

# Assessment of Knowledge and Fire Safety Preparedness among Employees at Shopping Malls in Lusaka District

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## Abstract

Fire disasters in public buildings continue to raise major concerns about the safety of individuals who occupy these buildings, as well as the customers. The objective of this study was to assess the knowledge and fire safety preparedness among employees of shopping malls in Lusaka district. This study employed cross sectional descriptive design, with quantitative methods. Data was collected using a structured questionnaire from 83 respondents (employees) who were purposively sampled from six shopping malls in Lusaka. Collected data was analysed using descriptive statistics. The findings revealed that employees' levels of knowledge on fire safety preparedness is low. Further, that there is low or lack of implementation of practices aimed at ensuring fire safety. The study therefore, recommends that employees in public buildings be trained on how to ensure fire safety and appropriate responses in case of fire. Moreso, fire safety plans should always be displayed to the public.

**Keywords:** Fire; Knowledge; Practices; Preparedness; Public buildings; Safety.

## 1. Introduction

For longer than recorded history, fire has been a source of comfort and catastrophe for the human race. Early humans used fire to keep warm, cook food, and frighten predators. Sitting around the fire also helped them to unite and strengthened family groups and consequently speeded up evolution. However, fire also posed great risk and challenges to early people, including the challenge of starting and controlling fires and grappling with the threat of burns and wildfires. Fire continues to be a basic everyday element of most people's lives. This tendency of one of man's best friends to turn into his worst enemy cannot be underplayed, as improper handling and use of fire has led to several accidents in homes, offices, schools and other public places with very serious repercussions. Lack of knowledge in different occupations can lead to fire disaster (Salmawati, 2022).

A disaster may be natural or human-made incident that causes destruction that cannot be relieved without assistance. The damage caused by fire disaster reflects in many ways, and the impacts can be as complex as the economy itself (Johnson, 2017; Chaudhary and Piracha, 2021). Disaster is also defined as a phenomenon that produces large-scale disruption of societal infrastructure and the normal healthcare system, that presents immediate threat to public health, and requires external assistance for response (Afolabi, 2018). As population increases, fire occurrence increases in various forms which seem to be inseparable from man's carelessness such as illegal electrical connections, domestic use of fire and storing of fuel at home amongst others. These results into outrageous fire disaster causing a significant pain, loss of lives and property, stress, the wreckage of social and family ties with the environment. There are four major problems associated with fire disasters that retard or impede development namely; Loss of resources, Interruption of programmes and switching from crucial resources to other, shorter-term calamities, Disruption of the non-formal sector and the adverse impacts on investment climate (Abdulsalam, et al., 2016).

Fire disasters are generally on the increase in the country and threatening social and economic sustainability. The occurrence of fire disasters is not a new phenomenon in Zambian history. In 1997, Society House was gutted in Lusaka. In the same year, Cabinet Office was also burnt. In 2000, Indeni Refinery in Ndola was gutted and in 2008, Hydroelectric plant in Kafue Gorge was also gutted (Mwila, 2018). In recent times, hardly a year passes without news of a fire outbreak in a market in any part of Zambia. For example, Chisokone market in Kitwe has suffered from a series of fire outbreaks destroying property worth millions of Kwacha. The first one occurred in 1998, with another occurring in 2009. On 2nd December, 2012, it also experienced another outbreak. There is no doubt that, therefore that these recent fire outbreaks have generated 2 numerous discussions centering on how best at-risk communities are prepared against fire disasters (Fire brigade report, 2017; Mwila, 2018). The main objective of this study was to assess the knowledge and fire safety preparedness among employees of shopping malls in Lusaka, Zambia.

## 2. Fire Incidences in Zambia

In recent years Zambia has experienced a number of fire accidents in public buildings country wide. The public buildings with recent fire incidents include; The Public Service Pensions Building in September 2022 the fire swept through the firth flow of the building (Mvula, 2022), Melisa shopping center in Kabulonga in 2016 the fire damaged a lot of properties worth thousands of kwacha (Lusaka times, 2016), Chawama Embassy mall where a substantial number of properties was lost (The Zambian Observer, 2019) and the ZIMACO yard on freedom way in Lusaka was

guttered destroying property worth several millions of kwacha. The cause of fire accidents is mostly due to lack of knowledge and inadequate firefighting equipment (Muhamad Salleh et al. 2020). To this reason it is important to investigate the knowledge and preparedness of people managing these public buildings in order to reduce or do away with this problem.

