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Environmental Household Factors and Individual Hygiene Behaviors Associated with Self-Reported Water-Based Skin Diseases in the Coastal Area of Barane Beach, Majene Regency

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ABSTRACT

Water-based skin diseases remain an environmental health concern in coastal areas, particularly among communities with limited access to clean water and basic sanitation facilities. Coastal environmental conditions and hygiene practices may contribute to vulnerability to skin health problems. This study aimed to analyze household environmental factors and individual hygiene behaviors associated with the prevalence of self-reported water-based skin diseases in the coastal area of Barane Beach, East Banggae District, Majene Regency. This quantitative observational study employed a cross-sectional design involving 122 household heads. Data were collected from May to July 2026 through structured interviews and direct observation. The outcome variable was defined as the self-reported presence of water-based skin diseases, categorized as present or absent. Data analysis included descriptive analysis, chi-square tests, and multiple logistic regression. The prevalence of self-reported water-based skin diseases was 49.2% (n=60). Multivariable analysis identified household ventilation, observed physical characteristics of household water sources, and handwashing with soap behavior as variables statistically associated with self-reported water-based skin diseases. Housing density showed a tendency toward higher odds but was not statistically significant (aOR=3.10; 95% CI: 0.98–9.80; p=0.054). This study concludes that self-reported water-based skin diseases are associated with household environmental conditions and hygiene behaviors. The findings contribute empirical evidence for integrated environmental health strategies addressing skin health challenges in coastal communities.

Keywords: Coastal communities; Household environmental factors; Hygiene behaviors; Sanitation; Water-based skin disease

INTRODUCTION

Skin disease is one of the major health problems faced by communities in various developing countries, especially in areas with high population density and inadequate sanitation (El Banna et al., 2025). The World Health Organization (WHO) estimates that skin diseases can affect the quality of life for millions of people worldwide, ranging from physical to psychological disorders. In coastal regions, this problem becomes increasingly complex due to intense human interaction with the marine environment, as well as humidity that tends to be higher than in inland areas (Singh & Schikowski, 2023; Zieneldien et al., 2025).

Water-based skin diseases, also often referred to as skin diseases related to water contact, include various conditions such as tinea pedis, contact dermatitis, and other bacterial infections that spread easily under humid conditions (Sinha & Yeasmin, 2025). The coastal area of Barane Beach in Majene Regency is one such region whose environmental characteristics may favor the occurrence of skin diseases. High air humidity, potential environmental vulnerability of household water sources, and community habits of frequent direct contact with seawater or other surface water are environmental conditions potentially associated with disease occurrence (Babuji et al., 2023; Jiang et al., 2025; Liao, 2026).

Coastal areas are complex and dynamic ecosystems, often serving as centers of socio-economic activity, yet they also harbor significant ecological vulnerabilities, particularly related to environmental health issues (Wu et al., 2023). One of the crucial issues in these areas is the availability and accessibility of clean water and adequate basic sanitation. Many coastal communities face serious challenges due to limited clean water infrastructure, which often forces them to rely on surface water sources or shallow dug wells. These water sources are highly susceptible to contamination, both from saline seawater

seepage and unmanaged domestic waste (Covelli et al., 2022; Nilo et al., 2020).

Such environmental conditions may be associated with higher vulnerability to water-based skin diseases. Skin conditions such as scabies and contact dermatitis have been reported to be associated with environmental sanitation conditions and hygiene practices. The prevalence of skin diseases in coastal areas often serves as a direct indicator of environmental quality and public health behaviors (Gusti & Iqbal, 2024; Hamdan et al., 2025; Juanda et al., 2025).

Majene Regency, with its expansive coastline including the Barane Coastal Area, is one of the regions potentially facing these environmental health issues. Household environments in coastal areas, such as high humidity, inadequate ventilation, and the proximity between water sources and sanitation facilities (e.g., septic tanks), may be associated with the occurrence of skin diseases. In addition, personal hygiene behaviors including bathing habits, methods of water usage for daily needs, and handwashing practices may be associated with differences in exposure patterns related to water-based skin diseases.

