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OPEN ACCESS ORIGINAL ARTICLE

Environmental Hygiene Among Students: A Cross-Sectional Study at Abu Harbi School, Aden, Yemen

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ABSTRACT

Background: This research assessed the awareness, behaviours, and practices concerning environmental hygiene among fourth- and fifth-grade students at Abu Harbi School in Aden, Yemen. The study sought to evaluate students' comprehension of cleanliness, their involvement in hygiene-related initiatives, and the efficacy of the school's infrastructure in facilitating these endeavors. Data were gathered via surveys, interviews, and observations from a cohort of 100 students. Data was analyzed using SPSS version 26. Descriptive analysis was used in this study.

Outcomes: The study comprised 46% males and 54% females, with 52% of participants attaining a fourth-grade level and 48% achieving a fifth-grade level. Findings revealed a moderate level of student awareness regarding environmental cleanliness and its health consequences. Although some cleanliness infrastructure, including waste bins, existed, maintenance practices and student involvement in environmental campaigns were deemed insufficient. Gender disparities in waste management practices were noted, with males exhibiting marginally higher rates of consistent garbage disposal (55%) and females displaying a greater propensity for the presence of waste bins in their vicinity (62%).

Conclusion: The conclusions emphasise the necessity for enhancements in hygiene teaching, facility upkeep, and student involvement in sustainability initiatives within the educational setting. The study emphasizes the crucial role of schools in fostering environmental consciousness and promoting healthy living among students.

Keywords: Hygiene, Students, Cleanliness, Aden, Yemen.

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INTRODUCTION

The cleanliness of the environment, especially in educational institutions, is essential not only for visual appeal but also for public health. In educational institutions, where children allocate substantial time daily, a hygienic environment is crucial for mitigating illness transmission, enhancing general health, and cultivating a conducive learning atmosphere [1]. Schools are distinctive environments where students get instruction in academic disciplines as well as social values, encompassing the significance of sustainability and environmental stewardship [2]. In these environments, pupils initially discover the relationship between hygiene, health, and well-being [3].

With global concerns such as pollution, climate change, and rising urbanisation, preserving sanitary and sustainable settings has become increasingly important. Polluted environments contribute to a variety of health problems, including respiratory and gastrointestinal ailments [4]. Poor hygiene procedures in public places, such as schools, enhance these environmental dangers [5]. Thus, fostering cleanliness in schools is not just about maintaining a healthy atmosphere, but also about developing in kids a feeling of responsibility towards their surroundings, which may continue into adulthood.

Many previous studies have repeatedly proven that a school's cleanliness influences not just student health but also cognitive and academic performance [6]. Research conducted in many countries have emphasised the relevance of hygiene instruction and the requirement for constant upkeep of school infrastructure [7]. For example, Malaysian research discovered that inadequate cleanliness procedures in school canteens contributed considerably to foodborne infections, which affected both students and staff [8]. Similarly, paper conducted in Brazil found a relationship between inadequate sanitation and the development of infectious illnesses, emphasising the significance of proper waste disposal and pest management in schools [9].

The cleanliness infrastructure of Abu Harbi School, which includes trash disposal containers, sanitation facilities, and cleaning methods, exists, however it is not routinely maintained. Furthermore, despite the existence of periodic cleaning initiatives, student participation is negligible. The purpose of this study is to assess the current conditions at Abu Harbi School and make recommendations for improving its environmental hygiene standards. In addition, this study aimed to assess the current level of environmental hygiene awareness and involvement among Abu Harbi School students. It also seeks to identify the most crucial areas for improvement in order to establish a healthy school environment by examining student behaviours, school infrastructure, and the effectiveness of environmental efforts. Moreover, this study intends to identify gaps in understanding and engagement in order to make recommendations for enhancing the school's environmental hygiene practices, hence promoting better health outcomes and a more sustainable school environment.

RESEARCH METHODS

Study Design

This study employed a descriptive and analytical technique to assess environmental hygiene awareness, and infrastructure at Abu Harbi School, Aden, Yemen. This study was conducted in the period between November and December 2023.

Study Area

The study was conducted at Abu Harbi School in Aden, Yemen. The school has some young students who, if given the right information and skills, have the potential to become effective advocates for environmental sustainability and cleanliness.

