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Disaster Management in Tanzanian Secondary Schools: An Assessment of Disaster Risk Preparedness and Mitigation Strategies

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Abstract
This study assessed the disaster risk preparedness in schools and mitigation strategies within school culture's quantitative and qualitative nature. Safety schools ensure high-quality management by implementing effective risk management strategies. To achieve quality education, schools must prioritise disaster risk mitigation strategies. In so doing, three objectives were employed, which include examining the influence of disaster-risk preparedness on school safety measures, assessing teachers' and students' emergency preparedness skills, and evaluating safety equipment availability in schools. The study utilised a mixed-methods approach, encompassing questionnaires, interviews, and physical observations. The research was conducted in the Dodoma region, focusing on five public secondary schools. A total of 152 participants were purposefully and randomly selected for the study. The quantitative data was analysed descriptively, while the qualitative data was thematically paraphrased and presented as quotes. The study further revealed that schools have insufficient safety equipment, leading to unpreparedness during emergencies. Additionally, it was found that teachers and students rarely receive emergency preparedness training, increasing crisis risk in schools. Furthermore, most schools lack essential safety equipment such as fire extinguishers, fire alarms, and fire exits, which puts them at potential disasters.

INTRODUCTION

School safety is gaining recognition worldwide. It is now officially recognised by various United Nations conventions and frameworks, including the United Nations Convention on the Rights of the Child, the Sendai Framework for Disaster Risk Reduction, the 2030 Agenda for Sustainable Development, the Paris Agreement on Climate Change, and the New Urban Agenda (United Nations, 2015). These frameworks approach the issue of school safety from different perspectives, highlighting its importance in different areas. The safety of school premises is a shared responsibility that requires effective leadership and coordination from school authorities (Ayonga, 2016; Öznacar, 2018; Proulx & Aboud, 2019; UNDRR, 2010, 2010; UNESCO, 2023). The safety of a school depends on its culture, management, and psychological support (Ak & Şahin, 2021; Corporation, 2010; Öznacar, 2018). In this regard, teachers, staff, pupils, parents, and the surrounding community must work together to develop a comprehensive strategic plan for quality management as a critical aspect in establishing effective school disaster management protocols (Amuli, 2019; Seddighi, 2022; Shah et al., 2020; Widowati et al., 2021). It has been noted by (Abbasov, 2018; Johnson & Levering, 2009) that schools should take a proactive approach to identify and address potential risks and hazards that may hinder their

operations and services. In addition, schools must implement initiatives that enable them to stay competitive while managing potential disruptions to their activities. Some of the methods highlighted by these authors that can be used to achieve this are checklists, flowcharts, surveys, and personal inspections.

Besides, Öznacar (2018) and Shah et al. (2020) noted that by prioritising quality management, establishing effective risk disaster management protocols, and proactively managing potential risks and disruptions, schools can create a safe and conducive learning environment for their students. Boon & Pagliano (2015) and Rofiah et al. (2021) define risk management as the process of making and taking decisions that will minimize the adverse effects of risk on a school. These risks include injury to students, lawsuits filed by angry parents, or damage to the school's reputation. Other scholars such Kellenberg & Mobarak (2011) and Wandee et al. (2017) consider risk management as an essential part of school management that helps in identifying potential risks and taking proactive measures to mitigate them. As per the UNESCO report of 2023, schools are supposed to be a haven for children. However, due to climate change, natural hazards in schools have become more frequent and intense, putting many children's safety at risk worldwide. The report also highlights that some school facilities lack properly constructed classrooms and playgrounds, gender-neutral restrooms, and adequate furniture (UNESCO, 2023).