Fire is one essential goods for human beings, but it becomes a danger when it occurs where it is not needed. The damage caused by fire disaster reflects in many ways, and the impacts can be as complex as the economy itself (Ahmed et al., 2016). Fire preparedness is very important in order to avoid adverse effects such as the damage of property and economy loss.

Fire, apart from being very useful, and an essential good for human being; it can be very dangerous, when it occurs where it is not needed, and unprepared (Pivello et al. 2021). Fire might lead to death in case of a serious accidents hence the need to assess the safety precaution measures put in place in these public buildings.

### 3. Causes of Fire in Buildings

Fire is defined as a chemical reaction of three elements. The rapid combination of the three elements; Oxygen, Heat and Fuel result in the production of heat and light (Torero et al. 2020; Gorbett and Kozhimal, 2022 ). Before fire can occur, there must be presence of the three basic element or ingredient of fire, which is referred to as fire's own Eternal triangle (Obasa et al. 2020).

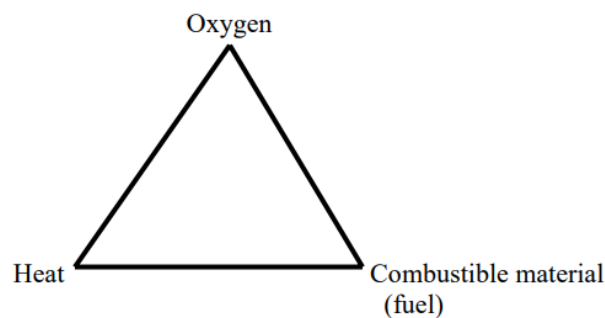


Figure 1. Fire triangle. Source: Makanjuola et al. (2009)

Scholarly evidence has revealed that when these three elements exist in the appropriate relationship, combustion would occur. Pointing out that the removal of one or more of the fire element or the triangle causes an established fire to be extinguished (Makanjuola et al. 2009; Muindi, 2014; Tesha et al. 2018). Causes of fire in buildings can be attributed to various factors; it has been observed according to Flores et al. (2021) as well as Anyanwu et al. (2021) that the causes of fire can be grouped under three headings and they are carelessness, accident and wilful act or arson.

According to the National Fire Protection Association (NFPA), the five most common causes of fires in commercial buildings are cooking equipment, heating equipment, electrical and lighting equipment, smoking materials, and intentional fire setting. Continue reading to learn more about which properties these risks affect, so you know where to focus your fire protection efforts (Ahrens et al., 2013; Addai et al., 2016; Unifour Fire & Safety, 2022).

When you think of buildings with cooking equipment, restaurants probably come to mind first. However, any business that serves food is likely to have a kitchen area. Because of high cooking temperatures, flammable oils and grease, and the hectic nature of commercial kitchens, this is the single most common cause of commercial fires. Cooking equipment is responsible for: 65% of fires in healthcare facilities, 61% of fires in restaurants, 38% of fires in educational institutions, 29% of fires in office properties and 13% of fires in stores and mercantile properties (Unifour Fire & Safety, 2022).

Human error is one of the causes of fire, with so many people often using the workplace on a daily basis, human error can be a common factor in the causes of fires. From using equipment incorrectly, not reporting faulty machinery, to even leaving cooking food unattended, accidents can easily occur without the proper training in place. It is important that building occupants are given some basic fire safety training to ensure the correct procedures are followed if any hazards are identified (Cvetković et al. 2022).

### 4. Fire Safety Preparedness in Buildings

Fire disaster preparedness is a collection of activities designed to increase the level of readiness or improve operational capability, for responding to a fire emergency or incident. Fire disaster preparedness involves planning, equipping, training and exercising in order to create or sustain capabilities in order to prevent, protect against, mitigate and respond to any fire emergency. Guides that one of the universally followed guidelines in fire disaster preparedness is that firefighting equipment should be kept wherever necessary. These equipment and facilities must be maintained regularly and if any problem is detected there should immediate repair (Mweetwa, 2018).

