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by Khaidar Ali

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An Analysis of Students' Perceptions of Environmental Sanitation Quality at An Najah Islamic Boarding School, Purwokerto

Khaidar Ali^{21*}, Saudin Yuniarno¹, M. Nur Khamid⁴, Azizah Elvasari¹, Arih Puspirta Murti¹

¹ Departemen Kesehatan Masyarakat, Fakultas Ilmu Kesehatan, Universitas Jenderal Soedirman

² Center for Sustainable Development, Universitas Jenderal Soedirman

³ Pusat Transportasi dan Pengembangan Wilayah, Lembaga Penelitian dan Pengabdian Masyarakat, Universitas Jenderal Soedirman

⁴ Departemen Gizi, Sekolah Tinggi Ilmu Kesehatan Husada Jombang

*Corresponding author: khaidar.ali@unsoed.ac.id

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ABSTRAK

Latar belakang: Sanitasi lingkungan di pondok pesantren memainkan peran penting dalam menjaga kesehatan santri, dimana lingkungan dengan kepadatan tinggi memiliki prevalensi penyakit menular tinggi khususnya diare. Namun, fasilitas sanitasi yang tidak memadai dapat menyebabkan risiko kesehatan dan penurunan kualitas hidup. Penelitian ini bertujuan untuk menganalisis persepsi santri terhadap kualitas sanitasi lingkungan di Pondok Pesantren An Najah Purwokerto.

Metode: Studi *cross-sectional* ini dilakukan pada 127 siswa dengan menggunakan pendekatan teknik *total sampling*. Data dikumpulkan menggunakan kuesioner terstruktur yang mencakup lima aspek sanitasi lingkungan: ketersediaan air bersih, fasilitas toilet, pembuangan limbah cair, pengelolaan limbah padat, dan kepadatan penghuni. Statistik deskriptif, meliputi distribusi frekuensi dan persentase, digunakan untuk menganalisis karakteristik responden dan hasil persepsi.

Hasil: Mayoritas responden adalah perempuan (88,2%), berusia ≤19 tahun (48,0%), dan lama mondok 1-3 tahun (48,8%). Secara keseluruhan, persepsi santri memiliki nilai rerata baik pada pengelolaan limbah cair (90,1%), ketersediaan air bersih (82,1%), pengelolaan limbah padat (80,9%), dan toilet (80,3). Sedangkan, persepsi kepadatan hunian rendah memiliki nilai cukup besar dengan 40,2%.

Simpulan: Persepsi santri terhadap kualitas lingkungan di pondok pesantren baik, khususnya pada pengelolaan limbah cair, ketersediaan air bersih, pengelolaan limbah padat, dan toilet. Meskipun persepsi terhadap kepadatan hunian rendah sehingga perlu adanya peningkatan fasilitas asrama untuk santri untuk mengurangi kepadatan hunian.

Kata kunci: Sanitasi; Lingkungan; Kualitas; Persepsi; Santri

ABSTRACT

Title: *An Analysis of Students' Perceptions of Environmental Sanitation Quality at An Najah Islamic Boarding School, Purwokerto*

Background: Environmental sanitation in Islamic boarding schools (pesantren) plays a crucial role in safeguarding student health, particularly in high-density settings that the incident of communicable disease is prevalent. However, inadequate sanitation facilities may lead to health risks and reduced quality of life. This study was aimed to analyze students' perceptions of environmental sanitation quality at Pondok Pesantren An Najah, Purwokerto

Method: A *cross-sectional* survey was conducted on 127 students using a *total sampling* approach. Data were collected using a structured questionnaire covering five aspects of environmental sanitation, namely availability of clean water, toilet facilities, liquid waste disposal, solid waste management, and population density. Descriptive statistics, including frequency distributions and percentages, were used to analyze respondent characteristics and perception results.

Result: The majority of respondents were female (88.2%), aged ≤19 years (48.0%), and had been at the boarding school for 1-3 year (48.8%). Overall, students' perceptions had good average scores for liquid waste management (90.1%), clean water availability (82.1%), solid waste management (80.9%), and toilets (80.3). Meanwhile, perceptions regarding low housing density had a relatively high score of 40.2%.