In Tanzania's education context, disaster management is governed by Act No. 9 of 1990 of Tanzania Mainland and Act No. 2 of 2003 of Zanzibar. However, the safety of students and staff is not guaranteed due to the frequent outbreak of disasters such as fire, earthquakes, floods, winds, and contagious diseases (Amuli, 2019; Nestory, 2017; Nyagawa & Anangisye, 2023). Despite the presence of regulatory frameworks for disaster management in Tanzania's education sector, occurrences of disasters continue to pose a threat to the safety of both students and teachers. For example, several secondary schools have experienced fire outbreaks, including Shauritanga, Ivumwe, Iyunga, Idodi, Ihungo, and Kilosa (Amuli et al., 2023). These incidents highlight the urgent need for the government and other stakeholders to enhance disaster management strategies in the education sector to ensure the safety and well-being of students and teachers (Amuli, 2019; Mirzaei et al., 2019; Nyagawa & Anangisye, 2023; Okiror, 2018). Schools require safer environments for learning by establishing risk-preparedness plans to deal with life-threatening emergencies and disasters to reduce children's vulnerability (Aslam, 2023; Haulle, 2012; Rachmalia et al., 2011; Srichai et al., 2013). Schools are essential learning institutions for younger generations and play a vital role in instilling cultural values and passing on knowledge. However, schools need to protect children from natural and human-made disasters by prioritising disaster risk education and ensuring school safety since pupils can act as a bridge between theory and practice, and their knowledge can have a trickle-down effect that saves lives in their communities (Gökmenoğlu et al., 2021; Mubita et al., 2021, 2023; Narasimhan, 2020). It is imperative to ensure the safety of students and teachers through the effective implementation of disaster management strategies that align with the regulatory framework. Such strategies should enhance disaster preparedness, response, and recovery. Therefore, there is a dire need to prioritise the safety of students and teachers to create a conducive learning environment that promotes academic excellence. The main objective of this study was to assess the Disaster Risk preparedness and Mitigation Strategies in Tanzanian Secondary Schools.

Study objectives

1. Examine the influence of disaster-risk preparedness on school safety measures;
2. Assess teachers' and students' emergency preparedness skills and
3. Evaluate safety equipment availability in schools

REVIEWED LITERATURE

This study was guided by the Protection Motivation Theory (PMT) developed by Rogers in 1975. PMT is a model for health behaviour change that explains how school cope with and make decisions in times of harmful or stressful events in life like disasters (Rogers, 1975). The theory outlines the fear in schools as they expose students and staff to risky outcomes (Sus (MA) & Drew (PhD), 2023). It highlights that schools seeking protection are guided by four beliefs: severity of risk, vulnerability, perceived efficacy, and self-efficacy. The theory notes that schools may be discouraged from reducing risk behaviours due to perceived costs and gains associated with opposing risk-enhanced behaviour (Pechmann et al., 2003; Shillair, 2020). These studies found that many schools consider disasters as risky and equip themselves accordingly. However, the constant shortage of equipment affects the adequacy of safety strategies and preparedness against insecurity, ultimately increasing their unpreparedness.

Studies have demonstrated that ensuring safety in schools is a multifaceted and ongoing process, requiring the collaboration of school management, students, parents, workers, and the local community (Corporation, 2010; Karisa & Kikechi, 2022; Kileo et al., 2021; Shillair, 2020; Srichai et al., 2013). In another study Gicharu, (2015) and (Dube et al., 2016) highlights the need for disaster preparedness and mitigation measures in schools in developing countries, where the absence of dedicated safety departments poses a significant challenge. Similarly, Bisri & Sakurai (2017) have identified the vulnerability of Indonesian elementary public schools to high tsunami risk and the dependence on external support to manage disasters, which often fails to progress due to limited ownership and funding. In their study, Ghanekar et al. (2021) emphasised the crucial role of safety and emergency preparedness in mitigating fatalities caused by calamities such as building collapses, fire accidents, earthquakes, and floods. The authors cited the tragic Kumbakonam fire incident in Tamil Nadu, India, which claimed the lives of numerous school-going children, highlighting the importance of emergency preparedness at the school level.

According to (Kukali, 2013), a lack of basic knowledge of emergencies or the appropriate measures to take during a disaster is responsible for many fatalities. The study recommends that staff and students participate in emergency drills regularly to acquire skills and understand the dynamics of emergency calamities - what to expect and how to respond effectively. However, Kano & Bourque (2007) note that public schools in California lack adequate training and interagency coordination, with differences in disaster plans and the availability of emergency supplies between primary and secondary schools. Similarly, Karisa and Kikechi (2021) found that schools in Kenya have insufficient safety equipment and rarely train students in emergency preparedness. In most schools, only a few safety equipment, such as fire extinguishers, fire alarms, and fire exits, were available. Additionally, Karisa & Kikechi (2022) and Nakitto & Lett (2010) explain that most schools in Uganda lack emergency preparedness plans, which puts both school staff and students at risk and reduces stakeholders' confidence and trust in a secure environment for students.

