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Assessment of Markets Fire Emergency Preparedness in Tanzania A Case Study of 6 Markets in Ilala City Council -Dares Salaam

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Abstract

This study is intended to assess fire emergency preparedness in public and private markets in Dar es Salaam Region by measuring the specific market preparedness in fire emergency policies, fire safety equipment, signage and infrastructure, fire fighting knowledge and fire preparedness plans, and acknowledging areas of improvements. The study was comparative and adopted mixed approach design implying both quantitative and qualitative methods. Primary data were collected using questionnaires, semi-structured interview and observation. Secondary data were obtained reviewing published dissertations, articles, journals, textbooks and documents from the website. A total sample of 87 respondents from public markets were selected for the study. Quantitative data was analysed by using descriptive statistics with the help of SPSS. Qualitative data was analysed by using content analysis. The use of graphs and charts was encouraged to facilitate data presentation. The findings showed that fire emergency preparedness was good in private Markets compared to public market. The study revealed that both public and private markets had awareness on firefighting activities. However, public market did not offer much trainings compared to private markets which made majority of the respondents to have less knowledge on firefighting. Also, public markets lacked fire emergency policies, plans and some of firefighting equipment compared to private markets. The study recommended that markets should have fire emergency preparedness plans, policies, sufficient equipment, signage and infrastructure and monitoring and evaluation programs. Also separate fire preparedness budget and creation of awareness programs via different communication media to improve emergency preparedness.

Keyword: Fire Emergency, Preparedness in Fire Emergency, fire Policies, Fire safety, fire preparedness plans, Market and Tanzania

Introduction

Fire outbreaks are disasters which are caused by actions of human beings directly or indirectly.

Fire safety entails all the activities which are geared towards fire prevention, fire detection and fire control. These activities and processes are done to safeguard human life and to preserve property.

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 disasters (FEMA, 2007).

Fire safety preparedness is an essential aspect in both environmental and occupational safety and health. Fires being an example of physical hazards have affected many workplaces and most of them are mainly caused by inadequate strategies in fire prevention, detection and/ or fire control.

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The notion of emergency preparedness is very crucial in preventing fire emergencies from happening and lessening the impacts by reducing the number of deaths, casualties and damage to properties. It is one of the important elements in emergency risk reduction which encompasses community awareness, readiness to render appropriate responses and quick recovery.

In most of the developing countries like Tanzania, little is documented on preparedness for specific types of emergencies like fire especially in markets. This is explained in various reports of fire statistics in different countries of the world (CTIF, 2020). However, there has been numerous fire outbreaks in Tanzania from the lowest unit of family to the highest level of the nation. According to (Ndibalema A. , 2015), some of these incidents include the 1989 Ministry of Home Affairs headquarters fire, the 2002 National Insurance Investment building, the 2009 Tanzania Breweries Limited fire, and 2013 Sunset Bungalows and White sands hotel in Zanzibar, Dar es Salaam Parastatal Pension Fund (PPF) Towers in 2013, the 2020 Byamungu Islamic School fire (VoA, 2020), and 2020 Kimbi family fire in Tanga region (Facebook, 2020). The Sunset Bungalows and White sands incidents of 2013 resulted to a loss of more than 400 million Tanzanian shillings and 800 million Tanzanian shillings respectively (Michuzi, 2013), the Byamungu Islamic fire resulted to a death of 10 students and the Kimbi family fire resulted to death of 4 people.

Luoga (2020) claims that, most of fire emergencies that happened in the past are due to negligence in unpreparedness and poor implementation of the laws and regulations. Also (Ndibalema A. , 2015) adds that, fire emergencies are a result of poor fire management systems and lack of awareness to respond to fire emergencies.

According to (UNDRR, 2015), less has been done globally to improve the levels of emergency preparedness despite its importance. Furthermore, the Hyogo Framework for DRR report in Tanzania underlines a need of developing high level of preparedness capacity for all types of emergencies (PMO, 2015). This rises a concern that no enough measures are put in place to prepare for fire emergency as a whole and particularly in markets regardless the impacts they cause.

Fire incidences are a common phenomenon in Tanzania even though the country has limited record on market fires. The Fire and Rescue Force have recorded a total of 3,456 fire events that happened all over Tanzania in the year 2020 (Fire Rescue Force, 2020). It is hypothesized that such emergencies resulted from negligence in preparedness and particularly inadequate trainings for different facility users, poor fire emergency management, low awareness on the use of firefighting gears and insufficient enlightenments on community awareness and cautions on fire incidences (Ndibalema, 2015). Most of the market fires happening around the world during Covid-19 pandemic were caused by gas explosions. Tanzania is facing the same challenge and the level of vulnerability is increasing due to the pandemic.

Markets are emergency centres by nature which are complex and surrounded by many hazards including explosive chemicals, electrical wiring, flammable liquids and gas tanks and cylinders which at the right environment can lead to fire emergency. Proper assessment is needed to be done in order to enhance fire emergency preparedness in markets especially during Covid-19 pandemic.

Less attention of fire emergency preparedness is also observed in African countries whereby various fire incidences particularly in markets continue to destroy lives and properties of people (Murage, 2012). This makes preparedness one of the crucial aspects that should be considered to avoid destruction of people's lives and properties associated with fire outbreak (Addai *et al.,* 2016). In Tanzania, unpreparedness of fire emergency is also evident in various fire

incidences especially in markets whereby various fire incidences have been reported to occur in various places of Dar Es Salaam, particularly in Ilala City Council public markets. The overall research problem is that, despite its importance, there have been frequent fire outbreaks in public markets across the nation which continues to destroy markets' infrastructures, peoples' properties and even loss of life. In addition to that, there is little academic information regarding fire emergency preparedness in Tanzania particularly in public markets. Therefore, this justifies a need to carry out the study in the respective areas

Literature Review

Fire is one of the greatest discoveries in human life that has helped the world to evolve to where we are (Darwin, 1874). History explains that fire was discovered over 1,000,000 years ago in an open site in East Turkana, and site in the Chemoigut Formation at Chesowanja near Lake Baringo in Kenya (Gowlett, 2016). Ever since its discovery, fire has been used in various activities ranging from domestic use to technological discoveries including cooking, generating heat, light, incineration of wastes, smelting and forging of engines.

According to (Merriam-Webster, 2021) fire means the light and heat and especially the flame produced by burning. Many authors including (Pan American Health Organisation (PAHO), 2014) mentions three important elements in the fire occurrence; fuel, oxygen and source of ignition (heat) which form a fire triangle. If one of these elements misses then a catalyst must be present to help in the ignition process. The three elements are explained as follows;

Fuel; fire cannot start if there is nothing to burn. Fuel is any combustible material that can be used as the source of ignition of the fire, as well as to keep it burning example wood, paper, gas, animal fats, petroleum oil and electrical appliances. Some of these materials burn easier than others. In suppression of fire one element must be removed to discontinue the burning process and fuel is the hardest to be removed among all the three elements (Fire Risk Assessment Network, 2021).

Oxygen as an oxidizing agent that reacts with the fuel to start and continue the fire. Lower concentrations of oxygen result in slower fuel combustion. Reports explain that atmosphere of the earth consists of 21 % oxygen and most fires start with 16% of oxygen which indicates that there's enough to trigger a fire anywhere as long as the other two components are present (Oregon State Univ, 2020).

Heat is responsible for the initial ignition of fire, and is also needed to maintain the fire and enable it to spread. Heat perpetuates fire to escalate quickly by preheating fuel and making the air around the area more warmer.

