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EVALUATION OF ENVIRONMENTAL HEALTH CONDITIONS AT SIDOMULYO PRIMARY HEALTH CENTER: SANITATION INSPECTION, PHYSICAL ENVIRONMENTAL QUALITY, AND HYGIENE MANAGEMENT

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ABSTRACT

Background: Primary healthcare centers (Puskesmas) play a vital role in delivering healthcare services, making environmental health compliance essential for patient safety and service quality. This study evaluated environmental health conditions at Sidomulyo Primary Health Center, Samarinda, and identified areas requiring improvement.

Methods: A descriptive observational study was conducted in May 2026 using direct observation, interviews, documentation, and environmental measurements with standardized instruments. Environmental sanitation was assessed using the Ministry of Health inspection checklist during a single two-hour operational observation (10:00 AM–12:00 PM WITA).

Results: The health center achieved a sanitation inspection score of 2,048, indicating that most components complied with regulatory standards. However, relative humidity exceeded the recommended range (40–60% RH) in all assessed rooms, and noise levels in the waiting room (60.2 dB) and registration area (58.6 dB) exceeded recommended limits. Water pH met the standard (8.5), but bacteriological testing had not been conducted. Incomplete compliance was also identified in infectious medical waste management and implementation of the Integrated Joint Eradication Program (PPBT).

Conclusion: Several environmental health compliance gaps were identified, particularly in environmental monitoring, microbiological surveillance, ventilation, waste management, and PPBT implementation. These findings represent a single operational snapshot and support the need for continuous environmental health improvement in primary healthcare facilities.

KEYWORDS: Sanitation Inspection; Room Humidity; Primary Health Center Environmental Health; Medical Waste Management; Integrated Joint Eradication Program

1. Introduction

A primary health center (Puskesmas) is a first-level healthcare facility that plays an important role in improving community health status through promotive, preventive, curative, and rehabilitative efforts. As a healthcare facility that receives community visits on a daily basis, a primary health center is required to maintain a healthy, safe, comfortable environment that meets sanitation and health requirements. A healthcare facility environment that does not meet sanitation standards can increase the risk of disease transmission, nosocomial infections, and a decline in the quality of healthcare services provided to the community (Astuti & Handayani, 2021).

Environmental health in healthcare facilities encompasses various aspects, such as building conditions, air quality, clean water supply, medical and non-medical waste management, disease vector control, and the cleanliness of sanitation facilities. Poor sanitation in healthcare facilities can lead to an increased risk of pathogenic microorganism transmission, whether through the air, surface contact, or inadequately managed medical waste (WHO, 2019). Therefore, the implementation of environmental health standards is an essential component in efforts to protect patients, healthcare workers, and visitors to healthcare facilities.

In Indonesia, the management of environmental health in healthcare facilities is regulated through environmental health standards for primary health centers, covering building conditions, environmental media quality, waste management, sanitation facilities, and the control of other environmental risk factors. Compliance with these standards aims to create a healthcare service environment that meets health requirements, thereby supporting the optimal quality of healthcare services (Ministry of Health of the Republic of Indonesia, 2020).

The physical environmental conditions of a building, such as ventilation, lighting, temperature, and humidity, have a significant impact on comfort and the risk of microorganism growth indoors. Microclimate instability, particularly relative humidity levels exceeding established regulatory thresholds namely >60% Rh, accelerates the proliferation of bacterial and fungal pathogens on indoor surfaces and within bioaerosols. This structural vulnerability significantly compromises indoor air quality and elevates the epidemiological risk of airborne nosocomial transmissions among vulnerable patient populations and healthcare personnel (Sari et al., 2022).

While robust regulatory frameworks exist, first-level healthcare facilities—especially those operating within high-density urban areas and humid tropical microclimates—frequently experience operational and structural deviations from standard sanitary protocols. Identifying specific system gaps in vector control, microclimate management, and medical waste handling remains critical, as localized structural deficiencies directly translate to compromised biosafety environments. Consequently, rigorous field assessments are imperative to diagnose these operational variances before they manifest as active vectors for cross-contamination.

The environmental health integrity of healthcare facilities directly dictates clinical service quality and patient biosecurity. Substandard sanitation matrices induce environmental distress, compromise sterile field boundaries, and diminish institutional public trust. Therefore, this scholarly investigation aims to execute a systematic quantification of multi-parameter environmental matrices at Sidomulyo Primary Health Center, Samarinda, providing an empirical foundation for the mitigation of structural risks impacting patient safety and the optimization of healthcare biosecurity frameworks.

2. Methods

This study employed a descriptive observational method to describe the environmental health conditions at Sidomulyo Primary Health Center. The study was conducted in May 2026 over a single day, from 10:00 AM to 12:00 PM WITA. The environmental measurements obtained during this period represent an operational snapshot of the health center during peak service hours rather than a stable, time-weighted average of the environmental conditions throughout the day.

