

Assessment of Fire Safety Measures in On-Campus Housing Facilities: A Case Study of Caleb University's Male Hostel

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Abstract

Universities, including Caleb University, offer various on-campus housing options, such as hostels and private residences. Ensuring fire safety in these facilities is paramount for the protection of students, staff, and property. This study investigates the fire safety measures in place at Caleb University's male hostel, examining both the physical infrastructure and the awareness and training of residents and staff. Using a mixed-methods approach, the study combines a physical inspection of fire safety equipment and infrastructure with semi-structured interviews to assess the comprehensiveness of fire safety protocols and awareness programs. The findings reveal significant gaps in both the awareness and implementation of fire safety measures. Only 33% of the staff and 69% of students are aware of any fire safety programs, and 86% of the staff and 65% of the students lack knowledge of evacuation protocols. These deficiencies highlight the need for structured and mandatory fire safety training, regular drills, and clear communication of evacuation procedures. Recommendations include the development of comprehensive fire safety programs, integration of fire safety education into the curriculum, regular maintenance of fire safety equipment, and partnerships with local fire safety authorities. Implementing these measures can improve the safety and preparedness of Caleb University's residential facilities, providing a safer living environment for all residents.

Keywords: Emergency Preparedness, Evacuation Protocols, Fire Safety, Fire Safety Awareness, University Housing.

Introduction

Universities offer a variety of on-campus housing arrangements for their students, including housing facilities, hostels, and private guest residences. It is expected to provide an attractive environment, conducive for learning and academic success, appropriate functionality that is in compliance with codes or standards, and adequate safety features (Velarde et al., 2020). Making provisions for fire safe facilities involves a comprehensively balanced action set consisting of continual fire safety awareness programs and education for the staff and students, firm adherence to fire safety legislative regulations, adequate fire protection features' maintenance, and prevention measures limiting potential fire sources and causing a reduction in total fuel load still existing. In the event that fire safety systems for facilities are designed in accordance with prescriptive regulations, there are likely to be some built-in assumptions regarding, occupant evacuation, fire spread potential, fire

detection, fire alarm triggering, and fuel load (Pekhotikov et al., 2022). Besides, it is necessary to ensure that, when a fire occurs, all the safety measures provided will be available for use and will perform satisfactorily (Festag, 2021). Despite the existence of fire safety rules and awareness programs, fires continue to occur in student dormitories, showing lapses in preventive and response plans.

The problem addressed in this research is the inadequacy and non-compliance of current fire safety measures in student hostels, specifically within the male hostel at Caleb University. This inadequacy poses significant risks to the safety of residents and the continuity of academic activities. The study seeks to investigate these shortcomings to propose improvements, emphasizing the importance of robust fire safety measures for the protection of lives, property, and the sustainability of educational environments. This paper explores these difficulties in the context of a specific educational institution, revealing insights into the efficiency of current fire safety procedures and possibilities for improvement by assessing the adequacy and compliance of fire safety measures with regulatory standards and the identification of potential vulnerabilities and areas for improvement in fire prevention. Facility managers are required by law to take all reasonable precautions to avoid fires and to guarantee, to the extent that it is practically possible, the safety of visitors, employees, and other residents in the event that a fire breaks out on the property. The people who live there aren't excluded, they also have obligations when it comes to fire safety.

Fires in educational institutions are a global concern, it is capable of causing irreparable harm especially to human life, property damage and disruption of educational activities. Studies by the National fire protection Association (NFPA) in the United States made public information giving insights as to fire frequency in educational facilities within the country. According to a report by the National Fire Protection Association (NFPA) an estimated average of 3,230 structure fires occurred in schools each year. It was discovered that fires resulted in an annual average of one civilian death, 39 civilian injuries, and a staggering \$37 million in direct property damage. (Campbell & National Fire Protection Association, 2020). The Minister of Interior, Rauf Aregbesola, stated that no fewer than 136 lives and property worth Three (3) trillion Naira were lost to fire incidents in 2021 (Idoko, 2022). The Punch Editorial Board (2024) discovered that 2,056 cases of fire incidents lost over One Trillion Naira of properties in 2022. Unfortunately, the lack of readily available fire statistics on a local level for educational facilities similar to what was done by the National Fire Protection Association (NFPA) in the United States underscores the need for fire safety studies locally. This case study of Caleb University's male Hostel seeks to bridge this knowledge gap. The examination of the various building types limited to the male hostel within the university and its unique fire risks, can create targeted recommendations for the improvement of fire safety practices and create a much safer living environment for the residents of Caleb University and any other University or school of technology facing similar problems. The objectives of this study are to assess the adequacy of current fire safety measures in Caleb