Currently, some authors have mentioned four elements which are important in the outbreak of fire. The elements are heat, oxygen, fuel and chain reaction which has altogether transformed the fire triangle into a tetrahedron. According to Fire Risk Assessment Network (2021), tetrahedron is a pyramid, which is a solid with four plane faces. This theory was reformulated after the discovery of the halon extinguishing agent.

Britez et al., (2019) further explains that, heat is the element used to start a fire, maintain and increase its spread. Oxidizer (oxygen) is in the air surrounding us and is needed for combustion. Fuel is the propagating element of fire and can be solid, liquid or gaseous. The chain reaction makes the burning process self-sustaining. Basically, the radiated heat from the flames reaches the fuel and it is broken down into smaller particles, which combine with oxygen and burn, radiating heat back into the fuel, thus forming a constant (self-sustaining) cycle.

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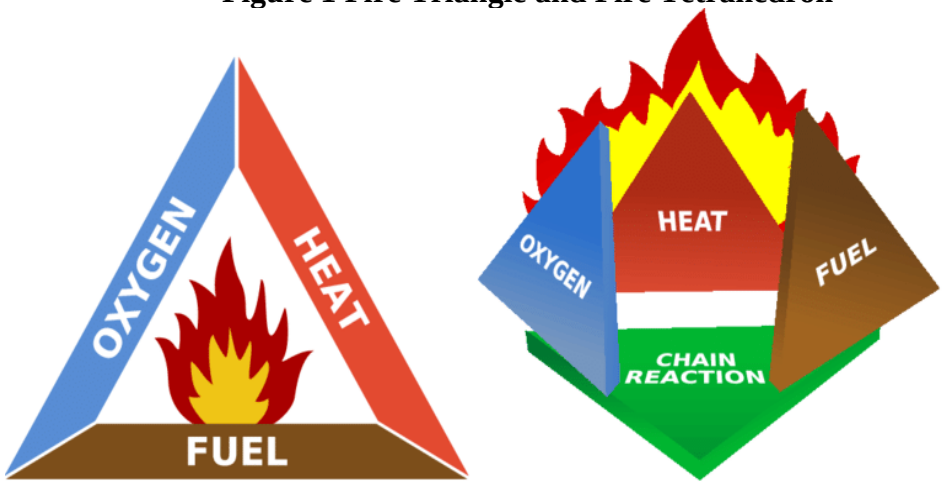
Figure 1 Fire Triangle and Fire Tetrahedron



Source (Underhill, Hiltz John, & Moyst , 2007)

Classes of Fire

Fire is classified in five classes which highly depend on the type of fuel / combustible material that is burning (Univ of Pennsylavania, 2014). The following are the classes of fire;

CLASS "A" stands for fires that leaves ash after burning. They are caused by ordinary combustible materials, such as paper, wood, cloth and plastics. This type of fire is best extinguished by removing the heat. Fire extinguishers for this purpose is dry chemical extinguisher and water.

CLASS "B" stands for fires that boil or bubble. They are caused by any non-metal in a liquid state such as flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents and lacquers. This type of fire is fast-spreading and can cover a very large area in a very short time. This fire accounted for only 2% of fires and a massive 21% of fatalities in 2010/11 in UK (HASpod, 2019). In Tanzania, the recent class 'B' fire that happened was in 2019 in Morogoro region resulting to more than 100 fatalities (BBC Swahili, 2019). The best way to extinguish it is by blanketing or smothering action (ABCs of Fire Extinguishers, 2021).

CLASS "C" stands for fires originating from flammable gases. The early steps of extinguishing this kind of fire is putting off electricity source to cut off current conduction. Generally, the fire extinguisher recommended is dry chemical or carbon dioxide. Water is highly not recommended in this class.

CLASS "D" fires stand for fires that have a dynamite effect as they involve combustible metals such as ammonium nitrate, sodium, lithium, potassium, titanium, magnesium and zirconium. In 2020, a port in Beirut Lebanon which did not properly store ammonium nitrate exploded and killed over 200 people, injured 7000 and displaced over 300,000 persons (Landry, Alameddine, Jesus, & et.al, 2020). This class is extinguished by dry powder.

CLASS "F/K" are fires caused by cooking appliances that involve combustible cooking oils such as vegetable or animal oils and fats. This class is extinguished by wet chemical.

Furthermore, fires from electrical currents do not have a clear distinction and they are not classified as electricity is not regarded as fuel but rather acts as heat source.

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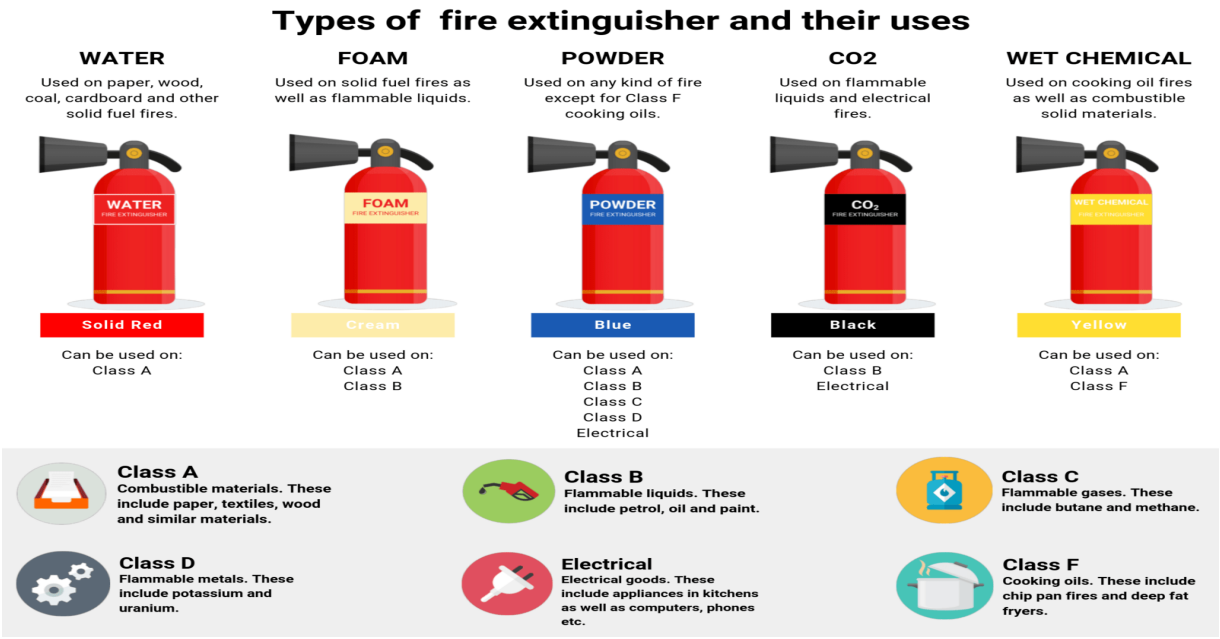
Figure 2 Types of Fire Extinguishers and Their Uses



Source; Google 2022

Concept of Fire Emergency

Fire is very important but possess a great danger when used incorrectly. In the world we are living today, there are many hazards that can lead to emergencies like fire. WHO (2002) explain emergency as a state in which normal procedures are suspended and extra-ordinary measures are taken in order to avert a disaster. Fire emergencies may be triggered by human actions which increases or decreases the probability of fire outbreak. The probability of fire outbreak / fire risk is determined probabilistically as a function of hazard, exposure, vulnerability and capacity. It is defined as the potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time (UNDRR , 2021). Some literatures explain that fire risk is a probability of negative consequences that can happen as a result of fire emergency or disaster.