Conclusion: Boarding school students' perceptions of environmental quality at the boarding school are positive, particularly regarding wastewater management, clean water availability, solid waste management, and toilets. However, perceptions of housing density are low, indicating a need to improve dormitory facilities for students to reduce housing density.

Keywords: Sanitation; Environment; Quality; Perception; Santri

INTRODUCTION

Environmental sanitation is one of the essential determinants of public health, encompassing the provision of safe and clean water, proper waste management, hygienic toilet facilities, and adequate housing density¹. Inadequate environmental sanitation is closely associated with the transmission of communicable diseases such as diarrhea, skin infections, and respiratory illnesses, which remain major public health problems in developing countries^{2,3}. Therefore, the effectiveness of sanitation systems serves as a key indicator of both overall health status and the environmental sustainability of a community⁴.

In Indonesia, *pondok pesantren* (Islamic boarding schools) represent a unique educational environment in which students (*santri*) live, study, and interact within the same compound. This residential nature often leads to high population density and limited sanitation infrastructure⁵. According to the Ministry of Health, many pesantren located in rural and semi-urban areas continue to face challenges related to access to clean water, wastewater disposal systems, and the availability of adequate toilet facilities⁶. In 2020, Indonesian Ministry of Religious recorded that 28,194 Islamic Boarding School with a total of 5 million *santri*⁷. Studies conducted in Indonesian pesantren have reported several recurring environmental sanitation issues, including poor sanitation and unkempt living environments, inadequate waste management practices, limited access to clean water, substandard wastewater drainage systems, and insufficient toilet and bathing facilities relative to the number of residents. A study conducted at a large pesantren reported daily waste generation exceeding one ton, including approximately 239.93 kg of plastic waste per day. Poor sanitation conditions in pesantren may increase the risk of disease transmission and negatively affect students' comfort and learning productivity⁸.

Banyumas regency has recorded a substantial and consistent increase in diarrhea case over past three years. Based on the Central Java Provincial Health Profile, the number of treated diarrhea cases in Banyumas Regency rose from 11,289 cases in 2022 to 19,095 cases in 2023, and further increased to 24,518 cases in 2024. The upward trend indicates a growing burden of sanitation-related disease in Banyumas Regency. Compounding this concern, only 89.3% of drinking water facilities in Banyumas Regency met quality standards as of 2024, where it is suggesting a persistent gap in safe water access that disproportionately affects populations residing in high-density institutional settings, such as pondok pesantren.

Understanding students' perceptions of sanitation quality is crucial because perception reflects both awareness and behavioral responses toward environmental health risks^{9,10}. According to the Health Belief Model, individuals' perceived susceptibility and perceived severity of health threats directly influence their motivation to adopt protective behavior. A positive perception may indicate effective sanitation management and health education, whereas a negative perception highlights priority areas requiring intervention. Previous studies have emphasized the importance of participatory assessment in improving environmental health standards within school and dormitory settings^{11,12}. While previous studies predominantly relied on observational methods to assess physical infrastructure, Perception-based assessment provides a complementary perspective by reflecting students' direct experience of sanitation quality, which may differ from objective measurements.

This study was conducted to analyze students' perceptions of environmental sanitation quality at Pondok Pesantren An Najah, Purwokerto. The assessment covered five key aspects of sanitation: clean water facilities, toilet facilities, wastewater disposal, solid waste management, and housing density. The findings of this study are expected to provide evidence-based recommendations for improving health and sanitation standards in pondok pesantren and similar residential educational institutions.

MATERIAL AND METHOD

Study Design and Setting

This study employed a cross-sectional design to assess the perception of students (*santri*) regarding environmental sanitation conditions in an Islamic boarding school located in Purwokerto, Indonesia. Data collection was conducted in 2025.

Population and Sample

The study population consisted of all students residing in the boarding school during the study period. Using a total sampling technique, a total of 127 respondents were recruited. Inclusion criteria included being a registered student living in the dormitories for at least one month prior to data collection and providing informed consent.