University's male hostel; evaluate compliance with existing fire safety regulations and standards; identify specific fire risks unique to the male hostel environment and propose targeted recommendations for improving fire safety practices based on empirical findings and best practices.

Literature Review

Overview of Fire Safety Regulations in Nigeria

Nigerian fire safety regulations aim to minimize fire damage and loss of life in buildings. The Federal Fire Service Act serves as the national framework, outlining the responsibilities of the Federal Fire Service (FFS) in coordinating fire safety initiatives across the country (Safe Guard Safety, 2024). The Act mandates fire alarm systems for early detection, clearly marked emergency exits, and adequate firefighting equipment proportional to building size and occupancy (Crimmins, 2019; Martini et al., 2022; Voloshenko et al., 2022). Additionally, building owners are responsible for regular inspections to ensure functionality (Tsujimoto et al., 2018). This regulatory framework lays the foundation for fire safety in Nigerian buildings, emphasizing compliance and preventive measures.

Importance of Fire Safety Regulations in Student Dormitories

The literature underscores the critical role of fire safety regulations in student housing. These regulations ensure that policies and practices are in place to minimize fire risks and enhance the safety of residents (Hassanain et al., 2018). Effective fire safety management includes regular reviews and updates based on risk assessments and changes in regulations, as well as communicating fire safety procedures to residents and staff (Egodage et al., 2020). Compliance with local fire safety regulations, such as the Federal Fire Service Act, is essential in creating a comprehensive fire safety strategy for student accommodations (Smith, 2021).

Knowledge and Awareness of Fire Safety Measures

Research indicates a significant gap in knowledge and awareness of fire safety measures among students and staff in educational institutions. A study by Zhang (2022) found that a large percentage of university populations, including staff and students, have moderate to less-than-moderate knowledge of fire safety measures. Additionally, a limited number of individuals know how to operate fire safety equipment, such as fire extinguishers and alarms (Chyi, 2022). This lack of awareness underscores the need for improved fire safety education and training within university settings.

Zakaria et al. (2019) conducted a study at a Malaysian university and discovered that only 47% of respondents were familiar with firefighting equipment and evacuation procedures. This finding suggests a need for enhanced fire safety education and emphasizes the importance of equipping students and staff with the necessary knowledge to respond effectively to fire emergencies.

Conceptual Frameworks and Fire Safety Management

The establishment of a conceptual framework for fire safety management can guide higher education institutions in delivering essential information to emergency response teams (Yusof et al., 2021). Existing studies have highlighted a troubling lack of fire safety knowledge among students and the general public (Zhang et al., 2022). This gap in knowledge serves as a critical motivator for the current research, which aims to improve fire safety practices and awareness in university settings.

Research Gaps

The reviewed literature reveals several gaps in current research on fire safety in educational institutions:

- i. **Limited Local Studies:** While studies such as those conducted by the NFPA provide valuable insights into fire safety in educational settings, there is a lack of localized research data in Nigeria, particularly concerning university dormitories.
- ii. **Knowledge and Awareness Deficiency:** There is a clear deficiency in fire safety knowledge and awareness among students and staff, which can lead to increased risks during fire incidents.
- iii. **Need for Improved Training Programs:** The literature suggests that current fire safety training programs are inadequate and need to be enhanced to ensure that all residents know how to use firefighting equipment and understand evacuation procedures.

This study addresses these gaps by focusing on the fire safety measures within Caleb University's male hostel. It aims to assess the current knowledge and awareness of fire safety among residents and evaluate the adequacy of existing fire safety measures. By doing so, the study provides localized insights and practical recommendations for improving fire safety practices and training programs, contributing to enhanced safety and sustainability in educational environments.