Although water-based skin diseases have become a concern in the context of environmental health in coastal areas, literature explicitly examining the interaction between household environmental factors (such as internal home humidity, ventilation, access to clean water, and distance between water sources and sanitation facilities) and personal hygiene behaviors within coastal populations remains very limited (Chandio et al., 2026; Ramdhani et al., 2022). Specifically, the critical research gap in this study is the lack of comprehensive studies that integrate micro household environmental variables with personal hygiene practices associated with the prevalence of water-based skin diseases in developing coastal areas such as Majene Regency.

Currently, much research on skin diseases in coastal areas tends to focus on epidemiological prevalence or solely on physical environmental factors, without delving deeper into how individual behaviors—such as frequency of bathing, use of water for household needs, handwashing habits, or methods of water management within the home—serve as modulators in exposure to environmental health risks (Hamdan et al., 2025; Juanda et al., 2025). In fact, the interaction between a vulnerable household environmental context and suboptimal hygiene practices may be related to environmental conditions potentially associated with skin infection occurrence. In areas such as the Barane Coastal Area, where natural conditions like high humidity and limited access to clean water are daily realities, it is important to investigate how communities respond to these factors through their daily behaviors.

In addition, literature that integrates eco-environmental and behavioral approaches in the context of Indonesia's coastal regions, especially in West Sulawesi, remains scarce. Previous studies (Gusti & Iqbal, 2024; Juanda et al., 2025) have revealed links between water pollution, poor sanitation, and the prevalence of self-reported skin diseases, yet have not examined in depth the role of behavior-based prevention strategies integrated with the micro-environmental conditions of the home. This creates an important research gap regarding how household environmental conditions and individual hygiene behaviors are simultaneously associated with self-reported water-based skin diseases in coastal communities.

Unlike previous studies that have primarily examined coastal skin diseases through isolated dimensions, such as disease prevalence, water contamination, or individual hygiene practices, this study advances existing evidence by simultaneously assessing objectively observed household environmental conditions and individual hygiene behaviors within a single analytical framework. The novelty of this study lies in integrating micro-level household environmental indicators, including ventilation conditions and observed physical characteristics of household water sources, with personal hygiene behaviors to examine their association with self-reported water-based skin diseases. This integrated approach provides a contextual understanding of the relationship between household environmental vulnerability and daily health practices within coastal communities, particularly in developing regions where environmental health challenges remain insufficiently documented. Furthermore, this study contributes empirical evidence from Barane Beach, Majene Regency, West Sulawesi, an underrepresented coastal setting in environmental health research. By focusing on household-level environmental and behavioral factors simultaneously, this study extends previous evidence and provides context-specific insights into self-reported skin disease patterns in coastal communities.

Therefore, this study aims to investigate how household environmental factors and personal hygiene behaviors, both collectively and individually, are associated with water-related skin disease prevalence in the Barane Coastal Area, Majene Regency. This research seeks to address that gap through an integrative approach, contributing both academically and practically to the design of contextually grounded public health interventions. The urgency of this study lies in providing evidence-based empirical data to support the formulation of adaptive and proactive public health policies in coastal areas, in line with the Sustainable Development Goals (SDGs), particularly the goals related to clean water and sanitation and to good health and well-being.

METHODS

Study Design

This study employed a quantitative observational design with a cross-sectional approach. This design was chosen to measure the independent variables (household environmental factors and personal hygiene behaviors) as well as the dependent variable (the presence of self-reported water-based skin diseases) simultaneously at a single point in time. Data collection was conducted from

May to July 2026 following approval from the Research Ethics Committee.

Location and Setting

The study was conducted in the coastal area of Barane Beach, East Banggae District, Majene Regency, West Sulawesi. The selection of this location was based on the coastal area's characteristics, which are vulnerable to basic sanitation issues and limited clean water availability due to seawater intrusion, as well as densely populated settlements that are associated with higher vulnerability to reported skin diseases.

