Journal of Shifa Sciences and Clinical Research (JSSCR)
Volume 7 Number 2, 2025
Journal Homepage: http://ejurnal.ung.ac.id/index.php/jsscr, E-ISSN: 2656-9612 P-ISSN:2656-8187
DOI : https://doi.org/10.37311/jsscr.v7i2.33454

Prevalence and Environmental Risk Factors of Dermatitis in Gorontalo Class IIA Correctional Facility, Indonesia

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ABSTRACT

Dermatitis is a common inflammatory skin disorder in correctional settings, often linked to poor environmental conditions. This cross-sectional study aimed to investigate the prevalence of dermatitis and its association with housing density, room temperature, and physical water quality among inmates at Gorontalo Class IIA Correctional Facility, Indonesia. A total of 168 inmates were selected through simple random sampling. Data on environmental conditions were collected using validated instruments, and dermatitis diagnoses were confirmed through clinical examination. The results showed that 91 inmates (54.2%) had dermatitis. Statistical analysis using the Chi-Square and Fisher's Exact tests revealed significant associations between dermatitis and both housing density and room temperature (p = 0.008), while physical water quality was not significantly associated (p = 0.958). These findings highlight that overcrowded living conditions and elevated indoor temperatures contribute significantly to the incidence of dermatitis in prison environments. Improving ventilation systems, regulating room occupancy, and enhancing hygiene promotion are recommended to reduce the risk of dermatitis in correctional facilities.

Keywords:
Dermatitis; Environmental Risk Factors; Housing Density; Room Temperature; Water Quality

Received:	***Accepted:***	***Online:***
2025-05-17	*2025-07-19*	*2025-07-25*

1. Introduction

Skin health problems are a significant public health issue, particularly in environments with poor sanitation and overcrowding. Skin diseases are defined as pathological conditions affecting the structure and function of the skin, with etiologies ranging from hereditary, inflammatory, neoplastic (both benign and malignant), hormonal, traumatic, and degenerative causes [1]. Emotional stress may also exacerbate dermatological conditions, and the skin often responds differently from other tissues. For example, severe inflammation of the skin can lead to systemic complications, such as anemia, impaired blood circulation, difficulty regulating body temperature, and electrolyte imbalances [2].

The skin is highly vulnerable to infectious and non-infectious diseases, particularly when exposed to unclean environments. Skin can be affected by a wide range of conditions—from mild, itchy rashes to severe, potentially life-threatening diseases [3]. Additionally, the skin often functions as a medium for interpersonal interaction (e.g., shaking hands, physical contact), and thus serves as a potential vector for disease transmission. Infections such as dermatitis can spread through direct skin-to-skin contact or indirect contact via shared personal items such as towels, clothing, or bedding [4].

Dermatitis is a non-contagious inflammatory condition of the skin involving the epidermis and dermis. It results in a variety of skin manifestations, such as erythema, edema, papules, vesicles, scales, and lichenification, often accompanied by itching [5]. Globally, the prevalence of dermatitis in developing countries varies between 20% and 80%, and it remains a major public health concern in Indonesia. In 2017, skin and subcutaneous diseases ranked third among the top ten causes of outpatient visits in Indonesian public hospitals, with 86% of cases related to skin disorders [6].

In correctional institutions, the health conditions of inmates are influenced by both individual factors and environmental factors, including overcrowding, room ventilation, and access to clean water. As part of broader society, inmates are entitled to proper sanitation and health services [7]. The World Health Organization emphasizes the need for environmental sanitation in prison settings, especially in high-density facilities, as part of inmates' human rights and their entitlement to health insurance and care continuity [8].

Environmental sanitation, a core component of public health, encompasses physical infrastructure and behavioral practices aimed at reducing human exposure to contaminants. This includes housing density, room temperature, and water quality. Overcrowded environments, such as prisons or dormitories, increase the risk of communicable skin diseases like dermatitis [9]. Transmission is facilitated when environmental hygiene and personal hygiene are both neglected.

Based on initial observations at Class IIA Gorontalo Correctional Facility, Indonesia, 557 inmates were housed in a facility designed for only 330, resulting in a 57% overcapacity rate. Such overcrowding creates limited air circulation, elevated room temperatures, and reduced personal space—all of which increase the potential for disease transmission, particularly dermatitis.