Methodology

A mixed-methods approach was used in this study to comprehensively assess the fire safety precautions in university residence halls. This approach allowed for both qualitative and quantitative data collection, providing a holistic understanding of the current fire safety environment within the male hostel of Caleb University. The study was conducted in two main phases: a physical inspection of the existing fire safety infrastructure and semi-structured interviews with key personnel involved in fire safety management.

Research Design

The study employed a descriptive cross-sectional research design. This design was chosen to assess the current state of fire safety measures at a single point in time and to explore the experiences and perceptions of those responsible for fire safety management. The

mixed-methods approach allowed for triangulation of data, enhancing the reliability and validity of the findings by combining both quantitative and qualitative data collection techniques.

Sampling Method and Sample Size

A purposive sampling method was employed to select participants for the study. Purposive sampling was chosen because the study required insights from specific individuals who had direct knowledge and involvement in fire safety practices within the male hostel. The key personnel selected for the semi-structured interviews were hostel supervisors and facility managers, as they are directly responsible for implementing and overseeing fire safety measures in the hostel.

The sample size for the physical inspection was focused on one male hostel within Caleb University, chosen to provide a detailed case study of fire safety practices in a specific educational context. To determine the appropriate sample size for the semi-structured interviews and questionnaire distribution, Yamane's formula was applied, ensuring a representative sample of the study population. Using this formula, a sample size of 329 respondents was calculated to distribute questionnaires among students, staff, and other relevant stakeholders in the hostel. Additionally, semi-structured interviews were conducted with 5 hostel supervisors, selected based on their direct involvement in fire safety management. The sample size for the interviews was deemed sufficient as data saturation was reached, with no new themes emerging from the last few interviews, confirming that the sample size was adequate for the qualitative aspect of the study.

Data Collection Procedures

The data collection process was meticulously divided into two distinct phases namely physical inspection and semi-structured interview.

Phase 1: Physical Inspection

A thorough on-site inspection was conducted by a trained researcher to document the existing fire safety infrastructure and equipment within the male hostel. The inspection process was systematic, involving detailed walkthroughs of the hostel premises to identify and record fire safety equipment and facilities. Specific details recorded included:

- i. **Type of Fire Safety Equipment:** A comprehensive inventory of all fire safety equipment, including smoke alarms, fire doors, emergency exits, and fire extinguishers, was compiled.
- ii. **Number of Equipment Units:** The exact number of each type of equipment was meticulously documented to provide a quantitative understanding of the overall fire safety preparedness.

- iii. Location of Equipment: The specific location of each piece of equipment within the hostel was meticulously documented through detailed notes and supplemented with photographs or floor plans for enhanced clarity.

This meticulous physical inspection aimed to provide a clear picture of the tangible resources available for fire prevention and response within the hostel environment.

Phase 2: Semi-Structured Interviews

Following the physical inspection, the research delved deeper into the fire safety practices and protocols implemented within the hostel through semi-structured interviews with key personnel, specifically hostel supervisors. These individuals possess a wealth of knowledge about the day-to-day operations and fire safety procedures employed within the residence. The interview guide, meticulously crafted beforehand, explored a range of critical topics designed to illuminate the fire safety practices beyond readily observable elements. Key areas of inquiry included:

- i. Resident Fire Safety Awareness Programs: The interview inquired about the existence and structure of any fire safety awareness programs offered to residents. This insight shed light on the efforts undertaken to educate residents on fire prevention techniques, evacuation procedures, and proper fire extinguisher usage.
- ii. Evacuation Protocols: The interview explored the established evacuation protocols in place for the event of a fire emergency. This included details on designated assembly points, communication protocols for alerting residents, and ensuring a smooth and safe evacuation process.
- iii. Staff Training on Fire Safety Procedures: The interview investigated the frequency and comprehensiveness of fire safety training provided to the hostel staff. This information revealed the level of preparedness and knowledge possessed by the staff responsible for resident safety during a fire emergency.

All interviews were conducted in a private and secure setting to encourage open and honest responses from the participants. Each interview lasted approximately 30 to 45 minutes and was audio-recorded with the informed consent of the participants. The recordings were then transcribed verbatim to ensure the meticulous preservation of every detail for subsequent analysis.