Variable Study and Data Collection

This study examined the dependent variable in the form of self-reported presence of water-based skin diseases (binary: present or absent). Water-related skin diseases include conditions generally associated with water exposure and poor environmental sanitation, such as scabies and contact dermatitis. Cases were identified based on respondents' reports regarding the symptoms they experienced or their history of such skin conditions during the study period through structured interviews. Outcome measurements were based on the respondents' reported disease history, not on clinical diagnosis by healthcare professionals. Therefore, these results reflect the prevalence of self-reported water-based skin diseases in the study population and should be interpreted as self-reported health outcomes.

Operational Definition of Variables

The operational definitions of environmental sanitation, housing conditions, and personal hygiene variables were established based on applicable national environmental health standards. Housing ventilation was categorized as meeting the standard when the ventilation area was ≥10% of the total floor area of the house, while values <10% were categorized as not meeting the standard. Indoor lighting was categorized as adequate when the lighting intensity was ≥60 lux, whereas values below this threshold were classified as inadequate. Indoor humidity was considered acceptable when relative humidity ranged from 40–60%, while values outside this range were categorized as not meeting the standard.

Housing density was assessed based on the ratio between residential floor area and the number of occupants. A density of ≥8 m² per person was categorized as meeting the standard, whereas <8 m² per person was categorized as not meeting the standard. Observed household water characteristics were assessed based on physical indicators, including color, odor, and turbidity. This assessment was conducted through direct observation of household water sources during data collection. No laboratory examination of chemical or microbiological parameters was performed; therefore, the findings represent observable physical characteristics of household water sources and should not be interpreted as a comprehensive, laboratory-confirmed evaluation of water quality according to national drinking water standards.

Sanitation facilities, including toilet availability, wastewater disposal systems, and waste management, were classified based on their compliance with basic sanitation requirements. Personal hygiene behaviors were assessed using structured interview questions. Handwashing with soap was categorized as adequate when respondents reported washing their hands with soap at critical times, while other hygiene behaviors, including footwear use, towel sharing, bathing practices, and seawater contact, were categorized based on reported exposure frequency and potential health-related behaviors.

Primary data were collected from 122 household heads throughout the Barane coastal area using a combination of face-to-face structured interviews and direct observation checklists. The interviews gathered sociodemographic and hygiene behavior data, while trained field data collectors directly assessed physical housing parameters and sanitation facilities. All collected data underwent verification for completeness and coding before being subjected to bivariate and multivariate logistic regression analysis.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics through three analytical stages. First, descriptive analysis was performed to summarize sociodemographic characteristics, household environmental conditions, personal hygiene behaviors, and the prevalence of self-reported water-based skin diseases using frequencies, percentages, means, and standard deviations where appropriate. Second, bivariate analysis was conducted using Chi-square tests (and independent samples t-tests for continuous age data) to examine the association between each independent variable and the outcome variable. Variables with a bivariate significance level of $p < 0.25$ were selected as candidate variables for multivariable logistic regression analysis. This criterion was applied based on the recommendation of Hosmer et al. (2013), which suggests using a less restrictive significance level during the initial variable selection stage to minimize the exclusion of potentially important confounding variables. Therefore, variables that may have potential confounding effects or meaningful associations but do not reach the conventional significance level were retained for multivariable modelling.

Multicollinearity among independent variables was assessed using the Variance Inflation Factor (VIF). All variables included in the final logistic regression model showed VIF values below 1.1, indicating that no problematic multicollinearity was identified. A VIF threshold below 5 was considered acceptable based on previous methodological recommendations (Hair et al., 2019). Multivariable logistic regression analysis was subsequently performed using a backward elimination procedure based on the Wald statistic. All candidate variables identified from the bivariate analysis were entered into the initial model. Variables with the lowest statistical contribution were sequentially removed until the final multivariable model was obtained.