Fire emergencies have devastating consequences that may result into deaths, injuries, loss of properties, and extensive damage to business and homes (World Fire Statistics, 2014). In 2019, a fire department responded to a fire on average every 24 seconds in the United States (NFPA, 2015). A home fire was reported every 93 seconds, a home fire death occurred every three hours and 10 minutes, and a home fire injury occurred every 43 minutes. According to CTIF (2020), Barbados, Netherlands and USA, are among the top 15 countries with high fire emergencies per thousand people per year 2018, Barbados recording 6.95 fire events per thousand people, USA 4.05 fire events per thousand people and Netherlands 5.18 fires per thousand people.

In Africa, fire emergencies have occurred in all the countries and have resulted to injuries, deaths, loss of properties (CTIF, 2020). In East Africa, Tanzania is leading in fire deaths per year having an average of 2,808 deaths and being among top 25 countries in the world fire 2020 report with more than 2.0 deaths per 100,000 inhabitants having a rate of 5.2 deaths per 100,000 inhabitants (CTIF, 2020). The report further reveals that Kenya has a total number of 1,230 deaths per year which is an average of 2.5 deaths per 100,000 inhabitants while Uganda has an average of 2,228 deaths which is 5.4 deaths per 100,000 inhabitants per year.

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Fire emergency has resulted to loss of lives, injuries and destruction of different facilities in various countries including public markets in Tanzania (Luoga, 2020), boarding schools (Nyagawa, 2017) and markets facilities in South Africa (SABC News, 2021).

Relevance of the Theory to the Study

This theory provides that individuals tend to safeguard themselves from any of harm which is persuaded by four aspects which involve belief related to the risk, severity, belief related to the vulnerability and belief related to the perceived efficacy and self-efficacy. In addition to that, this theory is very crucial in this study as it provides the importance of protecting from various risks and dangers where for the purpose of this study, various strategies are taken into consideration and these are conducting inspection, providing education to the community about fire emergency preparedness, fire risk management and fire emergency preparedness plan.

Behavioral Theory

This theory attempts to elaborate about human behaviour by analyzing what is commonly known as the antecedents and consequences present in the environment of individuals. Therefore, according to Ejeta (2015), preparedness for disasters and emergencies at individual, community and organizational levels could be more effective tools in mitigating (the growing incidence) of disaster risk and ameliorating their impacts. That is, to play more significant roles in Disaster Risk Reduction (DRR). Preparedness efforts focus on changing human behaviors in ways that reduce people's risk and increase their ability to cope with hazard consequences.

Disaster preparedness is one of the basic components of DRR. Preparedness identifies the steps necessary to increase the likelihood of avoiding or minimizing hazard effect consequences. Preparedness strategies are developed through a hazard identification and mapping, vulnerability analysis and risk assessment with behavior change strategies being used to inform how the outcome of this process can translate into protective actions. Effective preparedness reduces vulnerability, increases mitigation level, enables timely and effective response to a disaster event and so shortens the recovery period from a disaster, and increases community resilience.

The Concept of Emergency Preparedness

The Sendai Framework for Disaster Risk Reduction 2015-2030 has preparedness amidst its four (4) priority of actions (UNDRR, 2015). This was an assessment done after the Hyogo Framework for Disaster Reduction 2005-2015 which showed an emphasis in increasing efforts in preparedness activities to reduce the impacts of potential emergencies. According to UNDRR (2021), emergency preparedness refers to all the knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from the outcomes of any hazard that may happen or is happening at a given time.

FEMA informs that, preparedness involves activities as planning, training, and educational activities for events that cannot be mitigated. Such activities may comprise of developing preparedness plans for what to do, where to go, or who to call for help in an emergency, exercising plans through drills; table top exercises and full-scale exercises, preparing a list of required items that can be used in case of emergency and acknowledging potential vulnerabilities by performing scenario identification.

Preparedness includes all activities and measures taken to assure that there is an operative reaction to the influence of hazards. These activities include forecasting and early warning, scenario identification (Manesh, 2017), temporary evacuation of people and property from threatened locations (AL-Fazari & Kasim, 2019), recruiting, assigning, and

training staff who can assist in key areas of response operations, identifying resources and supplies that may be required in an emergency, designating facilities for emergency use (Federal Emergency Management Agency, 2006) and planning and Monitoring.

In this study, preparedness has incorporated some elements of fire risk assessment to acknowledge the level of vulnerability and preparedness in the markets. According to HM Government (2006), fire risk assessment refers to an organised survey which is done step by step in a certain premise to understand the nature of the activities conducted and the possible causes of fire and the people that can be affected in the premise and in the surrounding areas. Fire risk assessment includes in identifying fire hazards, recognizing vulnerable people, evaluating the existing fire safety arrangements, recording findings; produce an emergency plan; instruct; inform and train, and arrange to regularly perform risk assessment (Fire Safety Section, 2013)

Fire risk assessment is important in markets to identify the fire hazards, reduce the risk of those hazards causing harm to as low as reasonably possible and decide what physical fire precautions and management arrangements are necessary to ensure the safety of people present in the market (Fire Safety Section, 2013)

Strategies employed by Fire and Rescue Force in Fire Emergency Preparedness

Baig and Ashraf (2016) on fire risk assessment at superstores in Pakistan showed that, the purposes of the fire risk assessment are to make an identification of the fire hazards or fire prone areas. The process of risk management can be done by dividing the process into different stages such as identification of risk, risk analysis and risk responses. There are many methods which can be used for assessment of risk such as expert judgment which is based on knowledge and experience, plan decomposition, analysis based on assumption and brainstorming for identification of risk factors. Moreover, the study revealed that, area accessibility of some stores increases the chances of hazard as if fire tenders are not able to reach them on time then loss of lives and property would be greater and even there is risk that it would convert into disaster. By studying the past cases of fire incident in super stores of Karachi it was found that there are two cases of fire had been reported in last 5years.

Twigg *et al.* (2017) on improved methods for fire risk assessment in low-income and informal settlements found that, fire policy and mitigation strategies in least developed nations are constrained by insufficient information on incidence, impacts, and causes, which is mainly due to a lack of ability and resources in collecting information, analysis, and modeling. Hence, community-based risk and vulnerability assessment methods which are widely used in disaster risk reduction could be adapted to urban fire risk assessment and could be enhanced by advances in crowd sourcing and citizen science for geospatial data creation and collection.

Likewise, the reviewed study by Twigg *et al.* (2017) attempted to provide detailed information related to the fire risk assessment including fire policy. However, the study only based on these strategies leaving behind other strategies such as fire inspection, provision of education, fire risk management and fire emergency preparedness plan.

In the same trail, Rawat (2003) on the fire risk assessment for forest fire control management in Chilla forest range of Rajaji national park Uttaranchal showed that the entire study area was vulnerable to forest fires during summer seasons. On the other hand, all existing forest roads need to be cut and burnt annually during winter. Also firewatchers should be engaged during fire season. Strict vigilance needs to be maintained to any kind of public entry inside park during fire season. In addition to that, the study stated that it is very crucial for raising the level of awareness of local people with regard to fauna, flora and to

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help in protecting environment without the cooperation of the local people it would be difficult to protect that particular area.

The reviewed study by Rawat (2003) attempted to provide detailed information related to the fire risk assessment. However, the study only based on this strategy leaving behind other strategies such as fire inspection, provision of education, fire risk management and fire emergency preparedness plan.

Boakye (2017) on the emergency fire response in Ghana with reference to fire stations in Kumasi unveiled that comprehensive emergency management and response is crucial for disaster prevention and health emergencies. However, in African countries with an abundance of natural disasters and a rising surge in cardiovascular and obstetric emergencies, little research exists on emergency response. The study used Geographic Information Systems (GIS) tools including location -allocation modeling to evaluate the existing system of fire facilities, identify gaps in service, and suggest locations for new fire stations to maximize population coverage. Moreover, the study findings showed that, there is a poor distribution of fire stations within Kumasi Metropolitan Assembly (KMA) and large portions of the metropolis are underserved.