Data Analysis

The data collected from both phases were collated and analyzed systematically.

- i. Quantitative Analysis: The results of the physical inspection were presented in a descriptive manner, outlining the types and quantities of fire safety equipment discovered and their specific locations within the hostels. This quantitative data provided a clear overview of the current fire safety infrastructure.
- ii. Qualitative Analysis: The interview transcripts were analyzed using thematic analysis techniques to uncover important themes regarding the hostels' fire safety

procedures. Thematic analysis involved coding the data to identify recurrent themes and potential knowledge gaps related to fire safety awareness, evacuation protocols, and staff training.

Additionally, government fire safety regulations and standards for university housing were reviewed to establish best practices. This review helped to contextualize the findings within the broader framework of fire safety standards and identify areas for improvement in the current practices at Caleb University.

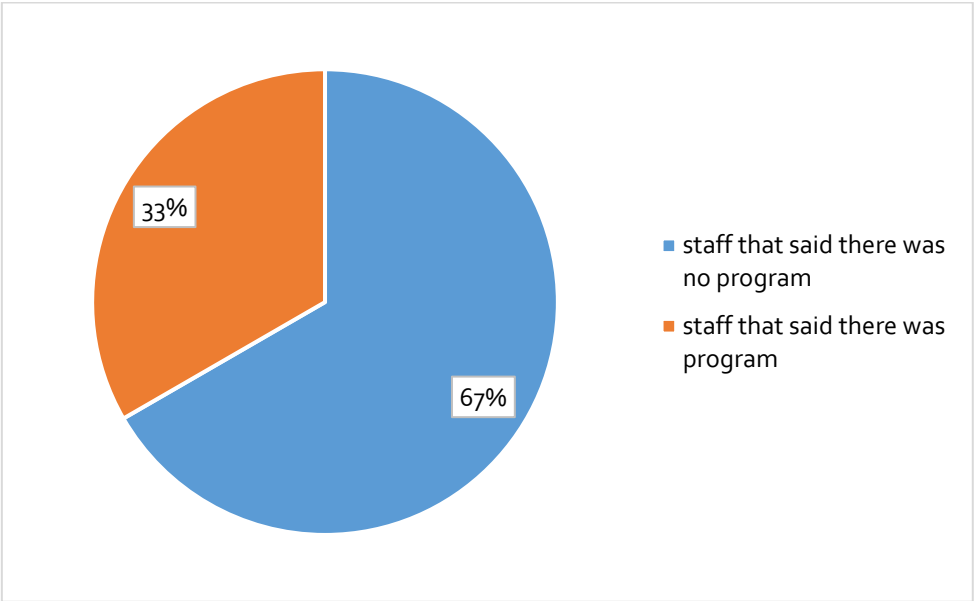
Ethical Considerations

The study adhered to ethical guidelines throughout the research process. Informed consent was obtained from all interview participants, ensuring they were fully aware of the study's purpose, their role, and their right to withdraw at any time. Confidentiality and anonymity were maintained to protect the privacy of the participants and the institution.

Findings and Discussion

A total of 7 staff members and 329 students residing in the male hostels of Caleb University participated in this research.

Figure 1: Resident Fire Safety Awareness Programs (Staff)



Source: Authors Fieldwork (2024)