In Tanzania, studies conducted by Haulle & Rugumamu (2015) observed that the Education Development Plans failed to consider the potential risks of natural disasters when designing and mapping school buildings. Additionally, they found that school curricula were not adequately connected to Disaster Risk Reduction (DRR), reducing participation in school management for sustainable development. In another study, (Kahwa, 2009) discovered that poor facilities in many ward-based schools and intentional student actions were responsible for school fire disasters. Another study conducted by Amuli et al. (2023; Nyagawa & Anangisye, (2023) and Waryoba & Mung'ong'o (2023) reveals that the administrative framework of most schools influenced schools' exposure to disasters in

Tanzania due to the absence of warning signs, disaster preparation plans, fire drills, and first aid tools. The study assessed the preparedness for disaster risk and mitigation strategies in Tanzanian secondary schools.

METHODS

The research employed a mixed-methods approach that incorporated both quantitative and qualitative methods. The study was conducted in the Dodoma region, covering five public secondary schools with 152 participants. The Bukhari sample size calculator was utilised to ensure the sample size's validity.

Table 1. Bukhari sample size calculator 2020

Confidence level	95%
Sample proportion (P)	0.5
Margin of Error (e)	0.05
Population size (N)	251
Alpha divided by 2	0.025
Z-score (z)	1.96
Sample size	152

Source: Bukhari (2020)

The table provided contains all the necessary information for determining the sample size. This study utilised a sample size of 152 participants, consisting of 5 Heads of School, Teachers, 40 Teachers, and 112 Students. The Head of School and Environment Teachers were selected using stratified purposive sampling, while teachers and students were chosen through simple random sampling (Creswell, 2014). Overall, the sampling strategy employed in this study was carefully designed to ensure that the sample is representative of the population and that the study results can be generalised to the larger population with a high degree of confidence. Data was collected from students and teachers using a questionnaire, while interviews were conducted with the Heads of schools and environment teachers. An observation checklist was also used alongside the interviews to gather data on the availability of safety equipment in the schools. The study provided both quantitative and qualitative data. Quantitative data were analysed using the Statistical Package for Social Sciences (SPSS) version 23.0, a computer program that filters data for descriptive statistical analysis. On the other hand, qualitative data was analysed thematically through techniques such as paraphrasing and quoting.

RESULTS AND DISCUSSION

Influence of disaster-risk preparedness on school safety measures

In order to ensure safety during disasters, it is crucial for all members of the secondary school community, including students, faculty, staff, and parents, to collaborate and develop effective disaster management strategies. This involves building a culture of preparedness and response that is inclusive to everyone in managing disasters and keeping everyone safe. In these objectives, teachers and students were asked to rate their school and surrounding area's potential for disaster and the most frequently occurring disasters. This assessment encompasses the likelihood of a catastrophic event such as a natural disaster, an accident, or a human-made disaster. Their responses are shown in Table 2.

Table 2. School Prone to Disasters Occurrence Expectations

#	Responses	Teachers		Student	
		Freq	%	Freq	%
1	Yes	26	65	69	61.6
2	No	14	35	43	38.4
	Total	40	10	112	10

Data presented in Table 2 show that a considerable proportion of teachers (65%) and students (61.6%) believe that the likelihood of a disaster occurring in their school is high. However, the remaining percentage of respondents expressed a lack of concern regarding the possibility of a disaster in the future. The concerns expressed by teachers and students regarding the allocation of school buildings are closely tied to the location of these schools, particularly those in peri-urban areas. These areas are susceptible to environmental threats, including floods, strong winds, and erosion. Furthermore, to better understand the safety and security landscape of schools, both teachers and students were asked to rate the frequency of various disasters transpiring within their respective schools. Their response is presented in Table 2.