For the logistic regression analysis, categorical variables were coded using binary dummy coding. The

reference category was defined as the category considered to represent the expected lower exposure or healthier condition. Specifically, for housing density, "Favorable" was used as the reference category and "Unfavorable" was coded as the comparison category. For ventilation, "Favorable" was used as the reference category and "Unfavorable" was coded as the comparison category. For observed physical characteristics of household water sources, "Favorable Physical Characteristics" was used as the reference category and "Unfavorable Physical Characteristics" was coded as the comparison category. For handwashing with soap, "Yes" was used as the reference category and "No" was coded as the comparison category. Odds ratios (OR) and adjusted odds ratios (aOR) were interpreted based on these reference categories, with values >1 indicating higher odds and values <1 indicating lower odds of reported water-based skin diseases compared with the reference group.

Ethical Considerations

This study was conducted in accordance with ethical principles for research involving human participants. Ethical approval was obtained from the Research Ethics Committee of the Institute of Health Sciences prior to data collection (Ethical Approval Number: Rek/124/KEPK IIKP/IV/2026). Before participation, all respondents were provided with information regarding the study objectives, procedures, potential benefits, and their rights as research participants. Written informed consent was obtained from each participant before interviews and household observations were conducted. Participation was voluntary, and respondents were informed that they could withdraw from the study at any time without any consequences. All collected information was kept confidential and used solely for research purposes. Data were anonymized during processing and analysis to protect participants' privacy.

RESULTS AND DISCUSSION

Basic sanitation-related conditions, including observed physical characteristics of household water sources and household sanitation facilities, showed variability among households. Based on direct observation of visible physical indicators, including color, odor, and turbidity, 51.6% of household water sources were categorized as having unfavorable physical characteristics, while 48.4% showed favorable physical characteristics. In addition, latrine conditions remained a concern, as 51.6% of respondents had sanitation facilities that did not meet health standards. The Wastewater Treatment System (SPAL) showed slightly better figures, with 55.7% of households already having an adequate wastewater disposal system.

Table 4. Bivariate Analysis of Environmental Sanitation and Personal Hygiene Factors Associated with Skin Disease

Variable	Category	Case (n=60)	Non-Case (n=62)	OR (95% CI)	p-value
Housing Density	Unfavorable	34	23	1.95 (0.95–4.02)	0.068
	Favorable (ref)	26	39		
Ventilation	Unfavorable	37	6	0.13 (0.05–0.31)	0.001
	Favorable	23	56		
Observed Physical Characteristics of Household Water Sources	Unfavorable	40	6	0.11 (0.04–0.25)	0.001
	Favorable	20	56		
Wastewater disposal (SPAL)	Unfavorable	35	19	1.84 (0.89–3.80)	0.097
	Favorable	25	43		
Wash hands with soap	No	45	14	0.16 (0.07-0.35)	0.001
	Yes	15	48		
Use of Footwear	No	35	33	1.58 (0.77–3.25)	0.209
	Yes	25	29		

Table 1. Characteristics of Respondents in Coastal Communities (N=122)

Characteristics	Category	Frequency (n)	Percentage (%)
Gender	Male	58	47.5
	Female	64	52.5
Age	15–30 years	45	36.9
	31–45 years	38	31.1
	>45 years	39	32.0
Education	Elementary school (SD)	50	41.0
	Junior high school (SMP)	42	34.4
	Senior high school (SMA)	30	24.6
Occupation	Fisherman	55	45.1
	Housewife	40	32.8
	Entrepreneur	27	22.1

Table 1 shows that female respondents (52.5%) slightly outnumbered male respondents. Respondents were fairly evenly distributed across all productive age groups. The largest proportion of respondents (41.0%) had completed only elementary school, indicating that educational attainment in this coastal community remains predominantly low. Nearly half of the respondents (45.1%) worked as fishermen, reflecting a high level of economic dependence on marine resources among the community.