Observations were conducted in the registration room, administration room, general outpatient clinic, warehouse, pharmacy, meeting room, waiting room, clean water source, sanitation facilities, and the surrounding environment of Sidomulyo Primary Health Center, following the environmental health inspection components for primary health centers.

Data were collected through direct observation, documentation, and environmental parameter measurements using measuring instruments. Lighting measurements were performed using a lux meter in rooms requiring specific lighting standards. Water quality measurements were conducted using a pH meter on the primary clean water source used by the health center. Air quality measurements were performed using a dust meter at the breathing zone level (approximately 1.5 m

above the floor) to determine $PM_{2.5}$ and PM_{10} particulate concentrations in accordance with indoor environmental quality assessment procedures.

The research instruments consisted of an environmental health inspection checklist for primary health centers, a documentation camera, a lux meter, a pH meter, and a dust meter. The data were analyzed descriptively by comparing the observation and measurement results with the requirements stipulated in the Ministry of Health Regulation of the Republic of Indonesia No. 2 of 2023 concerning the Implementation of Government Regulation No. 66 of 2014 on Environmental Health, as well as other relevant technical standards according to each measured parameter. To ensure data accuracy, all measurements were performed directly by the researchers and supported by photographic documentation throughout the study.

3. Result

This study employed a descriptive observational method conducted at Sidomulyo Primary Health Center in May 2026. Research activities included an environmental health inspection, direct observation, measurement of environmental factors, and data collection regarding the sanitation conditions of the health center. The research focused on the exterior building, interior building, sanitation facilities, physical environmental quality, waste management, and hygiene management at the health center.

The evaluation was carried out using the environmental health inspection form for primary health centers in accordance with the standards of the Ministry of Health of the Republic of Indonesia. Factors measured included lighting, noise, humidity, PM2.5 and PM10 concentrations, sanitation conditions, clean water availability, and medical and non-medical waste management.

Physical Environmental Quality Inspection Results

Table 1. Physical Environmental Quality Measurement Result at Sidomulyo Primary Health Center

Room	Lighting (lux)	Noise (dB)	Humidity (%Rh)	PM2.5 ($\mu g/m^3$)	PM10 ($\mu g/m^3$)
Registration	308	58,6	76,9	10	54
Administration	192	51,7	68	10	21
General Outpatient Clinic	112	50,3	69	10	15
Warehouse	110	36	78	20	57
Pharmacy	211	55	61	10	17
Meeting Room	168	40,4	62	10	55
Waiting Room	209	60,2	79	13	54

Furthermore, based on measurements conducted within two hours of observation, all assessed areas exhibited humidity levels exceeding the recommended standard, which is between 40–60% RH. The highest humidity detected reached 79% RH in the waiting room. These results reflect the environmental conditions observed during the measurement period and should not be interpreted as a long-term humidity level.

Table 2. Water Quality Inspection Results at Sidomulyo Primary Health Center

Parameter	Result
Water pH	8,5
Water Temperature	29°C

Based on Table 2, measurement results showed a water pH of 8,5, which still meets the clean water quality standard as it falls within the permissible range of 6,5–8,5. The recorded water temperature of 29°C is also within the normal range for a tropical climate region. Nevertheless, the biological quality of the water could not be comprehensively assessed because bacteriological testing, such as for the presence of Escherichia coli, had not yet been conducted.

Cleanliness and Order Management Assessment Results

The cleanliness and order management assessment was conducted on aspects of PPBT management, staff appearance, staff discipline, and operational order.

Table 3. Cleanliness and Order Management Assessment Results

Variable	Score
PPBT Management	5
Staff Appearance	50
Staff Discipline	55
Operational Order	35

The assessment results indicated that staff appearance and discipline were satisfactory. All staff wore complete uniforms, maintained a friendly demeanor, and carried out services in an orderly manner. However, PPBT management received a low score due to the absence of an established PPBT working group (Pokja PPBT), along with a lack of guidelines and documentation for environmental cleanliness activities.

Overall Sanitation Assessment Results

A summary of the environmental sanitation inspection results at Sidomulyo Primary Health Center is presented in Table 4.

Tabel 4. Summary of Environmental Sanitation Inspection Results at the Primary Health Center

Variable	Score
Exterior Building	160
Interior Building	1.324
Sanitation Facility Infrastructure	389
Cleanliness and Order Management	145
Additional Rooms	30
Total	**2.048**

Based on the inspection results, the total score obtained was 2.048. Although most sanitation components met requirements, Sidomulyo Primary Health Center could not yet be declared as fully meeting environmental health requirements, as several minimum key criteria remained unmet. These included high room humidity, noise levels in service areas exceeding permissible limits, the absence of biological water quality testing, and the unavailability of infectious waste treatment facilities.