This study aims to assess the correlation between environmental factors—specifically housing density, room temperature, and the physical quality of water—and the incidence of dermatitis among inmates in Class IIA Gorontalo Correctional Facility. The findings are intended to support the development of evidence-based strategies for improving environmental health in prison settings.

2. Methods

Research Design

This study used an analytical observational design with a cross-sectional approach to determine the relationship between environmental sanitation factors and the incidence of dermatitis among inmates. The research was conducted at Class IIA Gorontalo Correctional Institution, located at Jalan Katamso No. 33, Donggala District, Hulontalangi Regency, Gorontalo, Indonesia. Cross-sectional studies are widely used in public health to assess associations between risk factors and health outcomes at a specific point in time [1].

Population and Sample

The population in this study comprised all 557 inmates residing in the facility and two sources of clean water: ground well water and the municipal supply provided by the Regional Drinking Water Company (PDAM). The research sample consisted of 168 inmates selected using a simple random sampling technique to ensure representativeness [2].

Operational Definitions of Variables

The operational definitions of the variables studied, including measurement criteria, instruments, and scale of measurement, are detailed in **Table 1** below.

Table 1. Operational Definitions of Research Variables

No.	Variable	Operational Definition	Criteria	Measurement Tool	Scale
1	Housing Density	Defined as the floor area of the room divided by the number of inmates occupying it.	Meets criteria if room area ≥ 8 m² for max. 2 occupants. Does not meet criteria if < 8 m² for max. 2 occupants.	Laser Measuring Device	Nominal
2	Room Temperature	The degree of heat or cold within the prison cell.	Meets criteria if temperature is between 18°C–30°C. Does not meet criteria if <18°C or >30°C.	Digital Thermometer	Nominal
3	Physical Water Quality	Water used by inmates must be physically clean, tasteless, colorless, and odorless.	Meets criteria if: Turbidity ≤ 25 NTU, Color ≤ 50 TCU, Temp ≤ 3°C above ambient, Tasteless, Odorless. Does not meet criteria if any parameter exceeds these thresholds.	Turbidity Meter, Colorimeter (TCU), Thermometer, and Sensory Evaluation (tongue, nose).	Nominal
4	Incidence of Dermatitis	Presence of red, itchy, dry, or scaly skin lesions diagnosed by the facility doctor.	1 = Diagnosed with dermatitis 2 = Not diagnosed with dermatitis	Medical Record / Doctor's Diagnosis Form	Nominal

Data Collection Methods and Instruments

Primary data were collected through direct field measurement, interviews, and clinical observations, while secondary data were obtained from the inmates' medical records and institutional health reports. Tools used in this study included a laser meter to measure room dimensions, a digital thermometer to assess temperature, a turbidity meter and colorimeter (True Colour Unit/TCU) for water testing, and sensory evaluation (taste and smell) by trained personnel.

Data Analysis

Data were analyzed using both univariate and bivariate methods. Univariate analysis was used to describe the frequency distribution of each research variable. Bivariate analysis was conducted to test the association between the independent variables (housing density, room temperature, water quality) and the dependent variable (incidence of dermatitis), using the Chi-Square test. Fisher's Exact Test was used when expected frequencies were below 5. A significance level of 0.05 was used to determine statistical significance [3].

3. Results and Discussion

Respondent Characteristics

A total of 168 inmates participated in this study. **Figure 1** shows that 91 inmates (54.2%) were diagnosed with dermatitis, while 77 inmates (45.8%) showed no clinical signs of the disease. The relatively high proportion of affected individuals underscores the significant health burden of skin disease in correctional settings, where environmental sanitation is often substandard and overcrowding is prevalent [1],[6].