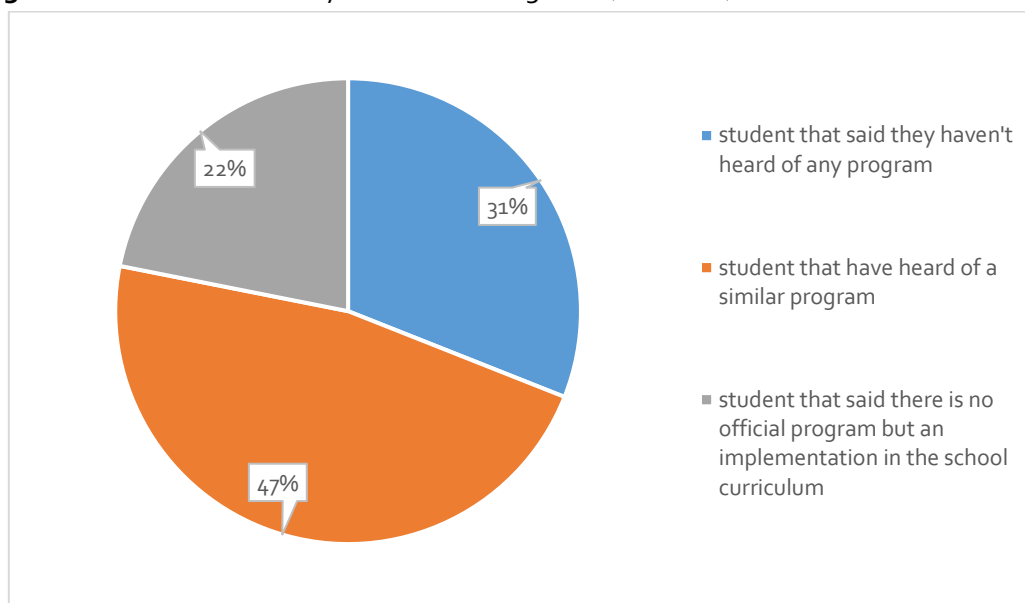
When questioned about the existence of fire safety awareness programs at Caleb University, responses from the staff varied significantly. A substantial 67% of the staff confirmed that there are no formal fire safety awareness programs in place, stating that any knowledge they possess about fire safety is based purely on personal experience and 33%

of the staff admitted that fire safety is mentioned only casually and not through any structured or dedicated awareness programs.

The responses from Caleb University staff, as depicted in figure 1, highlight a critical gap in fire safety preparedness. The 67% of staff who rely on personal experience rather than formal training reflects a reactive rather than proactive approach to fire safety. This aligns with findings by Amasi (2021), who argue that informal knowledge is insufficient for comprehensive fire safety, which requires systematic education and regular drills.

The staff who declined to respond may indicate a lack of awareness or discomfort in acknowledging deficiencies in fire safety measures. According to a study by Rice and Cooper (2010), non-responsiveness in safety surveys can be symptomatic of underlying issues such as inadequate training or fear of repercussions for admitting ignorance. The 33% who reported only casual mentions of fire safety underscore the need for more structured programs. Research by Rahman, Khan & Tanni (2022) shows that casual mentions are far less effective than formal training programs in ensuring preparedness and reducing fire-related risks.

Figure 2: Resident Fire Safety Awareness Programs (Students)



Source: Authors Fieldwork (2024)

Similarly, student responses highlighted varying degrees of awareness and participation in fire safety programs. Specifically, 31% of the students said they have not heard of any such programs. In contrast, 47% stated that they attended something similar upon resumption in their second year, and 22% mentioned that while they did not know of any specific programs, something similar was integrated into their school curriculum.

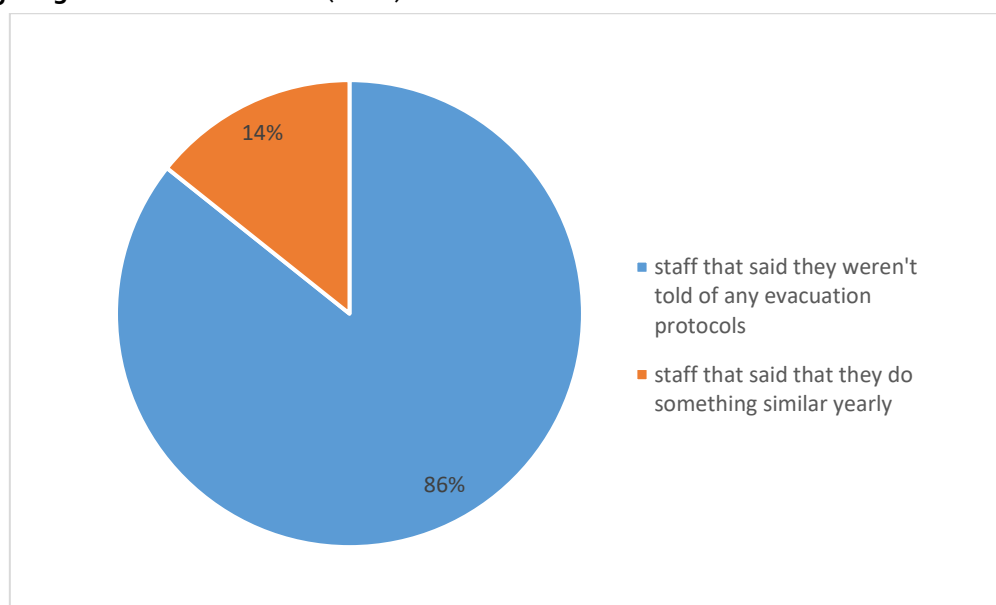
Among the students, the data suggests a mixed level of exposure to fire safety awareness. The 31% who have not heard of any programs indicate a significant gap in communication