Sample Size

The study was conducted with a sample of 100 students from Abu Harbi School, consisting of 50 fourth-grade students and 50 fifth-grade students. Stratified random sampling was employed to ensure

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equal representation from both grades. This approach helped obtain a more balanced view of environmental hygiene practices across different age groups within the school.

Sample Size Calculation

To determine the appropriate sample size, we used a simple formula for sample size calculation in proportionate stratified sampling:

$$n=Z^2 \cdot p \cdot (1-p) / E^2$$

Where:

- n = sample size,
- Z = Z-value (1.96 for a 95% confidence level),
- p = estimated proportion of students studying at the school (0.5, which gives the maximum sample size),
- E = margin of error (0.05).

Substituting values into the formula:

$$n=1.96^2 \times 0.5 \cdot (1-0.5) / 0.05^2 = 384$$

To achieve a more manageable sample size while maintaining reasonable statistical power, we adjusted the margin of error to 0.10. This increased margin of error allows for a wider range of potential outcomes, reducing the required sample size.

Recalculating with the adjusted margin of error:

$n = 1.96^2 \times 0.5 \times (1-0.5) / 0.10^2$
$n = 3.8416 \times 0.25 / 0.01$
$n = 0.9604 / 0.01$
$n = 96.04$

Therefore, for a 95% confidence level with a 10% margin of error, a sample size of approximately 96 would be needed. However, we calculated 100 participants.

Data Collection Procedure

Data were collected using the following tools:

Student Questionnaire

This survey aimed to assess students' awareness of environmental hygiene, their hygiene practices, and their participation in school cleanliness activities. It included both closed- and open-ended questions. Examples of questions include:

- "Do you dispose of garbage regularly?" Answer: Yes or No
- "Is waste disposed of in designated areas?" Answer: Yes or No
- "Do you participate in school cleaning campaigns?" Answer: Yes or No

Teacher Questionnaire

This tool gathered information from teachers about the state of infrastructure at the school, including waste disposal systems, maintenance of cleanliness facilities, and the integration of environmental hygiene into the curriculum. Teachers were also asked about their views on students' involvement in cleanliness initiatives.

Observation Checklist

Observational data were collected to assess actual student behavior regarding waste disposal, plant care, and other cleanliness practices. Observations were conducted in the classroom, playground, and schoolyard to monitor cleanliness practices in different environments.

Ethical Approval

The research was authorised by both the school administration and the ethics committee of the university of Science and Technology, Aden, Yemen with ethical approval number MEC AD050. Consent forms were issued to all participants (pupils and parents). The permission forms promised participants that their replies would be kept secret, and that no personal identifiers would be utilised in the research. School students were free to withdraw from the research at any time.

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Data Analysis

The collected data were analysed by SPSS software version 20 to discern trends and relationships among various factors. Descriptive statistics, encompassing frequencies and percentages, were employed to encapsulate demographic data and survey responses. For instance, the percentage of students who regularly dispose of waste was determined for enquiries regarding waste disposal practices. Regarding infrastructure (e.g., availability of waste bins), the percentage of students reporting access to such facilities was calculated. Furthermore, inferential statistics were utilised to investigate potential correlations between student awareness and behaviour. Chi-square tests assessed the association between gender and specific behaviours (e.g., waste disposal and plant care). The analysis aimed to evaluate whether the observed differences were statistically significant.

Survey Questions

The survey used in this study included a variety of questions to assess students' awareness, behavior, and participation in environmental hygiene practices. Sample questions included:

- Does Islam emphasize cleanliness? Answer: Yes or No
- Have you ever been educated about environmental cleanliness? Answer: Yes or No
- Do you consider the school environment safe for playing and activities? Answer: Yes or No
- Is there a waste bin in the schoolyard? Answer: Yes or No
- Do you participate in collective cleaning campaigns at school? Answer: Yes or No
- Are there plants in the school? Answer: Yes or No
- Do you take care of them? Answer: Yes or No
- Do you wash your hands before eating? Answer: Yes or No
- Do you dispose of garbage regularly? Answer: Yes or No
- Should the community participate in street cleaning campaigns? Answer: Yes or No

RESULTS

The survey results were organised into topics based on student replies, with some major elements summarised in tables 1 and 2. Table 1 shows that the sample is 46% male and 54% female, with a slight female predominance. In terms of academic level, 52% of participants completed fourth grade and 48% completed fifth grade.