Methodology

This research was carried out at Kariakoo International market, Ferry fish Intentional market City Mall, Imalaseko Super Market, Kisutu Central Market and Karume market. The justification of selecting this study area is the fact that most of the large public and private markets in Dar es Salaam are located in Ilala City Council in Dares salaam Region. The study was comparative and adopted mixed approach design implying both quantitative and qualitative methods. Primary data were collected using questionnaires, semi-structured interview and observation. Secondary data were obtained reviewing published dissertations, articles, journals textbooks and documents from the website. A total sample of 87 respondents from public markets were selected for the study. Quantitative data was analysed by using descriptive statistics with the help of SPSS. Qualitative data was analysed by using content analysis. The use of graphs and charts was encouraged to facilitate data presentation.

Findings and Discussion

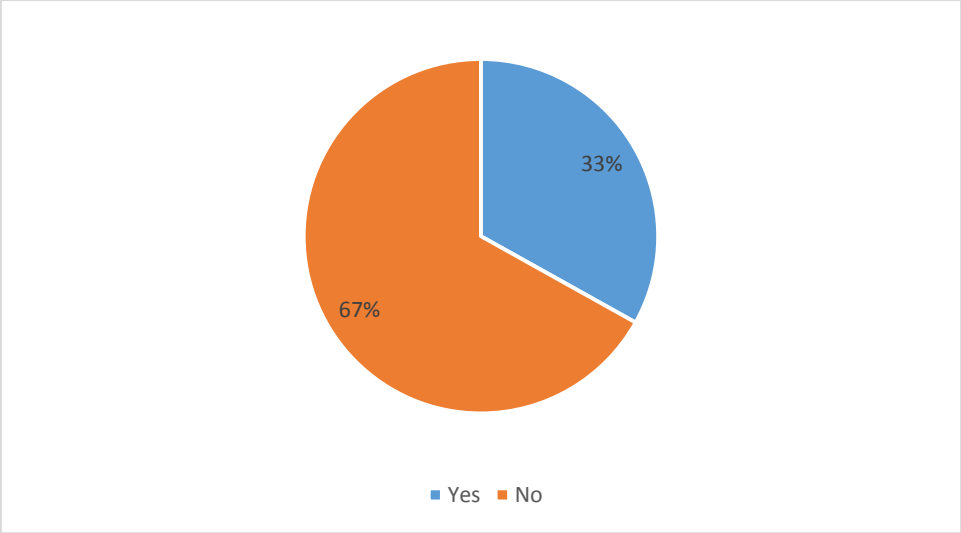
Fire policies and fire safety equipment, signage and other infrastructure

It is important to have emergency policies which offer guidance, consistency, accountability, efficiency, and clarity on how market fire emergency preparedness should be done (CMHC, 2021). The fire emergency preparedness policy carries a lot of weight in any institution so as to save the lives of other people and put a priority in their safety. Emergency policies are supposed to be under review annually to accommodate all the changes needed. Such policies enable markets preparedness in case of fire emergency along with fire safety equipment, signage and other supporting infrastructure. In this section the availability of the policies, fire safety equipment, signage and other supporting infrastructure and their efficiency.

Availability of the fire emergency preparedness policy on fire emergency preparedness

Public and private markets do differ in their practices as some have general policies for disaster preparedness and some have specific policy of fire emergency preparedness and some do not have at all.

Figure 3 shows the availability of fire preparedness policies in public markets.



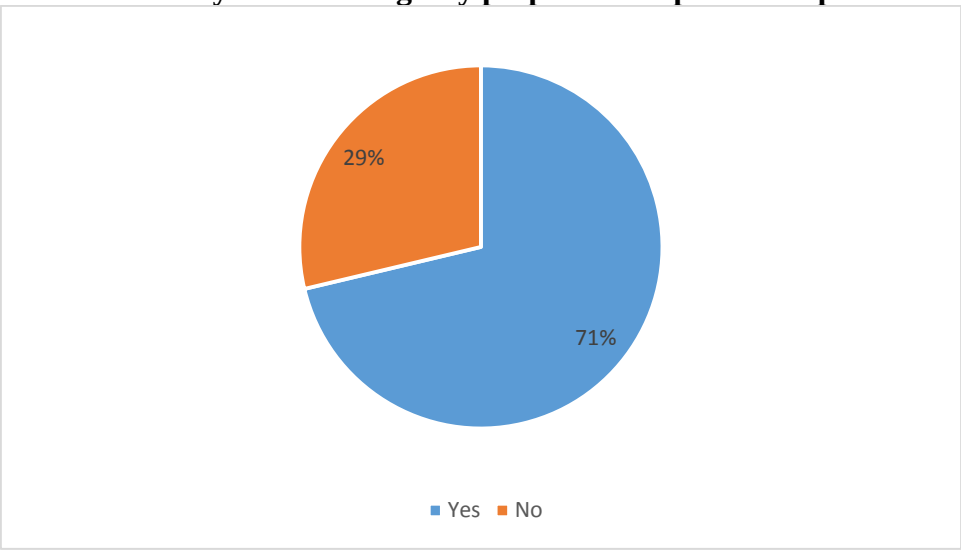
Source: Field data (2022)

The data from Figure 3 indicated that, 67% of public respondents confirmed no fire emergency preparedness policies were operational in their markets. The remaining 33% responded that there is a possibility that policies are operational. The respondents further informed that the markets do not have policies for general emergency preparedness and in case of any situation they do not have any emergency guidance.

This underlines the need to develop fire emergency preparedness policies in the markets as any successful emergency need guidance and clear procedures to be followed.

The availability of fire emergency preparedness policies in private markets is different from the public sector as the Figure 4 shows;

Figure 4. Availability of fire emergency preparedness policies in private markets



Source: Field data (2022)

The data from the analysis show that, private markets have prioritised on fire emergency preparedness policies through ensuring that the policies are formulated and put in operation through practices. From Figure 4, 71% indicates that there are policies formulated to provide guidance for fire emergency preparedness as part of enhancing the safety of their

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facilities and the people within from the impacts that maybe resulted from fire emergencies. 29% of the respondents indicated that there are no policies formulated for fire emergencies.

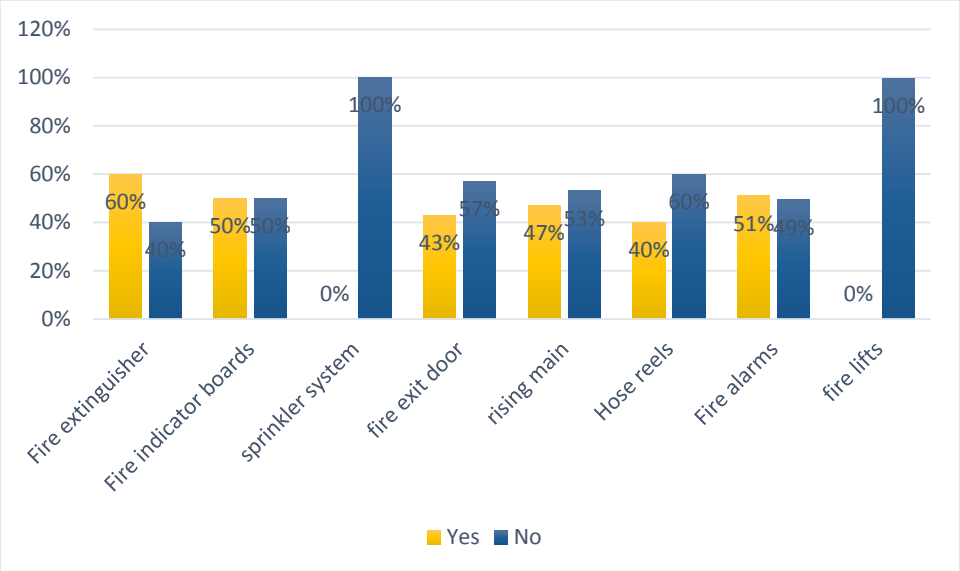
It was reported from the interview that one of the market had an operating fire emergency policy which is reviewed annually and communicated to their staff concerning the changes. The other market had already prepared a draft on fire emergency preparedness policy which was to be turned into a full policy and properly communicated to their staff. The study found that the 28.6% of respondents who denied on the availability of policy into lack of awareness on the availability of the draft because at that stage information remains with the administration alone.