Data Collection Instrument

Data were collected using a structured questionnaire developed by the researchers based on existing environmental sanitation literature and national sanitation standards. Content validity was conducted through expert judgment prior to data collection, which was adapted from environmental sanitation assessment guidelines. The questionnaire was divided into two sections:

1. Respondent characteristics: including sex, age, and length of stay in the boarding school.

- Environmental sanitation assessment: covering five key domains, including clean water facilities (availability, physical quality, and distance from contamination sources), Toilet facilities (location, separation, adequacy, cleanliness, ventilation, and mosquito control), Wastewater disposal system (drainage, watertightness, flow, pollution prevention, and septic tank management), Solid waste disposal facilities (availability of trash bins and temporary disposal sites), and Housing density.

Each item was assessed dichotomously, whereby responses indication compliance with sanitation were categorized as good, and that indication non-compliance was categorized as poor.

Data Analysis

Data were coded and analyzed using descriptive statistics. Frequencies and percentages were used to present the distribution of respondent characteristics and their perceptions of environmental sanitation quality. The results were summarized in tables and narratively described to highlight areas of adequacy and insufficiency. This study was conducted by using Stata version 13.1 (College Station, Tx, USA)

RESULT AND DISCUSSION

Respondent Characteristics

Table 1. The characteristics of respondent

No	Variable	Category	n	%
1	Sex	Male	15	11.8
		Female	112	88.2
2	Age	≤ 19 Years old	61	48.0
		20-21 Years old	58	45.7
		≥ 22 Years old	8	6.3
		< 1 years	47	37.0
3	Length of Stay	1-3 years	62	48.8
		> 3 years	18	14.2

The characteristics of respondent was presented in Table 1. Based on Table 1, A total of 127 respondents participated in this study. The majority of respondents were female (88.2%), while only 11.8% were male. In terms of age distribution, nearly half of the respondents were ≤ 19 years old (48%), followed closely by those age 20–21 years (45.7%), while only 6.3% were aged ≥ 22 years. Based on descriptive analysis, the respondents had a mean age of 19.65 years (SD=1.18) with ages ranging from 17-23 years. Regarding the length of stay in the boarding school, most respondents had resided for 1–3 years (48.8%), followed by less than 1 year (37.0%), and a smaller proportion had stayed for more than 3 years (14.2%).

Perception of Environmental Sanitation Quality

Table 2. The perception of environmental sanitation quality

No	Variable	Category	n	%
Clean water facilities				
1	Water Availability (minimum of 1.5 liters per person per day)	Good	110	86.6
		Poor	17	13.4
2	Pyhsical Water Quality (colorless, tasteless, and odorless)	Good	102	80.3
		Poor	25	19.7
3	Distance from Contamination Sources (minimum of 10 meters)	Good	101	79.5
		Poor	26	20.5
Toilet				
1	Toilet Separation from Other Areas	Good	110	86.6
		Poor	17	13.4
2	Separate Toilets for Male and Female Occupants	Good	125	98.4
		Poor	2	1.6
3	Number of Toilets in the Islamic Boarding School Determined by the Number of Residents	Good	41	32.3
		Poor	86	67.7
4	Toilet Cleanliness	Good	117	92.1
		Poor	10	7.9
5	Toilet Floor Free from Standing Water	Good	105	82.7
		Poor	0	0
6	Availability of Ventilation in the Toilet	Good	115	90.6
		Poor	12	9.4
7	Bathtub Facility Not Serving as a Breeding Site for Mosquitoes	Good	101	79.5
		Poor	26	20.5

No	Variable	Category	n	%
Wastewater Disposal System				
1	Wastewater Drainage Channel Separated from Liquid Waste Disposal Area	Good	115	90.6
		Poor	12	9.4
2	Wastewater Drainage Channel is Closed and Watertight	Good	114	89.8
		Poor	13	10.2
3	Wastewater Flow System is Not Clogged	Good	116	91.3
		Poor	11	8.7
4	Wastewater Flow System Does Not Cause or Contribute to Environmental Pollution	Good	112	88.2
		Poor	15	11.8
5	Wastewater is Directed to a Septic Tank and Does Not Seep into the Ground	Good	115	90.6
		Poor	12	9.4
Waste Disposal Facilities				
1	Availability of Trash Bins in Each Room	Good	105	82.7
		Poor	22	17.3
2	Availability of Temporary Waste Disposal Sites (TPS) for All Areas	Good	106	83.5
		Poor	21	16.5
3	Placement of TPS Approximately 10 Meters Away from Classrooms, Dormitories, or Buildings	Good	97	76.4
		Poor	30	23.6
Level of Housing Density				
1	Level of Occupant Density in Rooms or Dormitories	Good	76	59.8
		Poor	51	40.2