Table 1: Demographic Information of Participants n= 100

Category	Males (%)	Females (%)
Gender	Males	46.0
	Females	54%
Educational Level	Fourth Grade	52%
	Fifth Grade	48%

Table 2 illustrates gender-based differences in waste management and environmental care practices. Males are more proactive in regular garbage disposal (55%) and slightly more likely to use designated waste disposal areas (52%-53%). However, females are more likely to have waste bins in their surroundings (62%) and slightly prioritize plant care (52%). Both genders show near-equal agreement on the importance of community involvement in street cleaning campaigns, indicating shared responsibility for environmental upkeep.

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Table 2: Awareness, Behavior, and Practices Related to Environmental Hygiene Among Students n = 100

Question	Males (%)	Females (%)	Interpretation
Q1: Do you dispose of garbage regularly?	55%	45%	Males (55%) dispose of garbage more regularly than females (45%).
Q2: Is waste disposed of in designated areas in the classroom?	52%	48%	Males (52%) are slightly more likely to dispose of waste in designated areas.
Q3: Is waste disposed of in designated areas in the classroom?	53%	47%	Males (53%) show a slightly higher tendency to dispose of waste properly.
Q4: Are there specific waste bins in your area and around your home?	38%	62%	Females (62%) are more likely to have waste bins in their areas compared to males (38%).
Q5: Do the plants get a suitable environment and care?	48%	52%	Females (52%) are slightly more likely to ensure plants receive proper care.
Q6: Should the community participate in street cleaning campaigns?	51%	49%	Both genders largely agree on the need for community participation in street cleaning.

Table 3: Gender-wise Association with Environmental Practices n = 100

Question	Males (%)	Females (%)	Chi-square Value	P-value	Interpretation
Q1: Do you dispose of garbage regularly?	55%	45%	3.84	0.05	Males are more likely to dispose of garbage regularly; borderline significance.
Q2: Is waste disposed of in designated areas?	52%	48%	0.64	0.42	No significant association between gender and proper waste disposal.
Q3: Is waste disposed of in designated areas?	53%	47%	1.00	0.32	No significant association between gender and proper waste disposal.
Q4: Are there specific waste bins in your area?	38%	62%	7.56	0.006**	Females are significantly more likely to have waste bins in their area.
Q5: Do the plants get a suitable environment/care?	48%	52%	0.16	0.69	No significant association between gender and plant care.
Q6: Should the community participate in cleaning?	51%	49%	0.04	0.84	Both genders equally agree on community participation in cleaning campaigns.

Table 3 highlights that most questions show no significant association with gender, except for Q4, where females are significantly more likely to report the availability of specific waste bins in their areas.

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DISCUSSION

The study's findings reveal that while the majority of participants recognize the importance of cleanliness, their actual habits and involvement in school cleaning efforts remain limited. Furthermore, even with the presence of basic infrastructure such as garbage bins, cleanliness-related facilities, and the school's participation in environmental activities, there is still a need for development.

One major conclusion was that male students were more likely than female students to dispose of rubbish on a regular basis and in authorised waste disposal places. This might represent behavioural variations driven by social or cultural variables, as well as disparities in how hygiene practices are taught or enforced in the school setting. Our findings are consistent with research done in Brazil by Ferreira JD et al [10] on the link between school cleanliness and student hygiene behaviour, which discovered that student engagement in hygiene activities was substantially connected to their level of education and awareness. The study discovered that higher levels of hygiene education were associated with improved waste management and cleaning habits, similar to the moderate awareness level obtained in our study. However, as with Abu Harbi School, the study found that despite the availability of infrastructure, maintenance and active participation in cleanliness efforts were frequently insufficient. Our findings differ with those of ONG'INJO AJ [11], who performed a research in Kenya on hygiene practices in school canteens and discovered a considerably greater direct correlation between infrastructure (i.e., well-maintained waste disposal systems) and improved student hygienic behaviour. According to the findings of this study, students demonstrated better levels of hygiene awareness and involvement in cleanliness activities when regular maintenance and clear waste disposal systems were in place. The disparity in findings might be attributable to varying emphasis on environmental cleanliness initiatives and infrastructure upkeep. While Abu Harbi School has some basic amenities, low student involvement and uneven upkeep appear to be significant impediments, albeit less so in the Malaysian research.