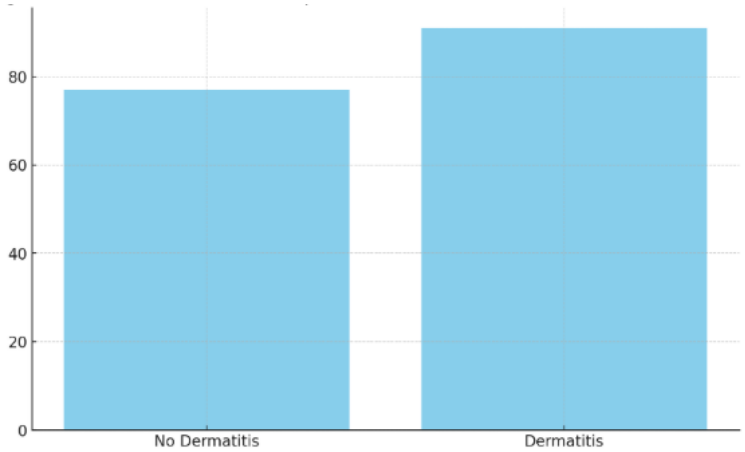

Figure 1. Characteristics of Respondents Based on the Incidence of Dermatitis

Figure 2 presents the age distribution of the respondents, with the majority aged 25–44 years. This age group represents the most socially and physically active phase of life, potentially increasing their exposure to shared items, personal contact, and irritant environments—all of which contribute to a higher risk of dermatitis [4],[5]. Moreover, age can influence immune response and skin barrier function, affecting individual susceptibility to dermatitis [15].

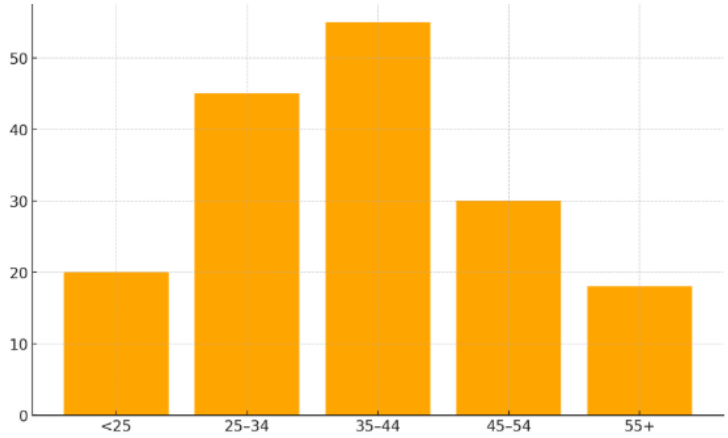

Figure 2. Characteristics of Respondents Based on Age

Figure 3 shows the education levels of respondents, with most having only completed primary or secondary schooling. Lower educational attainment may reduce awareness regarding personal hygiene, sanitation practices, and early symptoms of skin disease. Previous studies have shown that limited health literacy is associated with poor hygiene practices and increased risk of skin disease in underserved populations [3],[8].

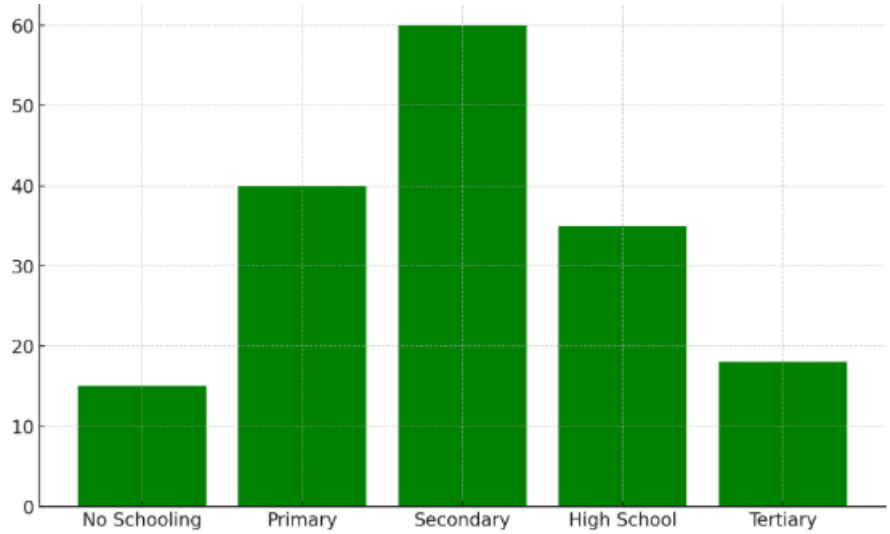

Figure 3. Characteristics of Respondents Based on Education

Figure 4 shows that many respondents had stayed for more than one year in the correctional facility. Prolonged residence increases exposure to cumulative environmental risks such as poor air quality, lack of sunlight, and poor bedding hygiene. Previous findings suggest that the longer individuals are exposed to poor prison conditions, the more likely they are to experience health deterioration, including skin disorders [6],[7].