Table 2. Distribution of Household Environmental Characteristics among Respondents

Environmental Variable	Category	Frequency (n)	Percentage (%)
Housing Density	Unfavorable	57	46.7
	Favorable	65	53.3
Ventilation	Unfavorable	43	35.2
	Favorable	79	64.8
Lighting	Unfavorable	71	58.2
	Favorable	51	41.8
Humidity	Unfavorable	62	50.8
	Favorable	60	49.2
Floor type	Unfavorable	58	47.5
	Favorable	64	52.5
Observed Physical Characteristics of Household Water Sources	Unfavorable	63	51.6
	Favorable	59	48.4
Latrine	Unfavorable	63	51.6
	Favorable	59	48.4
Wastewater disposal (SPAL)	Unfavorable	54	44.3
	Favorable	68	55.7
Waste management	Unfavorable	57	46.7
	Favorable	65	53.3

Unfavorable waste management was still found in 46.7% of households, which may serve as a breeding ground for disease vectors and a source of environmental pollution in the surrounding area.

Table 3. Distribution of Personal Hygiene Practices among Respondents

Behavioral Variable	Category	Frequency (n)	Percentage (%)
Handwashing with Soap	No	59	48.4
	Yes	63	51.6
Use of Bath Soap	No	61	50
	Yes	61	50
Sharing Towels	Yes	60	49.2
	No	62	50.8
Use of Footwear	No	68	55.7
	Yes	54	44.3
Seawater Contact	High	65	53.3
	Low	57	46.7

This study found that the prevalence of self-reported water-based skin diseases was significantly associated with several household environmental conditions and individual hygiene behaviors. These findings are consistent with environmental epidemiology theory, which states that the interaction between environmental exposure, host susceptibility, and behavioral factors is associated with the occurrence of disease. In the multivariable analysis, household ventilation showed the lowest adjusted odds ratio among the statistically significant factors (aOR = 0.017). Household ventilation was statistically associated with self-reported water-based skin diseases, which may reflect differences in household environmental conditions.

Table 5. Multivariable Logistic Regression Analysis of Factors Associated with Skin Disease Occurrence

Variable	Category	Adjusted Odds Ratio (aOR) (95% CI)	p-value
Housing Density	Unfavorable	3.10 (0.98–9.80)	0.054
	Favorable (ref)	1.00	
Ventilation	Unfavorable	0.017 (0.003–0.110)	<0.001
	Favorable (ref)	1.00	
Observed Physical Characteristics of Household Water Sources	Unfavorable	0.034 (0.007–0.170)	<0.001
	Favorable (ref)	1.00	
Handwashing with Soap	No	0.028 (0.005–0.148)	<0.001
	Yes (ref)	1.00	

Note: Reference category (ref) was defined as the category representing the expected lower exposure or healthier condition. An association was considered statistically significant at $p < 0.05$.

Furthermore, favorable observed physical characteristics of household water sources were associated with lower odds of reported skin diseases. In coastal areas, household water sources may be exposed to various environmental pressures, including seawater intrusion and domestic wastewater influence, particularly in settings with limited sanitation infrastructure. However, this study assessed only observable physical characteristics of household water sources, including color, odor, and turbidity, and did not perform laboratory examinations of chemical or microbiological parameters. Therefore, these findings should be interpreted as associations between observed physical characteristics of household water sources and self-reported skin disease outcomes rather than evidence of confirmed water contamination. Unfavorable observed physical characteristics may reflect environmental conditions potentially associated with skin health risks. Improving household water management practices and access to better-managed water sources may support efforts to improve environmental health conditions (Jones & Harrison, 2025; Saxena et al., 2024).

Although it may seem simple, the practice of Handwashing With Soap (CTPS) emerged as an important associated factor that should not be overlooked. Hands represent an important pathway through which environmental exposures may occur, particularly through contact with environmental agents during daily activities (Afzal, 2019; Alharbi & Alshammari, 2024). Poor hand hygiene may represent a behavioral pattern associated with differences in exposure to environmental contaminants. However, this study cannot establish causal mechanisms. This finding further supports the global campaign for Clean and Healthy Living Behaviors (PHBS), which places CTPS as its main pillar (Divya & Maheswari, 2020).