The disparity between the findings of this study and those of studies in Brazil and Kenya highlights the complexities of promoting appropriate environmental hygiene practices in schools. Infrastructure is important, but it is not the only element determining student behaviour. This study reveals that continual teaching, active student involvement, and regular maintenance are essential for long-term effectiveness in promoting cleanliness. The disparities in findings show the relevance of contextual elements such as cultural attitudes towards cleanliness, the extent of hygiene education integrated into the curriculum, and the role of teachers and school administration in fostering sustainable behaviours.

The findings of this study show a substantial relationship between gender and the availability of specialised garbage containers in respondents' neighbourhoods. Females were more likely to report the existence of rubbish containers in their surroundings than males. This disparity may represent gender differences in environmental knowledge, family duties, or views of infrastructure. Women frequently have a more significant role in domestic garbage management, which may increase knowledge of waste disposal services in their surrounding vicinity. Sharma et al. [12] reported similar results in India, with women reporting much more access to garbage disposal services in their neighbourhoods than males. The authors ascribed this to women's regular participation in domestic garbage management and their proclivity to be more aware of local environmental concerns. This is consistent with our findings and strengthens the notion that gender roles might impact perception and reporting on waste management infrastructure. In contrast, a study in Nigeria by Adeyemi et al. [13] revealed no significant gender differences in garbage bin knowledge or availability. The study found that

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both genders in urban and peri-urban regions have equal access to garbage disposal facilities as a result of the region's universal waste management initiatives. This disparity emphasises the importance of localised elements, such as community-based trash management activities, in affecting accessibility and attitudes. The variations across research can be attributable to different cultural, socioeconomic, and infrastructure environments. In Yemen, conventional gender norms may imply that women are more involved in regular home activities, such as garbage disposal, which makes them more aware of the presence (or lack thereof) of rubbish containers. In contrast, in contexts with strong waste management systems or equitable duty sharing, such as those reported by Adeyemi et al., gender inequalities may be less significant.

Furthermore, the study's location—urban or rural—can alter the findings. Women may report higher levels of knowledge owing to their responsibilities, even in remote locations with less established infrastructure. This is consistent with our conclusion that domicile (village vs. city) has a major impact on trash management techniques.

CONCLUSION

Environmental hygiene in schools is essential for promoting student health, fostering a conducive learning environment, and instilling a sense of responsibility toward sustainability. The findings of this study at Abu Harbi School highlight both strengths and areas for improvement in the school's environmental hygiene practices. While students show moderate awareness of the importance of cleanliness, their behaviors, and participation in school cleanliness initiatives are insufficient. The infrastructure supporting cleanliness, such as waste bins and sanitation facilities, exists but is not always well-maintained, which affects its effectiveness. This study underscores the importance of integrating environmental hygiene education into the school curriculum, as well as the need for more active student involvement in cleanliness activities and campaigns. Schools must also prioritize the maintenance of cleanliness-related infrastructure to ensure that it meets the needs of the students and promotes a healthy school environment.

Based on the findings, the following recommendations are proposed:

Integration of Hygiene Education

It is crucial to incorporate more comprehensive environmental hygiene education into the school curriculum to deepen students' understanding of the connection between cleanliness and health, as well as the environmental impacts of poor hygiene practices.

Improvement in Infrastructure Maintenance

Regular upkeep and monitoring of cleanliness infrastructure, such as waste disposal systems, sanitation facilities, and cleaning routines, must be ensured to create a sustainable, hygienic environment.

Promotion of Student Engagement

Encouraging greater student involvement in cleanliness campaigns and environmental initiatives will foster a culture of responsibility. This could be achieved through the establishment of student-led hygiene clubs or more frequent and engaging school-wide cleaning events.

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