The perception assessment of environmental sanitation in the Islamic boarding school highlights varying conditions across different domains, including clean water facilities, toilets, wastewater management, and solid waste disposal. Clean water facilities were generally rated positively. The majority of respondents reported adequate water availability (86.6%), defined as a minimum of 1.5 liters per person per day, while only 13.4% perceived inadequacy. Similarly, 80.3% of respondents considered the physical quality of water (colorless, tasteless, and odorless) to be good. ²⁴ regard to the distance of water sources from potential contamination ($\geq$ ²⁷ meters), 79.5% rated this as good. A study conducted by Hasbiah et al. shows that while the water quality at Islamic boarding schools in Cianjur Regency is generally good, the quantity does not yet meet minimum requirements¹³. Microbiology assessment of source of water in pesantren also found that although the physical parameter is meet the standard, but the microbiology indicator found does not meet the criteria, where the source water contains the coliform¹⁴. The presence² of this bacterium is due to the range of source of water to toilet container is less than 10 meters. According to Indonesia's Ministry of Home Affairs Regulation No. 23 ¹⁴ 2006, the standard basic requirement for drinking water is set at 10 m³ per household per month. In addition, ²⁰ Ministry of Health Regulation No. 2 of 2023 establishes drinking water quality standards encompassing microbiological ² parameters (*Escherichia coli* and *Total Coliform*), physical parameters (temperature, total dissolved solids, turbidity, color, and odor), and chemical parameters (pH, nitrate, nitrite, hexavalent chromium, iron, manganese, chlorine, arsenic, cadmium, lead, fluoride, and aluminum).

The majority of respondents confirmed that toilets were separated from other functional areas (86.6%) and between male and female occupants (98.4%). Toilet cleanliness was reported to be good by 92.1%, with 82.7% noted that floors were free from standing water and 90.6% reporting adequate ventilation. Furthermore, 79.5% stated that bathtubs did not serve as breeding sites for mosquitoes. However, a significant deficiency was identified in the adequacy of the number of toilets, with only 32.3% rating this as good and 67.7% perceiving it as poor. It indicated that the perception of *santri* regarding the number of toilets is low. This finding is also found in Al-Ittihad Pesantren, where the number of toilets is does not meet criteria¹³. In addition, the distance ³⁴ween toilet container and source of clean water required attention, where the distance less than 10 meters will increase the risk of water contamination that rising the susceptibility of oral-fecal disease.

Wastewater disposal systems were reported to be functioning well. 88% of respondents reported the drainage channels as appropriately separated from liquid waste disposal, closed and watertight, free from blockages, environmentally safe, and directed into septic tanks without leakage into the soil. On the other hands, Solid waste disposal facilities were also reported positively, with 82.7% of respondents noted the availability of trash bins in each room, 83.5% acknowledging the presence of temporary disposal sites (TPS) for all areas, and 76.4% of respondents reported that the placement of TPS is approximately 10 meters away from classroom, dormitories, or building.

Waste either water and solid produced by pesantren is one of environmental issue. The presence of this waste may catalyze the existing of breeding site of disease vector, such as *Aedes*, where it can intensify the

transmission of dengue. In addition, this condition also adverse the health outcome through direct and indirect transmission between pathogen to human. Therefore, health issue such as Salmonellosis, Diarrhea, Scabies, Cholera is potentially found in pesantren with high magnitude. Study by Futri et al, on the other hands, found 65% diarrhea case in pesantren at Jambi City¹⁵. Study among *santri* in Medan found 48.6% of diarrhea case¹⁶.