The findings of this study show that, availability of fire emergency preparedness policies in both public markets and private markets has much difference. This is shown by the difference in percentage level which is more than 25% for availability of fire policies. This implies that there is more need to develop fire emergency preparedness policies in public markets compared to private markets.

Availability of fire safety equipment, signage and other supporting infrastructure

The Fire and Rescue Force Act of 2007 requires markets to have fire equipment, signage and other supporting infrastructure. In this section fire emergency preparedness was checked through availability of fire safety items including fire alarms, sprinkler systems, fire exit doors, hose reels, fire indicator boards and fire lifts. The Figure 5. Shows the availability status of these equipment in public markets:

Figure 5 ***Availability of fire safety equipment, signage and other supporting infrastructure in public markets***



Source: Field data (2022)

The data from Figure 5 shows that availability of one fire safety item differs from another depending on the preparedness of the markets. The respondents from public markets explained that fire extinguishers are available at a rate of 60% while fire alarms are available at 50%, sprinkler 0%, fire exit doors 43%, rising main 40%, hose reel 40%, fire indicator boards 51% and fire lifts at 0%. The study informed that the availability of these equipment were not sufficient as none of these items have exceeded 50% except for fire alarms. One of the respondents from the interview informed that their market had only two fire extinguishers,

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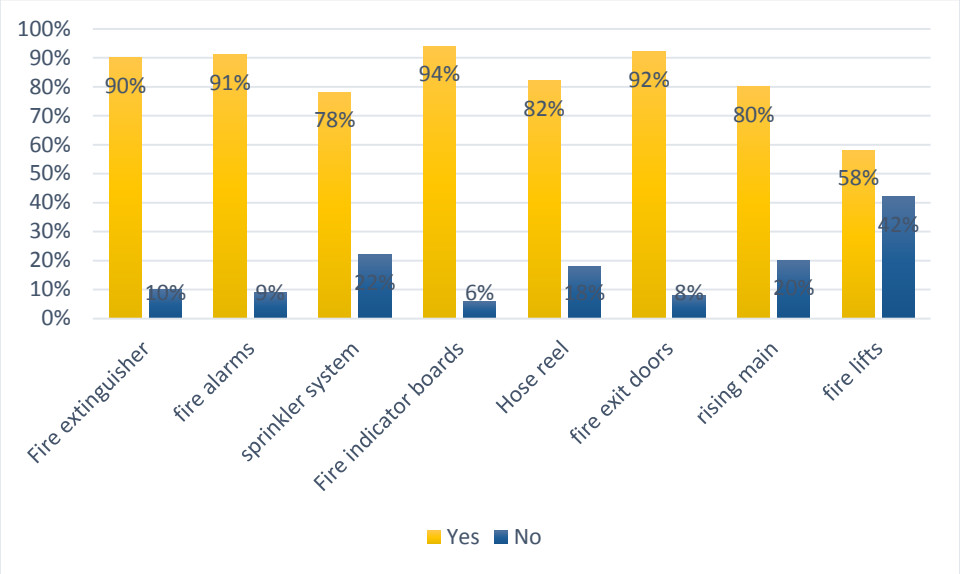
broken fire alarms and lacked rising main, hose reel and fire indicator boards. Availability of sprinkler system and fire lifts is the least in the public markets as their availability percent is 0%. The chosen markets in the case study do not have sprinkler system which is contradictory to Fire and Rescue Act of 2007. The Act states that any building which has from one floor onwards must have sprinkler system to protect itself from fire emergency.

The situation is better in private markets as there is more availability of fire safety items compared to public markets. The Figure 6 explain the situation as follows;

Figure 6 Availability of fire safety equipment, signage and other supporting infrastructure in private markets



Source: Field data (2022)

The data from Figure 6 show that fire indicator boards are leading with an availability rate of 94%, followed by fire exit door at 92%, fire alarms at 91%, fire extinguisher 90%, hose reel 82%, rising main at 80%, sprinkler system at 78% and fire lifts at 58%. It was reported from the interview that sprinkler systems were not available in all the desired buildings according to Fire and Rescue Acts of 2007. Most of the buildings built before 2000 had no sprinkler systems which pose a threat to fire emergency. Fire lifts were not available in one of the markets but they had emergency stairs which are not really functional in rescue of patients with critical conditions. In both markets there is availability of hose reels and rising main although the percentage does not indicate total availability. The study observed that, there is a possibility that the respondents are not informed of the name "rising main" and "hose reel" but are aware of its availability. The plate 1 shows fire safety equipment, signage and infrastructure available in private markets.

In fire emergency preparedness it is important to ensure that fire safety items are working and in good condition so that when fire emergency occurs the items can be used to lessen the impacts of fire. In this section, the study explored the working conditions of fire safety equipment, signage and other working infrastructure. The working condition of fire items in public markets is not satisfactory as the figure7 shows;

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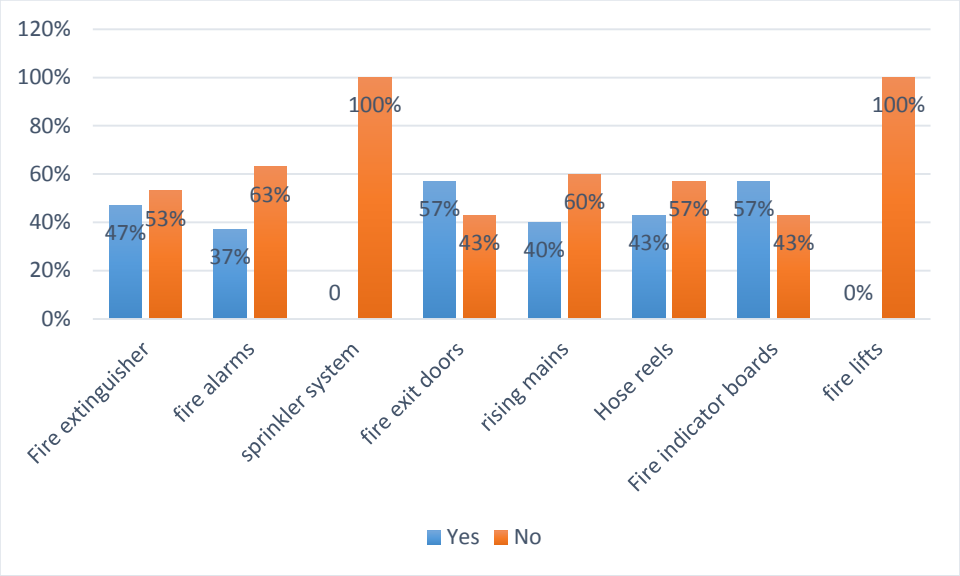
Figure 7 Working condition of fire safety equipment, signage and other supporting infrastructure in public markets



Source: Field data (2022)

Data from Figure 7 show that none of the fire safety equipment in public markets have exceeded 50%. This shows that most of the equipment are not in good working conditions. Fire indicator boards are in better working condition of 43% compared from all the remaining items. Data collected from observation showed that the signs are in place and they all lead to exit doors in one of the markets but the other market one had none.