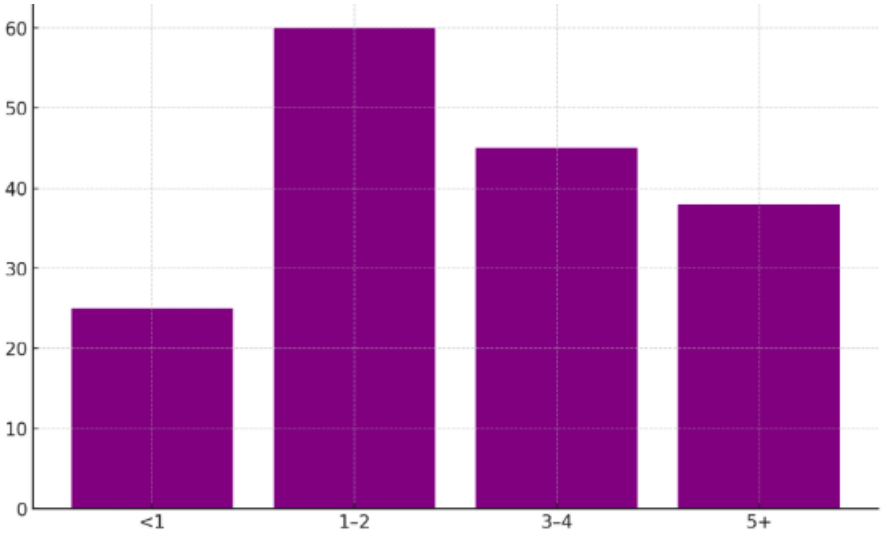

Figure 4. Characteristics of Respondents Based on Length of Stay in Correctional Institution

Figure 5 details the number of inmates housed in each room within the Marwah and Shafa blocks. Some rooms, such as Marwah Room 3 and Shafa Room 4, contained over 20 inmates each—far exceeding the housing density standards set by the Indonesian Ministry of Health [10]. Overcrowded and poorly ventilated rooms are known to create a favorable environment for the proliferation of pathogens and irritants, thereby increasing the risk of dermatitis [2],[11],[14].

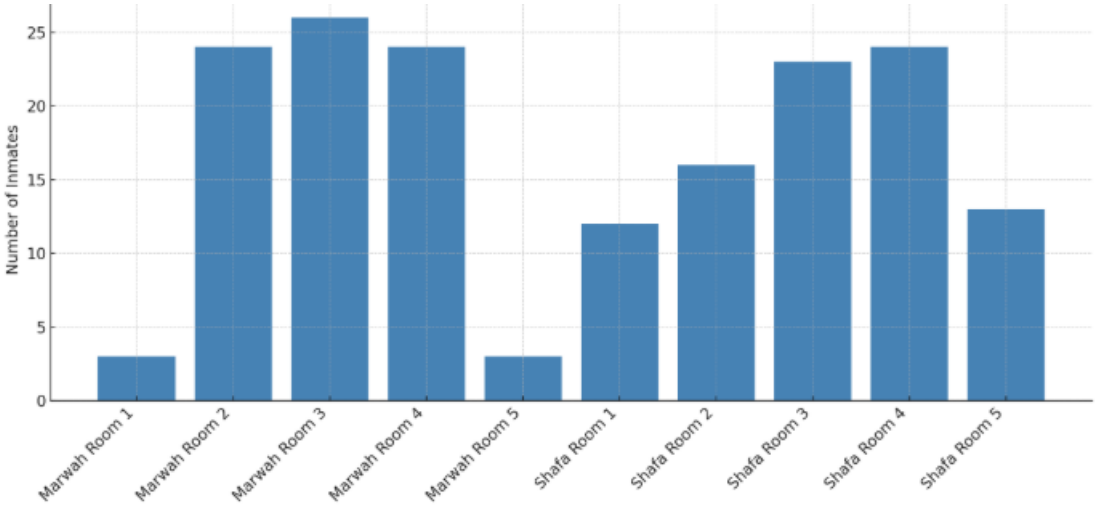

Figure 5. Characteristics of Respondents Based on Block where Prisoners Live

In conclusion, the demographic profile of the respondents—dominated by productive-age males, lower education levels, long incarceration periods, and dense housing—provides a critical context for understanding the environmental risk factors contributing to dermatitis in prison populations.