Kaluyu, (2016) posits that provision of fire safety support resources has a significant effect on fire disaster management preparedness and stakeholders should therefore be trained on fire disaster for effectiveness. In addition to above, fire disaster preparedness involves fire prevention method through education to teach people how to avoid causing fires. It influences behavior on the strategic goal of minimizing loss of life, property and enhance resilience. In spite having sufficient fire safety system installed in buildings, the incidence of fire hazard becomes the furthest and supreme threat to health and safety, as well as property to any community (Charbonnet et al. 2020; Kebut, 2024). In order to make sure that the safety of the building and its users are met, the fundamental features depend on the fire precaution system and equipment which should be according to the standard requirements. Nevertheless, the awareness on fire safety could necessarily alleviate the damages or rate of fatality during the event of fire.

Education is the key to fire prevention and preparedness. Building occupants can be taught how to prevent the components of the fire triad from converging to start a fire and how to handle a fire if one occurs (Casal-Guisande et al. 2023). Education is key in fire prevention hence the need to assess the knowledge, attitude and practices towards fire safety in buildings.

#### **4.1. Fire safety preparedness in Shopping Malls**

Fire safety preparedness is one of the four phases of fire emergency management which is aimed at fire disaster risk reduction. It is a continuous cycle of planning, organizing, training, equipping, exercising, evaluating and improving strategies to ensure effective coordination and enhancement of capabilities to respond to fire disaster (Federal Emergency Management Agency, 2017). The Fire safety preparedness encompasses a combination of or coordination of some activities or programs to avert destruction from fire, such programs include escape routes provisions and maintenance, fire prevention measures, staff training, and fire drill training (Andrew, 2017). Adequate knowledge on fire safety as well as availability of fire safety equipment, procedures and precautions in public buildings is paramount to attaining fire safety preparedness. Due to the danger of injury or death from fire-related emergencies, the employees of shopping malls as well as the users must comply with fire safety requirements (Florida Atlantic University, 2018).

Shopping malls are accessed by people from all walks of life and, therefore, provision of adequate fire safety measures is equally important. Kikwasi (2015) opined that in order to improve fire safety in shopping malls signage, warning alarms, detectors as well as fighting equipment need to be installed. In a study by Tabassum et al. (2014) it was revealed that almost all shopping centres surveyed were equipped with fire extinguisher and hydrant systems, smoke detectors and fire and safety signs and symbols, but means of escape and firefighting equipment found in almost all buildings were not maintained properly. This suggest the need for ensuring unimpeded emergency exit routes as well as regular maintenance of the equipment. Rahardjo and Prihanton (2020) adds by cautioning that, once a sprinkler system is installed, it is imperative to maintain and test it regularly for the system to work properly. Training through short course, seminars and workshops will equip visitors, users and occupants of building with knowledge to take action in case of fire out breaks. Scholars have recommended that all employees and security officers at shopping malls should be involved in regular fire drills at least once a year and they should be trained in the use of firefighting appliances (Tabassum et al. 2014; Kikwasi, 2015).

Similarly, on preparedness, the World Health Organisation (2017) advances that preparedness is a program of long-term activities whose goals are to strengthen the overall capacity and capability of the community to manage efficiently all types of emergencies and bring about an orderly transition from relief recovery, and back to sustained development. Contending that preparedness requires development of emergency plans, training of personnel at all levels and in all sectors, educating of the communities at risk, and ensuring that these measures are monitored and evaluated regularly. Overall on the preparedness practices aimed at preventing fire in public buildings literature reveals a number of practices these include conducting of safety trainings and fire drills, knowledge on effective use of a firefighting equipment among others as shown in table 1.