Fire extinguishers are working at 40% because some of the extinguishers are expired and not correctly stored as they are supposed to be serviced and hanged where anyone can see. Also some of them are obstructed with market equipment making it difficult to be accessible during emergencies.

Fire alarms are at 37% working condition because in one of the market the alarms are not working and the other markets the alarms are broken which makes it difficult to be used in emergencies.

Hose reels reached a 37% working condition because in one of the markets they are not available at all and in the other market they were not properly serviced. Observation showed that the last service for the hose reels was in January 2021which reduced the chances of working well in real emergency.

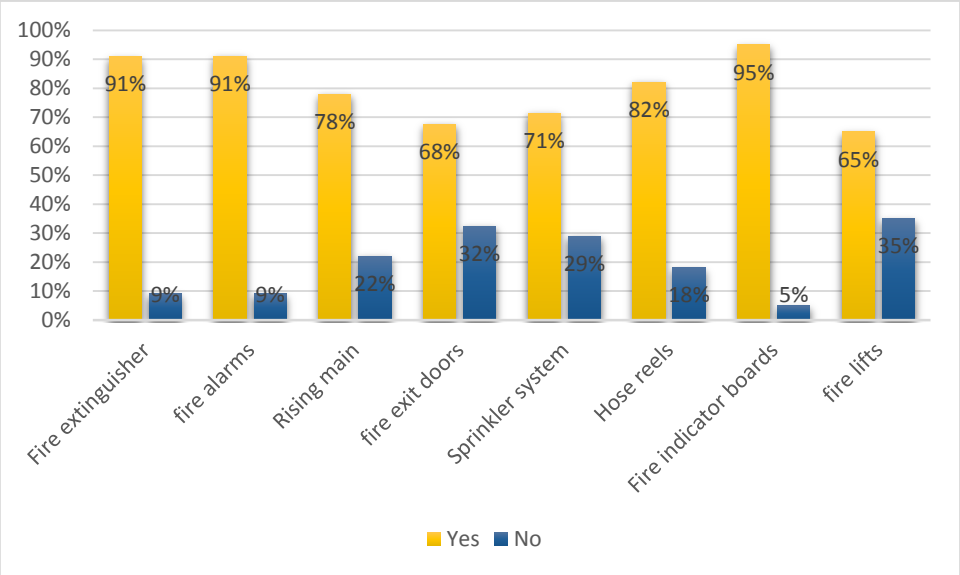
Fire exit door are at a rate of 33% because they are normal exit doors which are large in size to help evacuate many people at once but are not designed to block fire from spreading to other parts of the market. The doors are operating from the outside and not inside which is not easy to help evacuate people during fire emergencies.

Sprinkler systems and fire lifts were not available at all which has a 0% of good working condition. In both markets there were neither rams nor emergency stairs to be used alternatively in case of fire emergency.

Therefore, the data shows that working conditions of fire items in public markets is not good.

The working condition of fire safety items in private markets is different from the public as the Figure 8 shows;

Figure 8 Working condition of fire safety equipment, signage and other supporting infrastructure in private markets



Source: Field data (2022)

The situation in private markets is better than in public markets as the working condition of most of the items is above 50% which is good working condition.

Fire indicator boards are in better working condition of 95% compared from the rest of the items. Observation performed by the study revealed that indicator boards are in good working condition and they all lead to assembly points outside the market buildings.

Fire extinguishers and fire alarms are working at a good rate of 91% because they are regularly serviced, correctly hanged, not obstructed with market equipment and can be easily accessible during real emergencies.

Hose reels reached an 82% working condition, rising main 78% because in both market they are regularly service. Sprinkler showed a rate of 71% which indicated that there was uncertainty among the respondents because whenever drills are conducted the sprinklers are rarely used.

Fire exit door are at a rate of 68% because in one of the market the fire exit door is a normal door but larger in size helping to evacuate many people at once. Also the door opens from outside hindering people to pass smoothly in emergencies.

The study concluded that fire indicator boards, fire alarms and fire extinguishers are always in excellent working conditions as they are regularly monitored and serviced. The observation performed by the study revealed that other equipment including fire exit doors, hose reel and rising main are also serviced regularly and there are no obstructions from using the items.

Fire preparedness knowledge and fire emergency preparedness plans in public and private markets

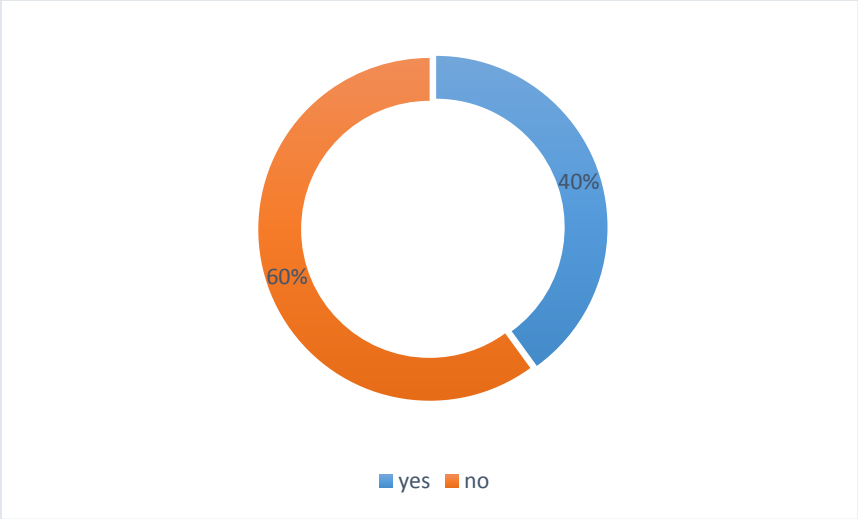
Knowledge on fire fighting

Knowledge is one of the important items in emergency preparedness as it helps to make informed decisions and coordinate activities to respond effectively. The study explored the knowledge on firefighting among market workers in both public and private markets. 40% of the respondents in public markets informed that they have knowledge on firefighting while 60% had no knowledge. Data obtained from the interview declared that trainings have not

Print ISSN 2771-1161
Online ISSN 2771-1153

been conducted for more than two years in one of the markets. In the other markets training is mostly done to security guards and not all staff which makes the rest of the stuff vulnerable to fire emergency. The study observed that firefighting knowledge in public markets is low as the majority of the respondents have poor knowledge. Figure 9 indicates the level of firefighting knowledge in public markets.

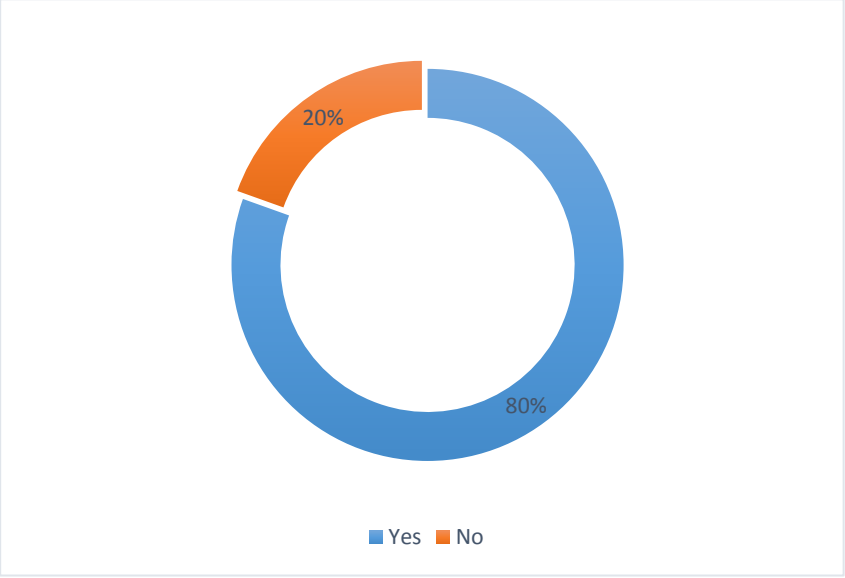
Figure 9 Knowledge of firefighting and safety in public markets



Source: Field Data (2022)

The data of respondents from private markets informed that 80% have knowledge on firefighting while 20% have no knowledge on firefighting. Majority of the respondents have awareness on firefighting which helps to act accordingly during fire emergency. This shows good preparedness level for private markets compared to public markets. The Figure 10 shows the level of knowledge in firefighting in private markets.

