

Contribution of Fire Prevention Programs for Fire Management in Secondary Schools: A Case Study of Dar Es Salaam Region.

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DOI: <https://doi.org/10.51584/IJRIAS.2025.100800180>

Received: 26 August 2025; Accepted: 02 September 2025; Published: 06 October 2025

ABSTRACT

This study assessed the Contribution of Fire Prevention Programs for Fire Management in Secondary Schools in Dar es Salaam Region, Tanzania, specifically the study focused on three key components: fire prevention programs, training and drills and regular fire safety inspections and regulations. Questioners and interview were used for data collection whereas thematic analysis was used to analyze qualitative data and statistical package for social sciences (version 20) was used to analyze qualitative data. Both qualitative and quantitative methods were applied to analyze the data. Findings indicated that the fire prevention programs, training and drills and regular fire safety inspections and regulations had a significant contribution on fire management in Dar es Salaam secondary school. The study concluded that Technological transactions, such infrastructure comprises different aspect such as uses security, advanced and modern fire prevention programs which facilitate the schools to overcome the fire disasters smoothly. So, adequate regular fire prevention programs play a key role in contributing in fire management issue in public and private schools positively. The study recommends that, the Ministry of Home Affairs should review Fire and Rescue Force (Fire Precautions in Buildings Regulations, 2015) to fit with Tanzanian environment, and the building plans application fee have to be reviewed. Ministry in President's Office, Regional Administration and Local Government and Ministry of Home Affairs have to harmonize the existing regulations in the aspect of building plans. It should also formulate National Fire and Rescues Policy for better fire safety management; Ministry of Home Affairs in collaboration with Fire and Rescue Force should lay down framework on mitigation of school fires.

Keywords: Firefighting strategies, Fire management, fire prevention programs, training and drills, and regular fire safety inspections and regulations.

INTRODUCTION

Fire disasters in schools and communities are mostly caused by cooking facilities, intentional actions, heating, earthquakes, tsunamis, arson attacks and damage to gas piping or electric wiring (Mutch, 2014, Bird et al, 2019). Researches show that there are many causes of fire in schools and around communities in the world (Tanaka, 2012; Mutch, 2014; United Nations Educational Scientific and Cultural Organization (UNESCO), 2017). Firefighting strategies are crucial for safeguarding lives, protecting property, optimizing resource utilization, mitigating risks, managing incidents effectively, and driving continuous improvement in fire safety and emergency response.

O'Laughlin (2019) observes that over the last two decades, there have been growing fire size, intensity, and property loss trends. Today, there is a lot of discussion on ways to avoid fires and minimize property loss. Every year, eight out of each (1,000,000) individuals in Europe are killed by fire, with numerous increased existences hospitalized. Governments have addressed this affair by modifying fire integrity tactics regularly. As a consequence, the number of fire fatalities in Europe has decreased by (65%) in the last 30 years (Isiwele *et al.*, 2021).

According to Coppola (2011) disasters such as fire incidents cause serious socio-economic, environmentally and, sometimes, death, thus the disasters like fire outbreaks in schools can have devastating effects on both human life and infrastructure. Unfortunately, the frequency of school fire incidents is on the rise globally,

affecting about 175 million children every year due to both natural and human-caused disasters (UNESCO, 2017; National Education Union, 2017; Firefighters Forum, 2009; United Nations International Children's Emergency Fund (UNICEF, 2015).

Nyagawa (2017), Damian (2017) and Amuli (2019) asserts that in Tanzania, fire incidents have increased over years, whereas 34 schools have been affected between 2010 and the early 2020s. This results in loss of life, property damage, and injuries in different regions of Tanzania. Studies conducted in Tanzania discovered that many schools have little ability on disaster preparedness to protect children from fire outbreaks and other hazardous situations (Nestory, 2017).

In addressing incident of fire, the government of Tanzania has issued a circular recognizing the risks of school fire and clarifying the roles of the school management team in implementing measures to mitigate risks (MoEST, 2017). These measures include ensuring the availability of firefighting facilities, and conducting regular fire safety training and drills.