**Table 1.** Summary of Fire Safety Preparedness Practices (Authors compilation).

Fire Safety Preparedness Practices	Authors
Fire Safety Trainings and Drills	Ogbonna et al. 2015; Isiwele et al. 2013; Tesha et al. 2018; Shokouhi et al. 2019
Assembly Point	Ogbonna et al. 2015; Tesha et al. 2018
Emergency Warning Signs	Ogbonna et al. 2015; Tesha et al. 2018
Firefighting Equipment/Gears	Isiwele et al. 2013; Adeleye et al. 2020;
Fire Instruction Notices	Tesha et al. 2018; Casal-Guisande et al. 2023
Training on Emergency Services in Case of Fire Occurrence	Tesha et al. 2018; Shokouhi et al. 2019
knowledge on effective use of a fire extinguisher	Ogbonna et al. 2015; Adeleye et al. 2020;
Simulated fire disaster response exercise	Ogajo, 2013; Isiwele et al. 2013; Zhu et al. 2020
Installation of fire alarms	Isiwele et al. 2013; Tesha et al. 2018; Rahardjo Prihanton, 2020
Regular maintenance of the warning system	Rahardjo & Prihanton, 2020; Cvetković et al. 2022
Regular maintenance of the direction and escape signs	Ogbonna et al. 2015; Rahardjo & Prihanton, 2020
Regular maintenance of fire appliances	Rahardjo & Prihanton, 2020
Maintenance of unimpeded escape routes	Dârmon & Babota, 2018; Rahardjo & Prihanton, 2020
Installation of fire/smoke detector(s)	Ogbonna et al. 2015; Gu et al. 2023

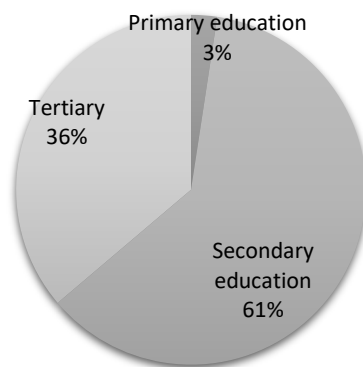
**5. Material and Methods**

This study adopted a cross sectional descriptive design with quantitative approach. Data was collected using a structured questionnaire containing closed-ended questions from a total of 83 respondents drawn from six shopping malls in Lusaka. These included shop attendants, cleaners, and employees from various companies/organisations operating at the malls. The development of the questionnaire (instrument) used for data collection was informed by the extensive literature review from which variables used to measure knowledge and practices on fire safety preparedness were identified and included on the questionnaire. Descriptive statistics was used for the analysis of collected data.

To measure the respondents’ agreement levels, statements were rated on a five-point Likert scale. Likert-type or frequency scales use fixed choice response formats and are designed to measure attitudes or opinions (Wegner, 2012). The scale of 1 to 5 was used, where 1 = Strongly disagree ( $\geq 1.00$  and  $\leq 1.80$ ); 2 = Disagree ( $\geq 1.81$  and  $\leq 2.60$ ); 3 = Neutral ( $\geq 2.61$  and  $\leq 3.40$ ); 4 = Agree ( $\geq 3.41$  and  $\leq 4.20$ ), and 5 = Strongly agree ( $\geq 4.21$  and  $\leq 5.00$ ). The collected data was analysed using descriptive statistics namely frequencies, mean scores, standard deviations, as well as the coefficient of variation (CV) to indicate the extent of variability about the mean.