Table 3. Forms of Disasters Occurring in Secondary Schools

Disaster	Frequent		Rare		Never	
	Freq	%	Freq	%	Freq	%
Fire outbreak	32	26.6	41	36.6	39	34.8
Floods	43	38.4	49	43.8	20	17.9
Windstorm	73	65.2	33	29.5	06	5.4
Drought	42	37.5	58	51.8	12	10.7
Falling trees near the building	21	18.8	34	39.3	47	42.0

Based on the data presented in Table 3, windstorms (65.2%), flooding (38.4%), and droughts (37.5%) are the most prevalent disasters in schools as reported by both teachers and students. Conversely, falling trees near school buildings (21%) and fire outbreaks (26.6%) are uncommon. Nevertheless, Heads of schools' caution that the impact of fire outbreaks is severe compared to other disasters. On the other hand, windstorms are a recurring and significant issue in schools with similar consequences to fires. Heads of school attribute this to the semi-desert nature of Dodoma's climate, which leads to frequent windstorms. This suggests that school mapping and allocation were not considered in most schools. This was supported by a school Head who claimed that:

"The location of this school is not user-friendly. Firstly, it is far from the water source, with no trees to provide shade for us and our students. The classrooms are full of dust due to the wind. Schools are built in favour of politicians without considering the lives of teachers and students".

These findings support the conclusions of Haulle & Rugumamu (2015), who found that Education Development Plans had overlooked the risk of earthquakes in the design and location of buildings, while the curricula insufficiently integrated Disaster Risk Reduction (DRR) approaches. Similarly, Shah et al. (2020), discovered that flood risk remains a significant concern for schools in Pakistan, as disaster risk management measures have been poorly implemented. After a thorough evaluation, it has been discovered that the safety of schools is a critical issue that requires urgent attention from the public. The findings indicate that the visited schools are generally unsafe due to windstorms (65.2%), flooding (38.4%), and droughts (37.5%) being the most prevalent disasters that

occur in these schools. It has been discovered that the safety of schools is a critical issue that requires urgent attention from the public. The findings indicate that the visited schools are generally unsafe due to windstorms (65.2%), flooding (38.4%), and droughts (37.5%) being the most prevalent disasters that occur in these schools.

Teachers and Students Emergency Preparedness Skills

Ensuring Teachers and the well-being of students, as well as the effective functioning of school during and after disasters, depends heavily on the preparedness of teachers and students for disaster risk. In order to measure the level of disaster-risk preparedness in schools, teachers and students were asked whether they had received training on emergency preparedness. In this objective, the teachers' responses are shown in Table 4, making this question vital for understanding the school's level of preparedness.

Table 4. Teachers and students on disaster preparedness

#	Responses	Teachers		Student	
		Freq	%	Freq	%
1	Yes	7	17.5	13	10.6
2	No	33	82.5	99	89.4
	Total	40	100	112	100

As shown in Table 4, only a small percentage of teachers (17.55%) and students (10.6%) have received emergency preparedness training. Furthermore, many teachers (82.5%) and students (89.4%) have not received any training, highlighting a potential gap in school emergency preparedness programs. This indicates that most groups may not be equipped to handle emergencies. These findings suggest the need for more accessible and comprehensive training programs in emergency preparedness for teachers and students to increase the readiness and safety of the school community in emergencies. These findings are in line with the research conducted by Karisa & Kikechi (2022) who found that 91.4% of teachers in Kenya have not received any emergency preparedness training to deal with disasters like fires and floods. Similarly, Nakitto & Lett (2010) found that Ugandan schools lack a formal training curriculum and disaster plans for preparing both teachers and students to handle emergencies. On the other hand, teachers and students were asked if disaster preparedness training in their schools was useful. The responses are shown in Table 5.

Table 5. Usefulness of disaster preparedness training skills to Teachers and students

#	Responses	Teachers		Student	
		Freq	%	Freq	%
1	Strongly Agree	23	47.50%	49	43.75%
2	Agree	9	30.00%	18	16.07%
3	Neutral	7	22.50%	36	32.14%
4	Strongly Disagree			4	3.57%
5	Disagree			5	4.46%
	Total	40	100	112	100

Based on Table 4, it can be seen that most teachers (47.5%) and students (43.8%) agree that the disaster preparedness training was useful, with a higher percentage of teachers strongly agreeing than students. However, many students (32.14%) remained neutral, which may indicate a lack of

understanding or uncertainty. In contrast, no teachers disagreed with the usefulness of the training, but a small percentage of students (4.46%) disagreed, and an even smaller percentage (3.57%) strongly disagreed. According to the heads of schools who were interviewed, the students' responses are supported, and it was noted that students' lack of experience was because no disaster had occurred that threatened their lives. However, some students had experienced a disaster in 2019-2020. The Head of the school further reported that a few trained teachers are organising safety and disaster preparedness events for students to some extent.