Despite the significant risks that fire incidents pose to secondary schools, and a circular issue by the government of Tanzania, there is a notable gap in the implementation and effectiveness of firefighting strategies in secondary schools. Previous studies have highlighted a limited awareness of fire risks among students and staff; however, there remains a critical deficiency in practical training and preparedness to prevent and manage such incidents (Amasi, 2021). Another study by (Bushesha & Ndibalema, 2022) indicates a low level of community awareness and inadequate training on fire safety and management within educational institutions, exacerbating the vulnerability of these environments to fire disasters while strategies for mitigating fire outbreaks, such as improving infrastructure and installing firefighting equipment have been recommended, there is limited evidence on the actual implementation and efficacy of these measures in secondary schools (Amuli *et al.*, 2023). It is against this reality this study aimed at assessing the contribution of firefighting strategies on fire management in secondary schools in Dar es Salaam, Tanzania, thereby providing insights on the current practices and identifying areas for improvement.

LITERATURE REVIEW

Fire incidences in secondary schools

Fire incidents in secondary schools pose significant threats to the safety of students, staff, and infrastructure. Coppola (2011) also contends that disasters such as fire incidents cause serious disruptions socio-economic, environmentally and, sometimes, death. National Education Union, 2017; Firefighters Forum, 2009; United Nations International Children's Emergency Fund (UNICEF, 2015).

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Fire Prevention Programs and Fire Management

Fire prevention programs contributes to fire management in secondary schools. White (2018) noted that it should also include fire prevention programs for emergency preparedness plan that documents are important information on procedures for responding to an emergency, such as fires, earthquakes, terrorism, and school violence incidents. However, Ndiang'ui (2021) recommended that lack of early warning systems to help control fire in its early stages; lack of disaster preparedness plans; lack of fire drills and First Aid Kits; lack of basic training on security; lack of fire extinguishers in key areas or lack of emergency exits etc. where exposing schools to disasters, especially fire.

Theoretical Framework

Modern Disaster Theory proposes that “preparedness can be measured by the performance of institutions during disaster risks caused by environmental, hazard and social vulnerability”. This theory assumes that the effects of

a disaster (vulnerability or susceptibility) was constantly be determined by how well prepared an institute, family or individual was (resilience). Susceptibility shows that every individual is susceptible to disasters whereas resilient shows how an individual can be able to resist the risks of a particular disaster (Chen, 2021).

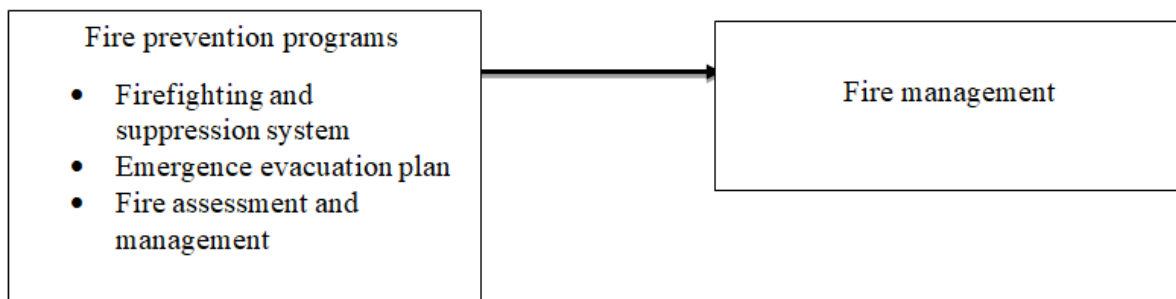
Conceptual Framework

The conceptual framework for this study posits that Fire prevention programs, directly contributes on Fire management. However, the effectiveness of this depends on factors such as employee training, technological infrastructure and organizational support.

The contributions of fire prevention programs play a crucial role in fire management by reducing the incidence of fires, thereby minimizing damage and enhancing safety. It can reduce the frequency of fire by educating the public about fire risks and safety measures, these programs help reduce the number of fires. This includes campaigns on the importance of maintaining electrical systems, safely handling flammable materials, and practicing safe burning habits.

Independent Variable

Dependent Variable



Source; researcher 2024

METHODOLOGY

Area of the Study

The study was conducted in Dar es Salaam region. Dar es Salaam is geographically located at 60°48" South, 39°17" East in Tanzania and covers approximately 1,590.5-kilometer squares. It is surrounded by Coastal region in North, Western and Southern parts, and bordered by the Indian Ocean in the East. Dar es Salaam consists of five districts, namely, Kinondoni in the north, Ilala in the center, Ubungu in the west, Temeke in the south and Kigamboni in the east of the region. The population of Dar es Salaam is approximately 5.33 million (Census, 2022) Report. This region is selected because there more than 12 schools fire cases reported by Ministry of Education Training and Science report (2017/2018) and thus, it was envisaged that such scenarios could give a pertinent situation of their occurrences measured through desired study objectives.