Association Between Housing Density and Dermatitis

Housing density is a critical determinant of health in correctional facilities. Overcrowded conditions reduce air circulation, limit personal space, increase humidity and temperature, and promote contact-based disease transmission. **Table 2** presents the relationship between housing density and the incidence of dermatitis among inmates. Of the 168 respondents, 162 inmates (96.4%) were housed in rooms that did not meet the spatial health standards set by the Indonesian Ministry of Health, which requires a minimum area of 8 m² per two occupants [10].

Among those diagnosed with dermatitis (n=91), 100% lived in rooms that failed to meet this requirement, while all inmates in compliant rooms (n=6) were not diagnosed with dermatitis. The p-value of 0.008 indicates a statistically significant association between overcrowding and dermatitis incidence.

Table 2. Relationship Between Housing Density and Incidence of Dermatitis

Housing Density	No Dermatitis (n, %)	Dermatitis (n, %)	Total (n, %)
Meets Criteria	6 (7.8%)	0 (0.0%)	6 (3.6%)
Does Not Meet Criteria	71 (92.2%)	91 (100.0%)	162 (96.4%)
Total	77 (100.0%)	91 (100.0%)	168 (100.0%)

Note: Statistical analysis was performed using the Chi-Square test. A significant association was found (p = 0.008), with a set at 0.05.

These findings align with prior studies that establish a direct link between overcrowded environments and the emergence of skin diseases. Zahtamal et al. [1] found that high residential density significantly increases complaints of skin irritation and dermatitis in community settings. Similarly, Lestari [3] reported a higher prevalence of skin problems in environments where ventilation and occupant load are not properly regulated.

From a biological standpoint, overcrowding increases skin-to-skin contact, raises room temperature, and reduces oxygen circulation all of which can compromise skin barrier integrity and encourage colonization by microbes or allergens [2], [5]. This effect is exacerbated in correctional facilities where hygiene practices are often restricted due to shared facilities and limited water access [6], [9].

Moreover, data from Marwah and Shafa block room distributions (see Figure 5) show that rooms housing 20–26 individuals were more likely to report dermatitis cases, reinforcing the conclusion that spatial congestion is not only statistically significant but also epidemiologically relevant. Such findings are consistent with global evidence that prison environments with high population density suffer from a higher burden of skin-related diseases [6], [9].

Therefore, reducing housing density should be prioritized in correctional facility management. Adequate spacing not only promotes general well-being but also serves as a preventive measure against environmental dermatitis outbreaks.

Association Between Room Temperature and Dermatitis

Room temperature is a critical component of the indoor environment that can influence skin integrity, barrier function, and overall dermatological health. In correctional facilities, where air conditioning and ventilation systems are often inadequate, temperature regulation becomes especially challenging.

As shown in **Table 3**, of the 168 respondents, 162 inmates (96.4%) lived in rooms where the temperature was outside the optimal health range of 18°C to 30°C, as recommended by the Indonesian Ministry of Health [11]. Among inmates diagnosed

with dermatitis, 100% lived in cells that failed to meet this standard, while none of the inmates in temperature-compliant rooms developed dermatitis. The p-value of 0.008 indicates a statistically significant association between room temperature and the incidence of dermatitis.

Table 3. Relationship Between Room Temperature and Incidence of Dermatitis

Room Temperature	No Dermatitis (n, %)	Dermatitis (n, %)	Total (n, %)
Meets Criteria	6 (7.8%)	0 (0.0%)	6 (3.6%)
Does Not Meet Criteria	71 (92.2%)	91 (100.0%)	162 (96.4%)
Total	77 (100.0%)	91 (100.0%)	168 (100.0%)

Note: *Chi-Square test was used to assess statistical significance. p = 0.008. Statistical significance was determined at a = 0.05.*

These findings are in line with international literature emphasizing that deviations from the normal thermal range can cause or exacerbate inflammatory skin conditions. High ambient temperatures increase sweating, moisture accumulation, and sebum production, creating a favorable environment for microbial growth, irritation, and itch [2],[5],[15].

Guo et al. [6] and Abolhasani et al. [2] noted that heat stress and high humidity are common triggers for dermatitis in confined settings such as prisons, where poor airflow and lack of thermal regulation are typical. Moreover, heat can damage the skin barrier by altering lipid composition, leading to dryness, pruritus, or microbial invasion. This is particularly problematic in tropical regions such as Indonesia, where ambient temperatures frequently exceed comfort thresholds [14].