Besides, the heads of the schools interviewed pointed out that they did not have the funds to train their teachers and students in emergency preparedness, making disaster preparedness an additional financial burden. One of the heads of the school provided the following statement:
"It is very expensive to organise disaster preparedness training in schools, especially since the government-provided budget to us is often insufficient. My experience tells me that many schools do not understand the importance of organising and requesting support from education authorities, as they may not be used to experiencing major disasters."

Based on the study finding it is discovered that many school community members lack emergency preparedness training. This could result in unpreparedness during disasters and a lack of knowledge on how to react.

Availability of safety equipment and preparing students for emergencies

Preparing teachers and students for emergencies and ensuring the availability of safety equipment are crucial steps towards creating a secure and productive learning environment. In this objective, teachers and the Head of School were asked to evaluate the adequacy of specific safety gadgets that may help respond to school disaster emergencies. Their responses are summarised in Table 6.

Table 6. Several important disaster equipment categories

#	School Safety Equipment	Availability		Somewhat available		Not available	
		Freq	%	Freq	%	Freq	%
1	Emergency Alam	0	0	0	0	0	0
2	Emergency point	45	100	0	0	0	0
3	Emergency exit door/window	2	4.4	5	11.1	38	84.4
4	Fire hydrant	0	0	0	0	0	0
5	Reliable water supply	14	31.1	22	48.9	9	20
6	Fire blanket	0	0	0	0	0	0
7	Fire sand bucket	24	53.3	10	22.2	11	24.4
8	First Aids	36	80	9	20	0	0
9	Gloves	3	6.7	11	24.4	31	68.9
10	Outwards door	12	26.7	21	46.7	13	28.9
11	Visitors access book	45	100	0	0	0	0
12	Metal detector	0	0	0	0	0	0

The findings of Table 6 indicate that several important disaster equipment categories are absent from the school. This lack of emergency equipment is a significant concern, mainly since no emergency alarms or fire hydrants are available, which are crucial for dealing with emergencies like fires. Additionally, the absence of emergency windows and doors (84.4%) and Gloves (68.9%) is a worrying trend since schools are not adequately equipped to deal with emergencies or accidents. However, it is

encouraging to note that most school respondents (53.3%) reported having fire sand buckets available, and predominantly, 80% reported having access to First Aid. This signifies that the school has taken some measures to respond to immediate injuries and small school fire outbreaks. Nevertheless, there is still a need to address the lack of essential emergency equipment to ensure the safety and well-being of students and staff in case of emergencies. The results are consistent with the studies conducted by Ayonga (2016) in Kenya and Nakitto & Lett (2010) in Uganda which indicate that a significant number of schools do not have adequate disaster response equipment and training for teachers, staff, and students resulting to inability to manage fire-related emergencies.

CONCLUSION

School safety is a critical issue that varies depending on geography, culture, and budget. Effective leadership, strict student monitoring, responding to parents' concerns, complying with safety policies, and managing the budget are key factors in creating a safe school. The study findings reveal that most schools are ill-prepared and lack essential emergency equipment. Most schools only have basic fire sand buckets and first aid kits, while other necessary safety equipment is either unavailable or inadequate. Both teachers and students have recommended improving disaster preparedness training and providing additional safety equipment to enhance the safety of all students and staff at school. The study recommends that the relevant Ministry responsible for Education implement the existing school safety policy framework to address the issue. This will ensure that all schools allocate adequate resources towards fulfilling the safety requirements, including providing comprehensive safety training and acquiring the necessary safety equipment. It was recommended that School Quality Assurance (SQA) officials should focus not only on curriculum quality but also on improving school facilities to ensure compliance with safety requirements. By doing so, schools will be better prepared to handle emergencies, and the safety of all students and staff will be significantly enhanced.

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