Research Design

A cross-sectional research design was employed for this study. This design was chosen for its ability to collect comprehensive data on the perceptions and experiences of respondents regarding fire management issues. Cross-sectional research design which provides snapshot of the characteristics, behaviors, or conditions of a population at a single point in time, making them suitable for this study.

Research Approach

A mixed-methods approach was utilized, combining quantitative and qualitative research methods. The quantitative aspect involved structured questionnaire to collect numerical data, while the qualitative component comprised semi-structured interviews to gain deeper insights into respondents' experiences and challenges. This approach allows for a richer understanding of the subject matter by triangulating data from multiple sources.

Target Population

The population for this study was secondary schools within Dar es Salaam region including both public and private secondary schools across the region, according to (Ownership, 2022) there is 141 public schools and 192 private schools in Dar es Salaam region which brings a total of 333 Secondary Schools. The study included a sample of 10 schools five publics and five private secondary schools to ensure a comprehensive understanding of firefighting strategies and their effectiveness.

Sample Size

The study employed the Cochran sample size formula for a known population is, Cochran's sample size formula for a known population means

n = sample size

z = Z score which depends on the confidence level

Z = score-95% = 1.96

P = proportion

e = error = 0.05

For statistical analysis sample size can be reduced up to 30 percent according to this the present sample size reduction by 30% of 384 was 116.

There for a sample size of 116 respondents was determined for this study, was 30 academic staffs, 30 non-academic staffs and 56 were students. This size is deemed adequate to provide reliable and valid insights into the contribution of firefighting strategies on fire management. According to Kothari (2019), an optimal sample size strikes a balance between being manageable and representative, allowing for meaningful analysis without overwhelming the research process.

Sampling Techniques

A purposive and simple random sampling technique. Simple random sampling was employed to select students and five public and five private schools from each district while purposive sampling was used to select three academic staffs who are the headmaster, a patron or matron, and an academic master, also nonacademic staffs included a cook, security guard, and cleaner and key informants who are heads of fire fighters from each district. This non-probability sampling method allows researchers to target individuals with specific knowledge or experience, ensuring that participants can provide valuable insights regarding the research questions. This technique is particularly useful in qualitative research, where the goal is to gain in-depth understanding rather than generalizability.

Data Collection Methods

Structured questionnaires: was used to collect data from students. The questionnaire included closed-ended questions with Likert scale responses to facilitate statistical analysis. Moreover,

Semi-Structured Interviews: semi-structured interviews were conducted to collect information from key informants. This tool allows for open-ended questions, enabling respondents to share their experiences, insights, and challenges regarding fire management practices.

Data Analysis Methods

Quantitative data was analyzed by using the Statistical Product for Social Solution (SPSS) for descriptive statistics such as frequencies and percentage. Qualitative data was analyzed by using thematic coding analysis

approach where by themes was arranged in relation to research objectives. When the study is completed the findings was presented in research report paper whereas the paper was arranged into chapters as per University guidelines.

Ethical Considerations

Ethical considerations were paramount in this research to protect the well-being, rights, and dignity of participants while maintaining the integrity and credibility of the study. The researcher was adhering to ethical standards by securing the necessary permits to conduct the research, ensuring all participants are fully informed about the study's purpose and provide their consent voluntarily. Participants have the right to withdraw at any time without facing any negative consequences, safeguarding participants' personal information by keeping it confidential (Names and identifying details was not be disclosed) and the participants was guaranteed that the data collected was used exclusively for academic purposes.