This study found that wastewater disposal system, clean water facilities, waste disposal facilities, and toilet pose high average score by 90,1%, 82,1%, 80,9%, and 80,3%, respectively. Yet the housing density's perception with low rating is relatively high with 40,2%. Based on the survey, the most crucial finding is that 67.7% of respondents considered the number of toilets inadequate by the rate of poor toilet availability is high. This is not merely a complaint about comfort but an indicator of a public health risk in a densely populated setting¹⁷. National standards in Indonesia recommend a toilet ratio of at least 1:40 for male, while 1:25 for female¹⁸. Fahham et al also noted that one toilet should be provided for every addition 10 *santri*. The negative perception identified in this study suggests that the actual ratio in the study site is below the recommended standard, leading to high usage density. This condition directly correlates with increased risks of oral faecal disease transmission, since toilets serve as hotspots for pathogens such as *E. coli* and *Shigella*(2,4). Studies conducted in pesantren have consistently reported similar findings, identifying insufficient toilet ratios as a major predictor of communicable disease incidence^{19,20}. Beyond physical health, long waiting times generates psychological stress and diminish dignity among students²¹.

Paradoxically, the qualitative aspects of toilet facilities were reported highly positive. The majority of respondents perceived toilets to be clean (92.1%), well-ventilated (90.6%), and free of mosquito breeding sites (79.5%). This illustrates the dichotomy between sanitation physical infrastructure, which remains insufficient, and sanitation behavioral practices, management, and hygiene promotion, which appears to be functioning effectively²². This finding indicates that pesantren administrators and *santri* have successfully implemented effective maintenance and cleaning systems. Routine cleaning practices and collective awareness to maintain shared facilities are valuable assets. Nevertheless, it must be emphasized that effective sanitation behavioral practice cannot fully compensate for inadequate sanitation physical infrastructure in the long term, as the maintenance burden becomes unsustainable and health risks remain high²³. Study by Choiri and Ma'adi highlights that clean toilet is correlated to the presence of sense of belonging among *santri*²⁴.

Positive perceptions of clean water facilities (availability, quality, and safety of sources) highlight a vital pillar supporting ²²her aspects of hygiene. Adequate access to clean water directly enhances the frequency and effectiveness of handwashing with soap, which is the most effective intervention for preventing diarrheal and respiratory diseases²⁵. Ensuring reliable water access in pesantren must be preserved. Similarly, positive perceptions of wastewater and solid waste management indicate a comprehensive understanding of environmental sanitation. A closed drainage system connected to septic tanks will prevents soil and surface water contamination, while the provision of trash bins in each room promotes responsible waste disposal behavior. Proper waste management is essential for vector control, not only for mosquitoes such as *Aedes aegypti* but also for flies and rodents that transmit diseases such as leptospirosis and typhoid fever^{26,27}, where these are the principal for biological and physical vector for disease.

The demographic profile of respondents, dominated by young females (88.2%), brings another dimension to the urgency of toilet adequacy. Inadequate sanitation poses a disproportionate burden on women, particularly in terms of Menstrual Hygiene Management (MHM)²⁸. Safe MHM requires clean toilets with sufficient water and sanitary disposal facilities. The lack of such facilities may force female students to adopt unhygienic practices, increasing the risk of reproductive tract and urinary tract infections²⁹, as well as contributing to absenteeism from learning activities due to discomfort and shame³⁰. The perception of poor housing density among *santri* is also reported relatively high, indicating that the facilities or availability of dormitory required attention. Dense housing among *santri* will elevate the risk of communicable disease such as tuberculosis, pneumonia, and scabies. Study by Ma'rufi³¹ found that patients with tuberculosis were highly distributed in population with low hygiene and environmental sanitation.

This study has several limitations, namely the data were entirely based on students' subjective perceptions, where further study should provide ³ight regarding the sanitation level through observation approach to infrastructure and facilities in pesantren, the study was conducted in a single Islamic boarding school, which may limit the generalizability of findings to other pesantren with different characteristics. This study did not directly measure quality of sanitation and disease prevalence among *santri* in pesantren, where further study is required to assess the quality of sanitation and health risk among *santri* including the determinant factor for the disease transmission.

CONCLUSION

This study found that *santri* at Pondok Pesantren An Najah generally reported positive perceptions of wastewater disposal system (90,1%), clean water facilities (82,1%), soild waste management (80,9%), and toilet (80,3%). However, two critical deficiencies were identified, namely the adequacy of toilet quantity was perceived as poor (67.7%) and housing density was recorded as inadequate by 40.2% of respondents. These findings

underscore the need to improve the availability of toilet and dormitory facilities for *santri*, alongside continued reinforcement of hygiene education and sanitation management practices on *pesantren*.

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