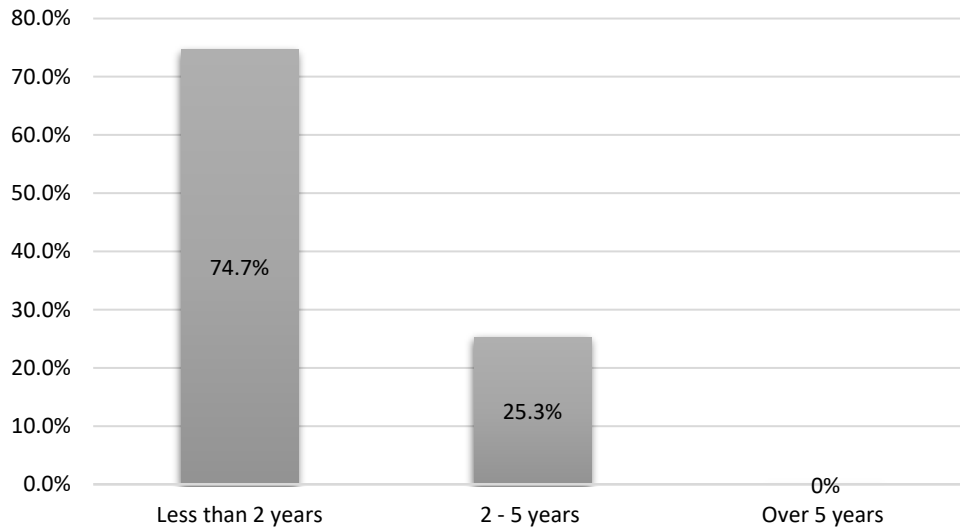
**6. Results**

Among the 83 respondents who took part in the study, 61% had attained education up to senior secondary school, whereas 36% had attained tertiary education, with 3% of the respondents having only primary education as shown in figure 1.



**Figure 1.** Respondents’ level of education

Furthermore, with regard to the respondents duration at the current stations, of the successive respondents 74.7% had work at the shopping more for the period of less than two years, whereas, 25.3% had worked for a period of two to five years as shown in figure 2.



**Figure 2.** Duration of work at the current station

**6.1. Knowledge on fire safety preparedness**

An assessment was carried out to ascertain employees level of knowledge on fire safety preparedness the results revealed that most employees agreed to knowing the location of the closest fire extinguisher and the location of emergency routes indicated with the means score of 4.29 and 4.24 respectively. However, the employees disagreed to having knowledge on PASS method of fire prevention with a mean score of 2.08. Likewise, regarding the knowledge of the number to call in case of fire emergency the respondents indicated lack of knowledge as denoted by the mean score of 2.49 and standard deviation of 1.603. The other information concerning knowledge on fire safety preparedness is presented in table 1.

**Table 1.** Knowledge of fire safety preparedness

Statements N=83 1 = strongly disagree (≥1.00 and ≤1.80); 2 = Disagree (≥1.81 and ≤2.60); 3 = Neutral (≥2.61 and ≤3.40); 4 = Agree (≥3.41 and ≤4.20), and 5 = Strongly agree (≥4.21 and ≤5.00)		Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	SD	CV (%)
1	I know the location of the closest fire extinguisher from our office/store	15.7	2.4	2.4	9.6	69.9	4.29	1.225	29
2	I know the emergency exit route from our store/office	12.0	3.6	3.6	18.1	62.7	4.24	1.195	28
3	I have been taught how to use a fire extinguisher in case of a fire outbreak	77.1	6.0	0	3.6	13.3	2.53	1.063	42
4	I know about different types of fire extinguishers	54.2	22.9	9.6	2.4	10.8	2.51	1.075	43
5	I know the emergency number to dial in case of fire	33.7	4.8	34.9	0	26.5	2.49	1.603	64
6	I know about fire triangle and its components	54.2	13.3	18.1	12.0	2.4	2.27	.976	43
7	I know about 'PASS' method of fire control	56.6	15.7	21.7	3.6	2.4	2.08	.858	41
	Composite mean						2.92	1.142	41

Overall, in assessing the level of knowledge on fire safety preparedness, the results revealed low levels of knowledge as denoted by the group mean of 2.92, though the SD and CV scores revealed some variations in responses about the mean.

**6.2. Practices on fire safety preparedness**

On fire safety preparedness practices the findings revealed poor implementation of fire safety practices as denoted with the means scores of; 1.82, 1.93, 1.98, 2.05, 2.13, 3.00, 3.04, 3.67 and 3.71 respectively. The employees only agreed to one practice which had the means score of 4.06 as shown in table 2.