On the other hand, housing density showed a tendency toward higher odds of self-reported water-based

skin diseases; however, the association did not reach statistical significance (aOR = 3.10; 95% CI: 0.98–9.80; p = 0.054). Therefore, housing density was not considered a confirmed associated factor in the final model and should be interpreted as a possible contextual association requiring further investigation (Adhikari et al., 2021; Çal & Ciravoğlu, 2024; Gunko et al., 2025). The observed tendency may be influenced by other contextual factors that were not measured in this study. These factors may include variations in household characteristics, environmental conditions, or other unobserved determinants that could influence the occurrence of water-based skin diseases. Therefore, the housing density finding should be interpreted cautiously as a possible association rather than an established mechanism or confirmed associated factor.

In addition to the physical structure factor, the limited research sample size (n=122) may have contributed to the wide confidence interval and uncertainty of the estimate for housing density. Thus, the result should be interpreted as a possible association rather than a confirmed associated factor. Further studies with larger sample sizes are recommended to clarify the relationship between housing density, building characteristics, and self-reported skin disease occurrence.

Overall, the findings of this study provide a comprehensive understanding of the factors associated with self-reported water-based skin diseases in coastal communities. The results suggest that improving household environmental sanitation, strengthening hygiene education, and promoting appropriate water management practices may support efforts to reduce environmental health risks. However, these findings should be interpreted considering several methodological limitations. First, the cross-sectional design limits the ability to establish causal relationships between household environmental factors, hygiene behaviors, and self-reported skin diseases. Second, the outcome measurement was based on respondents' reported disease history rather than clinical examination, which may introduce recall bias and misclassification bias due to differences in respondents' ability to recognize and report symptoms. Third, the relatively small sample size (n=122) and the inclusion of a single coastal location may limit the generalizability of the findings to other coastal populations. Furthermore, although household water characteristics were assessed through observable physical indicators, laboratory examinations of chemical and microbiological parameters were not conducted. Therefore, future studies incorporating clinical assessments, laboratory-based water quality analyses, and longitudinal research designs are recommended to strengthen evidence regarding environmental and behavioral factors associated with water-based skin disease occurrence.

CONCLUSIONS

This study highlights that water-based skin diseases in coastal communities are associated with the interaction between household environmental conditions and personal hygiene behaviors. The findings contribute to a broader understanding of environmental health risks in coastal settings by demonstrating the importance of considering both household-level environmental conditions and individual hygiene practices within an integrated framework. From a practical perspective, these findings emphasize the need for context-specific environmental health strategies that address household conditions, water management practices, and hygiene behaviors to support skin health protection and strengthen community-based interventions in coastal populations facing similar sanitation challenges.

SUGGESTION

The Regional Government, through the Health Office and local Puskesmas, is expected to strengthen community-based environmental health policies in the Barane Beach coastal area. Strategic steps may include increasing education on Clean and Healthy Living Behavior (PHBS), with a primary focus on fostering the habit of Handwashing with Soap (CTPS) among residents who routinely engage in activities in aquatic environments. In addition, the government may consider strengthening household water management practices and providing technical guidance on the implementation of cross-ventilation systems to improve indoor environmental conditions related to household ventilation.

For future research, it is recommended to conduct follow-up studies using prospective or experimental designs with larger sample sizes to clarify the relationship between housing density, building characteristics, and self-reported skin disease occurrence. Future studies are also recommended to incorporate laboratory-based assessments of household water quality, including physical, chemical, and microbiological parameters, to strengthen empirical evidence regarding environmental and behavioral factors associated with skin disease occurrence.

DECLARATIONS

Ethics Approval and Consent to Participate

This study was approved by the Research Ethics Committee of the Institute of Health Sciences (Ethical Approval Number: Rek/124/KEPK IIKP/IV/2026). Written informed consent was obtained from all participants before data collection.

Consent for Publication

Not applicable. This article does not contain any individual person's identifiable data.

Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Author Contributions

AR: conceptualization, methodology, formal analysis, and writing – original draft; W: investigation, data curation, and writing – review and editing; NASR: formal analysis, validation, and writing – review and editing. All authors read and approved the final manuscript.

Artificial Intelligence (AI) Usage Statement

During the preparation of this manuscript, the authors used an AI-assisted tool solely to improve language and readability. No AI tool was used to generate data, perform statistical analyses, or interpret the findings. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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