or implementation of such programs. This is problematic as effective fire safety education should reach all students, as emphasized by Smith (2021), who found that schools with regular fire drills and awareness sessions significantly improved the fire response behavior of both staff and students.

The 47% of students who attended something similar in their second year suggests that there are some efforts being made, but they may not be consistent or comprehensive enough to cover all students from the onset. Regular and consistent training is critical, as highlighted by Lawson, G., Roper, Shaw, Hsieh & Cobb (2020), who advocate for ongoing fire safety education throughout students' academic journey.

The 22% who noted integration with their curriculum suggest a potentially effective approach, yet it seems to lack the visibility and formal recognition that dedicated programs would provide. Integrated approaches should be supplemented with explicit training and drills to ensure thorough preparedness.

Figure 3: Evaluation Protocol (Staff)



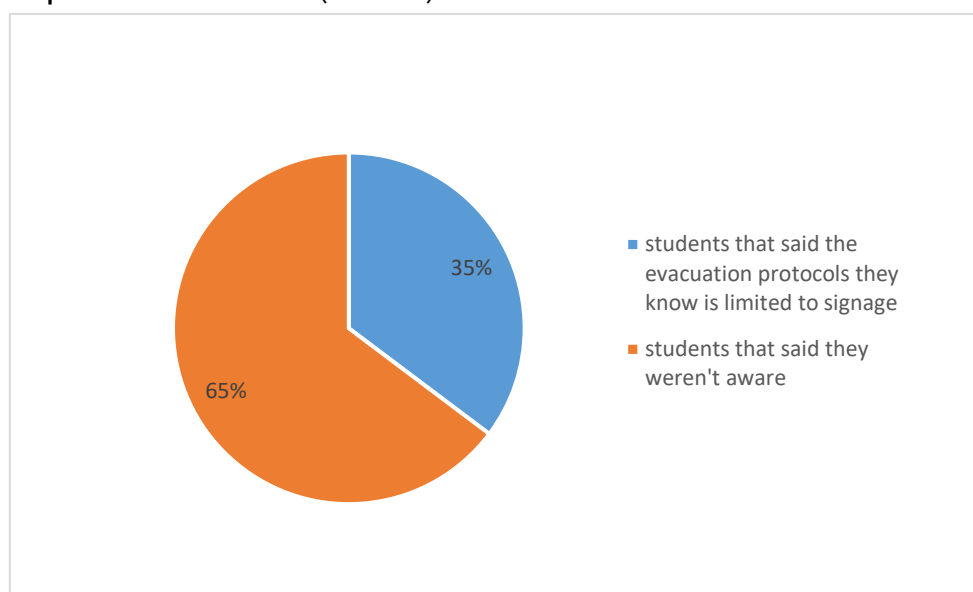
Source: Authors Fieldwork (2024)

Further inquiries revealed that 86% of the staff categorically stated that they were not informed of any evacuation protocols. The remaining 14% mentioned that something similar is usually covered in the annual non-teaching staff training.

The findings highlight a critical issue in the communication and training of evacuation protocols within the institution. The overwhelming majority of staff (86%) not being informed about these protocols poses a significant risk in the event of an emergency. This lack of preparedness can lead to confusion, delays, and potentially hazardous situations during an evacuation.

The fact that only 14% of the staff recalled any mention of evacuation procedures, primarily during non-teaching staff training sessions, underscores the need for a more comprehensive and inclusive approach to emergency training. It is essential that all staff members, regardless of their roles, are regularly and thoroughly trained on evacuation protocols.