Figure 10 Knowledge on firefighting and safety in private markets



Source: Field data (2022)

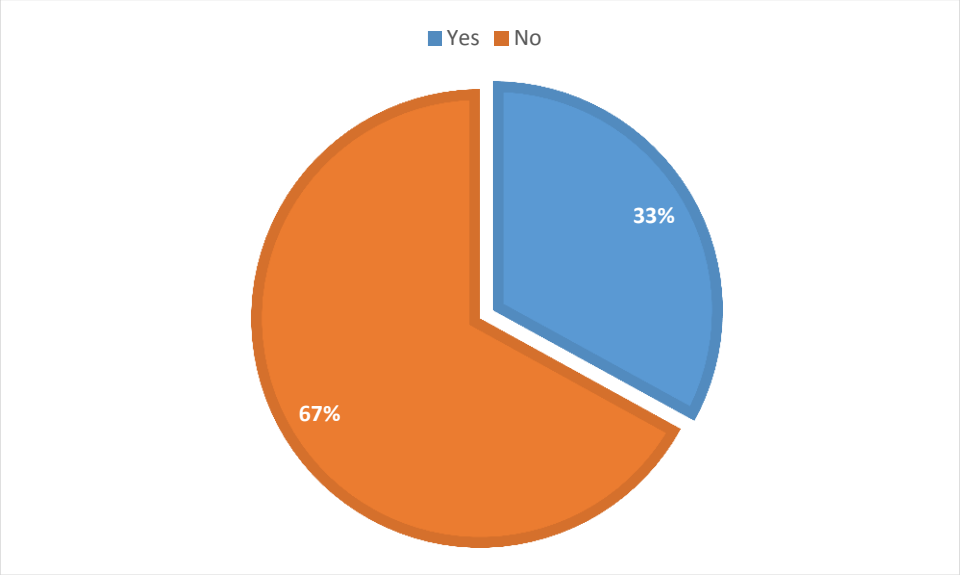
Print ISSN 2771-1161
Online ISSN 2771-1153

In general, the level of firefighting in public mrkets is low as majority of the respondents have no knowledge. The study concluded that more efforts should be made to create awareness in firefighting in public markets.

Participation in firefighting drills/exercises

Efficiency in fire emergency preparedness includes participation of people in firefighting drills/exercise as one of the implementation strategy in both public and private markets. It was observed from the study that 33% of respondents from public markets participated in drills conducted at the market while majority of the respondents 67% have never participated on fire drills. The data collected from the interview declared that in one of the market drills have not been conducted for three years and which makes majority of the workers inexperienced of using fire safety items. Therefore, it can be concluded that firefighting drills/exercises are less efficient in public markets as they are rarely carried out in the markets. This situation is indicated by the Figure 11 as follows;

Figure 11 Participation in firefighting drills/exercise in public markets



Source: (Field data2022)

The respondents from private markets revealed that they were always participating to drills in firefighting drills/exercises. The data observed that 62% of the respondents from private markets participated in fire drills while 38% never participated in fire drills. The majority of respondents participated in fire drills in private markets therefore, it can be concluded that firefighting drills/exercises are efficient in private markets as they are always carried out in the markets than in public markets. This situation is indicated in Figure 12 as follows;

Print ISSN 2771-1161
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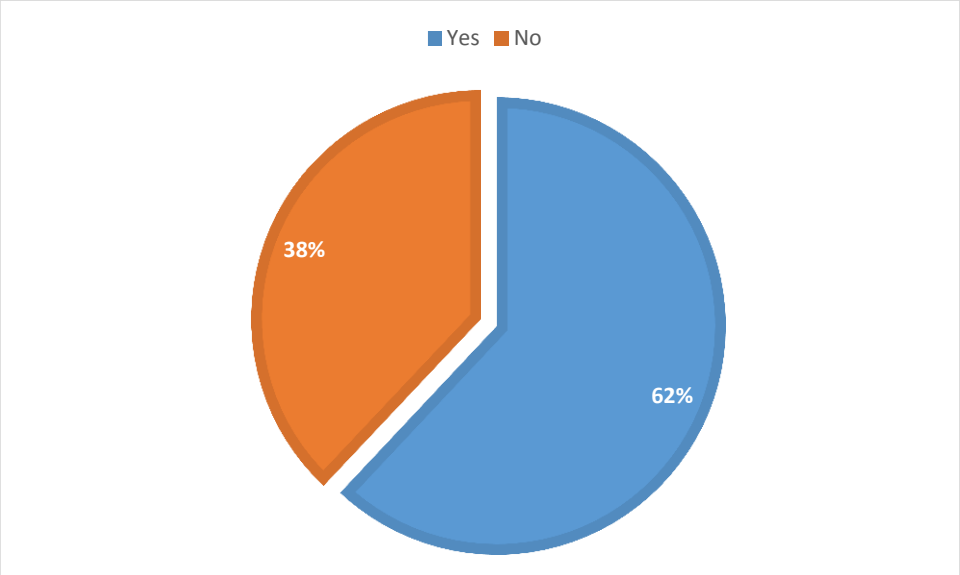
Figure 12 Participation in firefighting drills/exercise in private markets



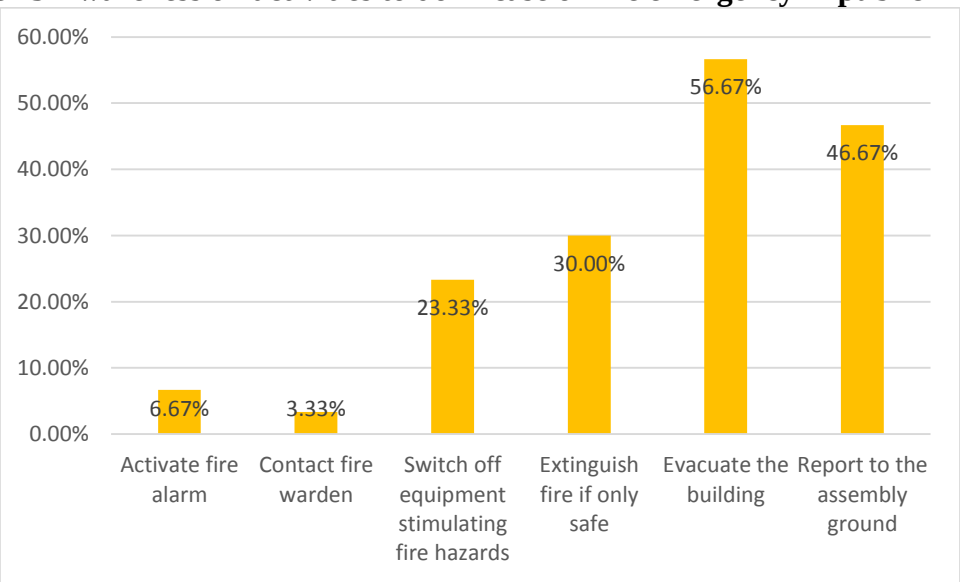
Source: Field data (2022)

In a nutshell, firefighting drills in public markets are lower than in private markets.