The result further corroborates studies such as that by Yustati and Suryadinata [5], who reported that environmental temperature significantly affects the risk of dermatitis in children exposed to suboptimal indoor climates. Similar effects can be reasonably expected in adult inmates experiencing chronic exposure to elevated temperatures and limited airflow in overcrowded cells.

Thus, the strong statistical association in this study confirms that temperature is not only a background environmental factor but also a modifiable determinant of health. Correctional facility management should prioritize improvements in ventilation and thermal comfort as part of broader environmental health interventions to reduce the burden of dermatitis and other heat-related skin conditions.

Association Between Water Quality and Dermatitis

Clean water is an essential component of environmental health. In correctional settings, water is used communally for bathing, washing clothes, and maintaining hygiene—factors that can influence the incidence of skin diseases. In this study, physical water quality was assessed based on turbidity, color, temperature, taste, and odor, using parameters established in Indonesian Ministry of Health regulations [12].

As shown in **Table 4**, out of 168 respondents, 141 inmates (83.9%) used water that met the required physical standards. Among those diagnosed with dermatitis, 84.6% (n = 77) were exposed to water meeting these standards, while 15.4% (n = 14) were exposed to substandard water. The p-value of 0.958 indicates no statistically significant association between physical water quality and the incidence of dermatitis in this sample.

Table 4. Relationship Between Physical Water Quality and Incidence of Dermatitis

Water Quality	No Dermatitis (n, %)	Dermatitis (n, %)	Total (n, %)
Meets Criteria	64 (83.1%)	77 (84.6%)	141 (83.9%)
Does Not Meet Criteria	13 (16.9%)	14 (15.4%)	27 (16.1%)
Total	77 (100.0%)	91 (100.0%)	168 (100.0%)

Note: Chi-Square test was used to assess statistical association. p = 0.958. Significance level set at a = 0.05.

These findings suggest that physical water quality, although important for general health, may not be a direct factor in the development of dermatitis in this correctional context. One possible explanation is that all inmates—both those with and without dermatitis relied primarily on PDAM water, which generally met physical standards such as clarity and odorlessness. This uniformity in water source may have reduced variation in exposure and thus the ability to detect an association.

Similar findings were reported in a scoping review by Guo et al. [6], which highlighted that while access to clean water is a human right and essential for preventing communicable diseases, its direct impact on dermatitis—particularly in institutional settings—is less clearly defined unless chemical or microbial contamination is present. Additionally, other factors like overcrowding, poor ventilation, and personal hygiene practices are likely to be more dominant contributors to skin health in this environment [1],[7].

Furthermore, Awi [4] and Hanafi [7] noted that in several prison-based studies, dermatitis was more strongly associated with housing and sanitation practices than with water quality. While poor-quality water can certainly contribute to other dermatological or gastrointestinal conditions, the absence of a significant link here suggests that interventions focused on reducing overcrowding and improving air quality may be more effective in mitigating dermatitis risk.

This study was limited by its cross-sectional design, which prevents causal inference between environmental factors and the incidence of dermatitis. The analysis did not control for potential confounders such as personal hygiene behavior, nutritional status, or history of skin disease, which may influence skin health independently. Additionally, the study was conducted in a single male correctional facility, limiting the generalizability of the findings to other institutions or populations.

Moreover, water quality assessment was restricted to physical parameters and did not include microbiological or chemical testing. Environmental variables such as temperature and humidity were also measured at a single point in time, which may not fully reflect ongoing conditions. Future research should employ longitudinal designs, include broader environmental indicators, and control for individual-level variables to enhance validity and applicability of the findings.

4. Conclusion

This study demonstrated a significant association between housing density and room temperature with the incidence of dermatitis among inmates at Class IIA Gorontalo Correctional Facility. Inmates living in overcrowded cells and exposed to suboptimal thermal conditions were more likely to develop dermatitis. Meanwhile, physical water quality showed no significant relationship with dermatitis, indicating that other environmental and behavioral factors may play a more prominent role in skin health within correctional settings. Based on these findings, it is recommended that prison management implement environmental interventions aimed at reducing overcrowding and improving ventilation and temperature regulation within prison

blocks. Health promotion strategies, including hygiene education and routine monitoring of environmental conditions, should also be strengthened. Future studies are encouraged to incorporate longitudinal designs and control for confounding factors to provide a more comprehensive understanding of the determinants of skin health in institutional environments.

