6.808), indicating that insufficient knowledge was the dominant modifiable factor associated with symptoms. PPE use and good personal hygiene showed protective directions of association, while age and working period reflected the importance of cumulative susceptibility and exposure.

Table 3
Final Multivariate Analysis Model of Multiple Logistic Regression Test

Variabel	B	Forest	Sig	OR CI 95%
Age	4,260	11,286	0.001	0.014 (0.001-0.170)
Tenure	2,247	9,844	0.002	0.106 (0.026-0.430)
Knowledge	1,918	7,064	0.008	6.808 (1.655-28.008)
Use of PPE	1,964	3,875	0.049	0.140 (0.020-0.9992)
Personal Hygiene	1,493	4,070	0.044	0.225(0.053-0.958)

These results demonstrate that irritant contact dermatitis symptoms among fish cleaning workers cannot be explained by occupational exposure alone. Rather, individual vulnerability, cumulative work exposure, knowledge, PPE use, and hygiene behavior interact to shape risk. This finding expands the existing literature by identifying both non-modifiable and modifiable determinants within the specific setting of a traditional fish auction site. The persistence of knowledge, PPE, and personal hygiene in the adjusted model is particularly important because these factors can be addressed directly through workplace interventions. Unlike age or accumulated years of employment, they provide actionable targets for occupational-health programs.

The findings indicate that prevention at the Paotere Fish Auction Site should prioritize improvement of occupational-health knowledge, consistent use of suitable PPE, and personal hygiene practices. Educational interventions should explain the mechanisms and early symptoms of irritant contact dermatitis, demonstrate appropriate skin-protection practices, and emphasize that prolonged wet work can damage the skin even when symptoms initially appear mild. Employers, market managers, and local health authorities should also improve access to clean washing facilities, drainage, waste management, gloves, boots, and protective clothing.

Periodic skin-health screening should be considered, particularly for older workers and those with long employment histories. Because the study examined associations at one point in time, causal relationships cannot be established; nevertheless, the consistency of the findings with previous research supports preventive action. Overall, the study achieved its objective by identifying age, working period, knowledge, PPE use, and personal hygiene as important determinants of irritant contact dermatitis symptoms, with knowledge emerging as the most prominent modifiable factor. These findings provide a practical basis for targeted occupational-health interventions to reduce skin disease risk and improve the health and working capacity of fish cleaning workers at the Paotere Fish Auction Site.

CONCLUSION

This study demonstrated that irritant contact dermatitis symptoms among fish cleaning workers at the Paotere Fish Auction Site were influenced by individual, occupational, and behavioral factors. Age, working period, knowledge, use of personal protective equipment (PPE), and personal hygiene were significantly associated with symptoms, with knowledge emerging as the most prominent modifiable determinant. Although longer working duration may contribute to cumulative exposure, dermatitis risk was also strongly influenced by exposure intensity and preventive behavior. PPE use showed a protective effect by reducing direct skin contact with irritants. These findings confirm that the study objective was achieved and provide a basis for targeted occupational health interventions. Prevention should prioritize health education, practical training on irritant hazards, consistent use of appropriate and comfortable PPE, improved personal hygiene, and safer workplace sanitation. Future studies should further examine specific irritant exposures, behavioral determinants, and the effectiveness of workplace-based intervention programs for preventing irritant contact dermatitis.

ACKNOWLEDGMENT

The authors gratefully acknowledge the management and fish cleaning workers at the Paotere Fish Auction Site (TPI Paotere), Makassar City, for their cooperation and participation during the data collection process. The authors also appreciate all individuals who provided support and assistance throughout the implementation of this study.

FUNDING

The author(s) reported there is no funding associated with the work featured in this article

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AUTHORS' CONTRIBUTION

Nur Aulia Ananda contributed to data collection, data analysis, and preparation of the original manuscript. Irviani Anwar Ibrahim conceptualized and supervised the study, contributed to the methodological design, and critically reviewed and revised the manuscript. Ranti Ekasari contributed to data interpretation and manuscript review. Habibi contributed to the methodological development and critical revision of the manuscript. All authors read and approved the final version of the manuscript.

COMPETING INTEREST

The author(s) declare no potential conflict of interest with respect to the research, authorship, or publication

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