Findings

Social-demographic of the respondents

Results from the table below shows that the respondents, 56.9% were male and 43.1% were female. Educational attainment shows that 26.7% held a certificate or diploma, 21.6 % hold a Bachelor's degree while 17.2% were advanced level and 15.5% were O level students. Age distribution indicated that 67.2% were aged 13-25 years, 18.1% were aged 16-38 years, 9.5% were aged 39-51 years and 5.2% were between 52 and above years. Regarding positions, 48.2% were students, 25.9% were nonacademic staff, and 25.9% were academic staff

Table 1. Source: Researcher (2024)

Characteristics of respondents	Profile	Frequency(n=116)	Percent (%)
Gender	Male	66	56
	Female	49	43.1
Education level	Primary Education	18	15.5
	Ordinary Level Student	18	15.5
	Advance Level Student	20	17.2
	Certificate in Education	10	8.6
	Diploma in Education	21	18.1
	First Degree	25	21.6
	Above	4	3.2
Age groups	13-25	78	67.2
	26-38	21	18.1
	39-51	11	9.5
	52 and above	6	5.2
Position/Designation	Academic Staff	30	25.9

	Non-Academic Staff	30	25.9
	Student	56	48.2

Presentation of the Findings

Contribution of the contribution of fire programs on fire management the findings revealed that 62.1% respondents strongly agreed that firefighting and suppression systems contribute on the fire management issues at large. While 13.8% of the respondents were neutral, and only 8.6% disagreed or strongly disagreed that firefighting and suppression systems do not act as a base for fire management in schools. This indicates that there was a general consensus that firefighting and suppression systems negatively contribute on fire management, reflecting positively on its effectiveness in this regard.

Availability

Fire Prevention Programs at in schools. Here, results in (Table 2) shows that 79.3%, of the respondents agreed that there were fire prevention programs at schools, 6.0% of respondents strongly agreed with this statement, suggesting that there are fire prevention programs at your school. While, 7.8%, were neutral, while only 2.4% disagreed. This data highlights that the majority of respondents view availability of fire prevention programs at their school.

Effectiveness of Emergency Evacuation

Most of the respondents, 85.3% agreed that emergency evaluation plan was effective on fire management and 12.3% strongly agreed, 7.8% of respondents were neutral, and only 6.9% disagreed or strongly disagreed. The data shows that emergency evacuation plan was a favorable scheme that serves as a way forward for fire management in your school, thereby improving the fire prevention programs.

The table below summarizes the results.

Table 2: Fire Prevention Programs and Fire Management

Statements	Responses	Frequency(n=116)	Percent (%)
Firefighting and suppression systems acts as a base for fire management in your school.	Strongly agree	18	15.5
	Agree	72	62.1
	Neutral	16	13.8
	Disagree	8	6.9
	Strongly disagree	2	1.7
	Strongly agree	18	15.5
Are there fire prevention programs at your school?	Strongly agree	7	6.0
	Agree	92	79.3
	Neutral	9	7.8
	Disagree	8	6.9
	Strongly disagree	0	0.0

Emergency evacuation plan is a favorable scheme that serves as a way forward for fire management in your school.	Strongly agree	14	12.3
	Agree	99	85.3
	Neutral	0	0.0
	Disagree	3	2.4
	Strongly disagree	0	0.0
Through Fire assessment and management an organization possesses committed system on fire management.	Strongly agree	14	12.3
	Agree	80	69.0
	Neutral	2	1.7
	Disagree	20	17.0
	Strongly disagree	0	0
Fire prevention programs are complementary elements for fire management in your school	Strongly agree	17	14.6
	Agree	94	82.0
	Neutral	2	1.7
	Disagree	2	1.7
	Strongly disagree	0	0.0

Source: Research findings 2024

Effectiveness of fire prevention program management

Results in (Table 2) shows that 82.0% of respondents agreed that Fire prevention programs are complementary elements for fire management, and 14.6% strongly agreed, indicating a high level of appreciation for its error-limiting capabilities. While, 1.7%, were neutral, while 1.7% disagreed or strongly disagreed. This indicates that most of respondents' recognition that fire prevention programs were complementary elements for fire management in schools.

Also, the interview with a one of the teachers from Ubungu Islamic High School about fire prevention programs in case of fire accident and fire management he argued that:

"The Ministry of education, science and technology has not provided us with fire extinguisher cylinders for our school. Even if they were available, our pupils and teachers do not know how to use them. No fire prevention programs have been conducted here. We lack persons responsible for fire outbreaks. We do not have fire safety inspection in schools and nonexistence of fire emergency plans as well".