Acknowledgements

The authors would like to thank Gorontalo State University, particularly the Faculty of Sport and Health, for their support and facilitation throughout the research process.

Conflicts of Interest:

The authors declare no conflicts of interest in relation to the design, implementation, or publication of this study.

References

[1] Z. Zahtamal, R. Restila, T. Restuastuti, Y. E. Anggraini, and Y. Yusdiana, "Analysis of the relationship between environmental sanitation and skin disease complaints," *Indonesian Journal of Environmental Health*, vol. 21, no. 1, pp. 9–17, 2022. [Online]. Available: https://doi.org/10.14710/jkli.21.1.9-17

[2] R. Abolhasani et al., "The impact of air pollution on skin and related disorders: A comprehensive review," *Dermatologic Therapy*, vol. 34, no. 2, p. e14840, 2021. [Online]. Available: https://doi.org/10.1111/dth.14840

[3] R. Lestari, "The Relationship Between Environmental Sanitation and Symptoms of Skin Disease in the Sukamenanti Health Centre Working Area, West Pasaman Regency," Nan Tongga Health and Nursing, vol. 17, no. 1, pp. 14–23, 2022. [Online]. Available: https://mail.ojs.unisbar.ac.id/index.php/nthn/article/view/555

[4] M. I. Awi, "Factors associated with the incidence of contact dermatitis in fishermen in the Spermonde Islands of Makassar City," Doctoral dissertation, Hasanuddin University, 2019.

[5] E. Yustati and A. S. Suryadinata, "Risk factors for dermatitis in children who come to the puskesmas," *Cendekia Medika*, vol. 7, no. 1, 2022. [Online]. Available: https://doi.org/10.52235/cendekiamedika.v7i1.102

[6] W. Guo et al., "A systematic scoping review of environmental health conditions in penal institutions," *International Journal of Hygiene and Environmental Health*, vol. 222, no. 5, pp. 790–803, 2019. [Online]. Available: https://doi.org/10.1016/j.ijheh.2019.05.001

[7] A. I. Hanafi, "The effect of hygiene and sanitation levels on the health level of prisoners," *Asian Journal of Engineering, Social and Health*, vol. 3, no. 7, 2024. [Online]. Available: https://doi.org/10.46799/ajesh.v3i7.400

[8] L. M. A. Sa'ban, A. Sadat, and A. Nazar, "Improving community knowledge in environmental sanitation improvement," *Dinamisia: Journal of Community Service*, vol. 5, no. 1, pp. 10–16, 2020. [Online]. Available: https://doi.org/10.31849/dinamisia.v5i1.4365

[9] M. Ferris et al., "An international review of skin conditions in incarcerated persons," *JAAD Reviews*, 2024.

[10] Ministry of Health of the Republic of Indonesia, *Decree No. 829/Menkes/SK/VII/1999 on Housing Health Requirements*, Jakarta, Indonesia: Kemenkes RI, 1999.

[11] Ministry of Health of the Republic of Indonesia, *Regulation No. 1077/Menkes/Per/V/2011 on Guidelines for Home Indoor Air Health*, Jakarta, Indonesia: Kemenkes RI, 2011.

[12] Ministry of Health of the Republic of Indonesia, *Regulation No. 2 Year 2023 on Amendments to Regulation No. 492 Year 2010 concerning Drinking Water Quality Requirements*, Jakarta, Indonesia: Kemenkes RI, 2023.

[13] W. Hermagasantos and S. C. K. Z. Saodah, "A method for determining customers' energy shrinkage cost," *ELKOMICS: Journal of Electrical Energy Engineering, Telecommunication Engineering, & Electronics Engineering*, vol. 8, no. 3, p. 672, Sep. 2020. [Online]. Available: https://ejurnal.itenas.ac.id/index.php/elkomika/article/view/3600/2382

[14] K. A. Holden, A. R. Lee, D. B. Hawcutt, and I. P. Sinha, "The impact of poor housing and indoor air quality on respiratory health in children," *Breathe*, vol. 19, no. 2, p. 230058, 2023. [Online]. Available: https://doi.org/10.1183/20734735.0058-2023

[15] K. Patel and R. Nixon, "Irritant contact dermatitis – a review," *Current Dermatology Reports*, vol. 11, no. 2, pp. 41–51, 2022. [Online]. Available: https://doi.org/10.1007/s13671-021-00351-4