4. Discussion

The environmental health assessment demonstrated that although most sanitation components at Sidomulyo Primary Health Center complied with national environmental health standards, several important gaps remain in environmental management and regulatory compliance.

The findings should be interpreted as an operational snapshot obtained during a two-hour observation period rather than a comprehensive representation of the health center's routine environmental performance.

All assessed rooms exhibited relative humidity levels above the recommended standard of 40–60% RH, with the highest values recorded in the waiting room (79% RH) and warehouse (78% RH). Elevated humidity observed during the assessment may theoretically create environmental conditions that facilitate the growth of bacteria and fungi if maintained over prolonged periods. However, because the measurements were obtained during a single observation period and no microbiological analyses were performed, these findings should be interpreted as indicating a potential environmental risk rather than evidence of ongoing healthcare-associated infection (HAI) transmission. Similar associations between elevated humidity and reduced indoor environmental quality have been reported by Sari et al. (2022), emphasizing the importance of adequate ventilation and air circulation in primary healthcare facilities. Consequently, improving ventilation systems and maintaining indoor humidity within the recommended range remain important preventive strategies.

Noise measurements exceeded the national recommended limit (<55 dB) in the waiting room and registration area. Nevertheless, interpretation of these findings should consider the operational characteristics of a high-volume primary healthcare facility. Unlike inpatient hospital wards, outpatient waiting and registration areas naturally experience greater patient movement, communication, and administrative activities. Therefore, the observed noise levels should primarily be interpreted as indicators of environmental comfort and communication efficiency rather than direct evidence of patient safety hazards. Administrative measures, patient flow management, and appropriate acoustic modifications may contribute to improving environmental comfort while maintaining service efficiency.

Lighting measurements generally complied with national standards, although the registration room slightly exceeded the recommended range. While excessive illumination may contribute to visual discomfort during prolonged computer-based work, the measured value remained close to the acceptable operational threshold. Periodic evaluation of lighting distribution and fixture placement would nevertheless help optimize visual comfort for healthcare personnel.

Physical water quality parameters met the applicable standards, with a pH of 8.5 and a temperature of 29°C. However, the absence of bacteriological examination represents a critical surveillance gap within the environmental health monitoring system. Consequently, microbiological safety of the water supply cannot be verified despite acceptable physical and chemical parameters. Routine bacteriological monitoring should therefore be incorporated into environmental surveillance programs to ensure comprehensive assessment of water safety.

The assessment of infectious medical waste management indicated that the high-temperature treatment component did not receive a score. This finding should be interpreted as evidence of incomplete regulatory compliance rather than direct evidence of inadequate waste disposal practices. Because the operational arrangements for final waste treatment were not specifically investigated, it remains unclear whether this finding reflects infrastructural limitations, administrative procedures, or reliance on licensed third-party waste contractors. Future assessments should therefore include verification of the complete waste management chain to identify the specific source of non-compliance.

The low PPBT management score reflects weaknesses in institutional environmental health governance rather than deficiencies in physical infrastructure alone. The absence of a formal PPBT working group, written guidelines, and systematic documentation suggests that environmental monitoring has not yet been fully institutionalized. Continuous monitoring, periodic evaluation, and clear organizational responsibilities are essential components for maintaining long-term compliance with environmental health standards.

This study has several limitations. Environmental measurements were conducted during a single two-hour observation period and therefore represent only a limited operational snapshot of environmental conditions. In addition, microbiological analyses of indoor air and water were beyond the scope of this assessment. Future studies involving longer observation periods, seasonal measurements, and comprehensive microbiological testing would provide a more representative evaluation of environmental health conditions in primary healthcare facilities.

5. Conclusion

This study provides a snapshot of the environmental health conditions at Sidomulyo Primary Health Center based on a two-hour environmental assessment. Although most sanitation components complied with the applicable environmental health standards, several structural non-compliances were identified, including elevated indoor humidity, noise levels exceeding the recommended limits in public service areas during the observation period, incomplete bacteriological surveillance of the water supply, incomplete compliance in infectious medical waste management, and weak institutional implementation of the Integrated Joint Eradication Program (PPBT).

These findings should be interpreted as indicators of potential environmental health risks rather than direct evidence of compromised patient safety or healthcare-associated infection transmission, since microbiological analyses and long-term environmental monitoring were beyond the scope of this study.

Strengthening environmental monitoring systems, improving compliance with environmental health regulations, enhancing microbiological surveillance, optimizing ventilation and waste management practices, and reinforcing institutional environmental governance through PPBT implementation are expected to improve environmental health performance and support safer, more sustainable primary healthcare services. Future studies involving longer observation periods and comprehensive microbiological assessments are recommended to obtain a more representative evaluation of environmental health conditions..

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