Figure 4: Evacuation Protocol (Student)



Source: Authors Fieldwork (2024)

The result of the students' survey stated that 35% of students possess knowledge on evacuation protocols and their knowledge of evacuation protocols is limited to the signage used within the school. This indicates that while some are aware of the existence of evacuation routes and procedures, their understanding is superficial and dependent solely on visual cues. 65% of the students reported having no knowledge of evacuation protocols at all. This significant majority highlights a critical gap in emergency preparedness and communication.

The additional findings reinforce the urgent need for improved communication and training regarding evacuation protocols within the institution. The reliance on signage by 35% of the students suggests that while visual aids are helpful, they are not sufficient on their own to ensure thorough understanding and preparedness. The lack of any knowledge among 65% of the students further underscores the inadequacy of the current approach to emergency training.

The findings of this study have several implications for fire safety management in educational institutions. The lack of formal fire safety programs and inadequate communication of evacuation protocols indicate that Caleb University, like many other institutions in Nigeria, is unprepared for fire emergencies. This unpreparedness poses significant risks to the safety and well-being of both staff and students.

These results suggest a need for policy changes at both the institutional and governmental levels to enforce more rigorous fire safety training and awareness programs in educational settings. The gaps identified in the study reflect broader systemic issues that could affect other institutions facing similar challenges. The results emphasize the importance of developing comprehensive fire safety management frameworks that include regular training, drills, and clear communication strategies to improve emergency preparedness and response capabilities.

Future studies could explore these issues further by examining the effectiveness of different fire safety training programs and their impact on preparedness and response outcomes. Additionally, expanding the research to include multiple institutions would provide a more comprehensive understanding of fire safety practices and challenges in Nigerian educational institutions.

Conclusion and Recommendations

The findings of this study highlight critical gaps in the fire safety measures and awareness programs at Caleb University's male hostel, reflecting broader challenges faced by educational institutions in Nigeria. Despite existing regulations and standards, there is a significant lack of structured fire safety training and awareness among both staff and students. The absence of formal fire safety programs and evacuation protocols, as evidenced by the survey responses, underscores the need for a more proactive and comprehensive approach to fire safety management.

To address these issues, the following recommendations are proposed:

- i. Caleb University should develop and implement structured fire safety awareness programs that are mandatory for all staff and students. These programs should cover fire prevention techniques, evacuation procedures, and the proper use of firefighting equipment.
- ii. Regular fire drills should be conducted to ensure that all residents and staff are familiar with evacuation routes and procedures. These drills should be complemented by hands-on training sessions on the use of fire extinguishers and other safety equipment.
- iii. Clear and accessible communication of evacuation protocols is essential. This can be achieved through the use of visual aids, such as detailed maps and signage, as well as digital platforms like the university's website and mobile applications.
- iv. Integrating fire safety education into the curriculum can ensure that students receive consistent and comprehensive training throughout their academic journey. This can be supplemented by guest lectures and workshops conducted by fire safety professionals.
- v. Routine inspections and maintenance of fire safety equipment, such as smoke alarms, fire extinguishers, and emergency exits, should be carried out to ensure their functionality and compliance with safety standards.

- vi. Partnering with local fire safety authorities can provide valuable insights and resources for improving fire safety measures. Joint initiatives, such as safety audits and training sessions, can enhance the overall preparedness of the institution.
- vii. Establishing a comprehensive fire safety management framework can guide the implementation of safety measures and ensure ongoing compliance with regulations. This framework should include policies for regular reviews and updates based on risk assessments and regulatory changes.

While this study provides valuable insights into the fire safety practices at Caleb University's male hostel, there are limitations that should be acknowledged. The study's focus on a single hostel within one educational institution may limit the generalizability of the findings to other settings. Future research could expand the scope to include multiple hostels across different universities to provide a more comprehensive understanding of fire safety challenges in educational institutions across Nigeria. Additionally, the use of a mixed-methods approach provides a broad overview but may benefit from deeper quantitative analysis of fire safety incidents and their causes. Further studies could explore the long-term impact of implemented fire safety measures on reducing fire incidents and enhancing preparedness among residents and staff.

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