It was observed that fire and safety departments in all Tanzania learning institutions are non-existent or members are not trained or equipped to fight fire in their schools. This could either be as a result of naturalist attitude that God would take care of all unpredictable disasters or could be as a result of sheer negligence or both.

During interview with head of school at Kinondoni Secondary School about the school safety in case of fire he had this to say:

“The safety of school occupants will be enhanced if staff knows what to do both before and during an outbreak of fire or other emergency. This can be achieved by ensuring that staff including temporary and part-time personnel receives appropriate instruction and training. All new entrants to a school should be trained be pupils, staff or support staff on fire prevention programs. The programs should be conducted around the school. All of them should also receive instruction on the school fire evacuation routine and receive instruction and training appropriate to their responsibilities in the event of any emergency”.

DISCUSSION OF THE FINDINGS

Majority of respondents (87.1%) agreed that every pupil should be aware on fire prevention programs which will help him to know what to do and not to do in case of fire outbreak while 71.0% agreed that it is important for pupils to prepare for firefighting in case of fire outbreak instead of escaping it. This was contrary to what have been observed earlier in another study (Nakitto *et al.*, 2010) where about 46% of school surveyed had ever been trained on fire safety. The fire extinguishers usage, firefighting and causes of fires were part of training course according to Nakitto *et al.*, (2010). In their study, in Uganda, it indicated that 60% of schools had persons in charge of fires though about 84% of schools had no fire safety plans in place and 34% of schools had fire assembly place. Das, *et al.*, (2001) indicated that leaders like head of schools with knowledge about fire safety purchased fire devices (like fire extinguisher) and also prepared their students and employees to take immediate action to prevent death, injury and destruction of properties whenever disaster strikes.

One of the primary findings is that fire prevention programs contribute on fire management, fire prevention programs enhance awareness among students and staff about fire hazards and safety measures, implementation of fire prevention strategies can lead to a decrease in the frequency of fire incidents in schools, schools develop and refine safety protocols and emergency plans as a result of these programs, regular fire prevention programs lead to more effective identification and mitigation of fire risks, programs encourage adherence to fire safety regulations and standards, staff and students become more responsible for maintaining a fire-safe environment. This is vital as accurate data is fundamental for fire management, and overall operational efficiency. For instance, reducing the risk of discrepancies and errors. As observed by Akinmoladun *et al.* (2020), secure fire management systems can lead to better decision-making and enhanced operational performance by providing reliable information for strategic planning and daily operations.

Additionally, the study found that fire preventive programs help in mitigating the risks associated with fire hazards and fire attacks, which can disrupt schools' operations and lead to significant financial losses. According to research by Sharma and Sharma (2020), organizations with strong fire preventive programs experience fewer disruptions and lower costs associated with fire incidents, thereby maintaining a smoother and more efficient school operation.

Moreover, the implementation of fire prevention programs is associated with improved compliance with regulatory requirements and industry standards. Regulatory compliance is crucial in ensuring that warehouse operations adhere to legal and industry standards, which in turn affects overall performance. The study aligns with findings from White (2018), which emphasize that the contribution of fire prevention programs in secondary schools should also include an emergency preparedness plan that documents is important information on procedures for responding to an emergency, such as fires, earthquakes, terrorism, and school violence incidents. Because the safety of the students is more important, this plan is essential. In addition, schools can also serve as emergency shelters, so it is recommended that there is a plan for town-wide crisis situations as well.

CONCLUSION AND RECOMMENDATION

Conclusion

This study addresses that inadequate regular fire prevention programs is amongst the factor that contribute on fire management in the public and private schools. Individual end-users and entire school's environment units can naturally resist any change in fire prevention programs that poses uncertainty in security and privacy of their thing can affect fire management in the public and private schools. Technological transactions, such infrastructure comprises different aspect such as uses security, advanced and modern fire prevention programs

which facilitate the schools to overcome the fire disasters smoothly. So, adequate regular fire prevention programs play a key role in contributing in fire management issue in public and private schools positively.

Recommendations

From the study findings and conclusions made above, the following recommendations are drawn.

To ensure the good and effective operation of fire management, the government should provide enough fund to bust the schools to adopt fire prevention programs in public sectors. Also, the government should be able to improve technological infrastructure national wide such as faster firefighting equipment's and stable networks, and stable power supply, and also all this should be gone along with providing an adequate fund to the responsible schools.

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