**Table 2.** Practices/Measures on fire safety preparedness

N=83 1 = strongly disagree (≥1.00 and ≤1.80); 2 = Disagree (≥1.81 and ≤2.60); 3 = Neutral (≥2.61 and ≤3.40); 4 = Agree (≥3.41 and ≤4.20), and 5 = Strongly agree (≥4.21 and ≤5.00)		Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	Mean	SD	CV (%)
1	The emergency fire exit route is always left unimpeded/unobstructed	8.4	0	10.8	25.3	55.4	4.06	1.374	34
2	Fire warning systems are maintained regularly	8.4	0	15.7	41.0	34.9	3.71	1.427	38
3	We have a procedure for emergency evacuation in case of fire	31.3	20.5	13.3	8.4	26.5	3.04	1.418	47
4	We have fire prevention plan in the store or office	33.7	18.1	10.8	19.3	18.1	3.00	1.307	44
5	We did fire safety preparedness trainings at the mall	80.5	0	11.0	1.2	7.3	2.13	.899	42
6	We did trainings on first aid firefighting at the mall	86.7	4.8	6.0	1.2	1.2	2.05	.516	25
7	Simulated fire disaster response exercise	95.2	1.2	3.6	0	0	1.98	.220	11
8	Fire safety preparedness trainings are done at least once a year	54.2	0	34.1	6.1	4.9	1.93	1.010	52
9	Fire safety drills are performed at the mall	59.0	0	34.9	1.2	4.8	1.82	.899	49
	Composite mean						2.64	1.008	38

Overall, the mean score recorded was 2.64 suggesting lack of implementation of the fire safety preparedness, this was supported by the standard deviation of 1.008 (barely above 1) as well as coefficient variation of 38%. Though, the standard deviation scores and coefficient of variation (CV) suggests variability in responses about the mean.

**7. Discussion**

**7.1 Practices on fire safety preparedness**

The study suggest that employees at shopping shopping malls lack of knowledge on steps to follow when using a fire extinguisher, most employees did not know the emergency number to use in case of a fire emergency and did not know how to use the fire extinguisher. Surprising enough more than half of the employees knew the location of the closest fire extinguisher despite not knowing how to use it. This agrees with Cvetković et al. (2022) who posited that most people do not know that it is their responsibility to prevent fire outbreaks, adding that incidents of fire outbreaks will not go down unless building occupants are well informed on the best practices aimed at ensuring fire safety. Most employees at shopping Malls did not know the correct number to call in case of a fire, this information agrees with Muindi, (2014) who conducted a research and indicated that (72%) of the respondents did not know the emergency telephone numbers to dial in order to report a fire outbreak. This suggest that in case of a fire outbreak, the response time by the staff and fire response teams would be prolonged. Overall, the levels of knowledge with regards to fire safety preparedness among employees at shopping Malls were low, despite having some of the necessary fire equipment most employees have little knowledge of the importance and on how to use the equipment.

**7.2 Practices on fire safety preparedness**

On fire safety Similarly, on the practices study revealed low levels of implementation of the practices when it comes to fire safety preparedness, none of the employees agreed to have participated in a fire drill at the mall. Most of the employees of shopping malls did not agree to have participated in fire safety preparedness trainings at the mall. These results agree with Kumisa (2014)’s research though conducted on schools, who found that none of the schools surveyed had ever done any fire safety training, or had ever carried out fire simulations and drills yet it is known that repetition is a key component in retention knowledge especially when it comes to do with the

issues of fire safety. Likewise, Muindi (2014) in a similar study in universities found that majority (96.3% and 93.0%) of the respondents in the campuses surveyed had never undertaken fire safety training. According to Target Fire, (2022) Human error is one of the causes of fire, with so many people often using the workplace on a daily basis, human error is a common factor in the causes of fires. From using equipment incorrectly, not reporting faulty machinery, to even leaving cooking food unattended, accidents can easily occur without the proper training in place. All staff should be given some basic fire safety training to ensure the correct procedures are followed if any hazards are identified. Overall, the results collected suggest employees at shopping malls do not undergo fire safety preparedness training and this is not the best practice, considering that one of the leading causes of fire outbreaks is human error which comes about if workers are not trained.

## 8. Conclusions

In buildings where a lot of people converge such as shopping malls and many other public places ensuring fire safety is essential in safeguarding the lives peoples as well as the integrity of the building. From the study evidence suggest low awareness as well as poor fire safety preparedness among the employees of shopping malls (public spaces), this has potential to pose danger to human life as well as the infrastructure development in case of fire outbreak. The study therefore, recommends that public building should always have a displayed fire safety plan. More so, that employees in public buildings should be trained on how to ensure fire safety as well as appropriate responses in case of fire. Fire simulation and drill exercises should be carried out regularly in public buildings to ensure that everyone understands the procedures to follow in case of an emergency.

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## Conflict of Interests

The authors declare no conflict of interest.

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