Awareness on activities to do in case of fire emergency in public markets

Awareness has reflected a number of activities ranging from evacuating the building, reporting to the assembly ground, extinguishing fire if only safe, switching off the equipment stimulating the fire hazards, activation of the fire alarm and contacting the warden. The data from the analysis shows awareness regarding the activities to be done in case of fire emergency in public markets.

Figure 13 Awareness on activities to do in case of fire emergency in public markets



Source; Field data, (2022)

Print ISSN 2771-1161
Online ISSN 2771-1153

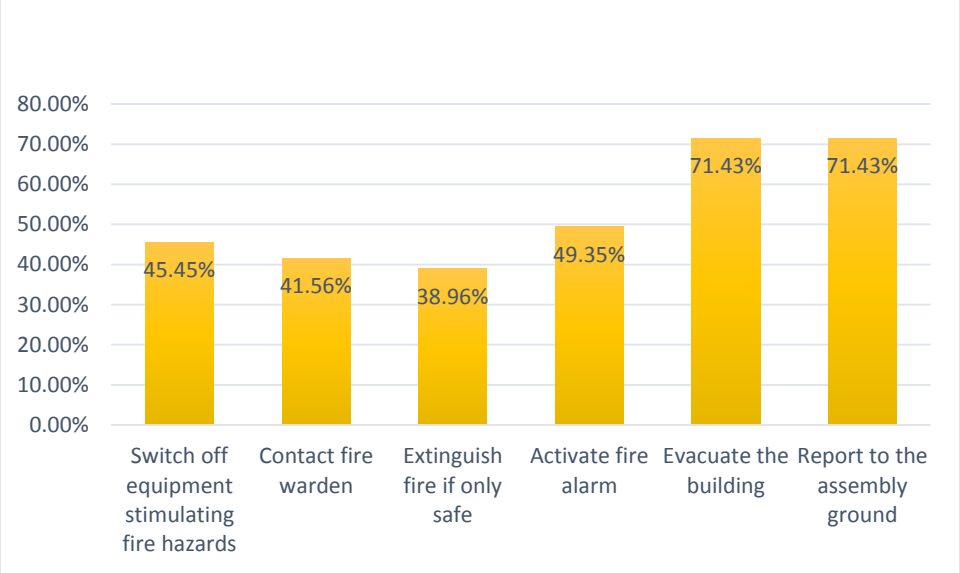
From the figure 13, 56.67% indicate the main activity which is to be done in case of fire emergency in the public market which is to evacuate the building, followed by 46.67% indicating reporting to the assembly ground, followed by 30% indicating to extinguish fire if only safe. 23.33% indicate the switching off equipment stimulating fire hazards while 6.67% indicates the activation of the fire alarm. Lastly, 3.33% indicate that the contact to the warden should be made.

This implies that, in case of fire emergency most of the public workers in these market will vacate the building heading to the assembly point as they have knowledge on how to use fire exit signs. The data informs that most of them do not have chronological order on the activities to be done in case of fire emergency. Figure 13 shows that majority of the workers will try to extinguish fire before pressing the fire alarms and switching off equipment stimulating to fire hazard.

However, if there will be a fire emergency most of the market workers might be in greater danger as the assembly points have been turned into parking lots for vehicles.

The results of the data collected from the private markets that were visited show that, the majority of the respondents were aware of activities to be done in case of fire emergency in the market. Figure 14 shows the percentage of awareness according to activities:

Figure 14 Awareness on the activities to do in case of fire emergency in private markets



Source; Field data, (2022)

From the Figure 14, 71% indicate the evacuation of the building is the main activity and reporting to the assembly ground. Followed by 49% indicating activating fire alarms, switching off all equipment stimulating fire hazard (45.5%) and contact fire warden (41.5%). Lastly the respondents indicated that 38.9% will extinguish fire if only safe. The study has concluded that, the respondents from the private sector are well aware of the activities to do in case of fire emergency compared to respondents from public markets.

Print ISSN 2771-1161
Online ISSN 2771-1153

Improvement needs of fire emergency preparedness in public and private markets
Monitoring and evaluation routine of fire emergency preparedness items

The study considered market policies, fire equipment, signage and infrastructure, fire hazard and vulnerable groups, fire training and drills, and fire emergency preparedness plans in the monitoring and evaluation process of fire emergency preparedness items in the market.

The majority of the respondents acknowledge that there is no monitoring and evaluation in market policies and fire emergency preparedness plans in public market. The data from the respondents further informs that fire training and drills, and fire safety equipment, signage and other supporting infrastructure are the leading item in monitoring and evaluation routine by 57% and 53% respectively. The rest which are 50% include market policies 43%, fire hazard and vulnerable groups (37%) and fire plans by 13% in the same descending order. The level for fire emergency preparedness policies and plans is relatively higher than others because in public markets there are no such practices. The study concluded that public respondents are not aware of the importance of fire emergency plans or policies in their markets. It is therefore important to stress on the importance of fire policies and plans together with monitoring and evaluation practices in all the areas so as to enhance fire emergency preparedness in public markets.

The situation in public markets is different from private market. Monitoring and evaluation routine is always performed on fire emergency plans followed by safety equipment, signage and other infrastructure as these fire items are always serviced and tested on their working ability. The rest include fire drills, fire hazards and vulnerable groups and lastly fire policies. It was reported from the interview that fire drills are reviewed annually same as fire hazards and fire policies. The respondents also mentioned that monitoring and evaluation is done in fire training and drills so as to make sure the knowledge offered is relevant and time bounded.

Fire policies have carried the least weight because in one of the market there is a complete draft of fire policy waiting to be communicated to other staff.

Areas of improvements on fire emergency preparedness in the markets

The study gave options to the respondents to choose areas of fire emergency preparedness improvements in the market. The respondents were given improvement areas including market policies, fire equipment, signage and infrastructure, fire hazard and vulnerable groups, fire training and drills, and fire emergency preparedness plans.

The data informs that majority of the respondents from the public market recommended improvement in fire training and drills by 60%, followed by fire safety equipment (50%) and fire hazard and vulnerable groups by (40%). The least recommended was fire emergency preparedness plans by 37%. This shows that majority of the respondents did not see the importance of these plans regarding the fact that they are not present in their markets.

On the other hand, the respondents from private markets recommended that much enhancement should be made on fire training and drills by 47% followed by fire equipment, signage and infrastructure (45%) and fire hazards and vulnerable groups by 39%. The least recommended both scored 32%, which are fire emergency preparedness policies and fire emergency preparedness plans. The data from the private markets also show that majority of the respondents do not give a lot of weight in policies and plans. These plans are as important as other fire emergency preparedness items and on further notice they help to instil a fire emergency preparedness culture among the workers by outlining clear directions on what to be done wherever an emergency occurs.

Print ISSN 2771-1161
Online ISSN 2771-1153

Conclusions

In general, fire emergency preparedness in public market is lower than private markets. The percentage for preparedness in most of the listed items in the study is not satisfactory. This increases vulnerability of public markets towards the impacts of fire emergency. It is better that efforts be made by the government to help prevail the impacts that can be resulted. The situation in private markets is better and they should keep updating their preparedness measures to match the needs of the markets so as to keep their people and properties safer.

Recommendations

Proper fire emergency preparedness reduces at a great level the impacts that are caused by emergency such as loss of properties, environmental pollution, anxiety, fear and panic attack. Preparedness also helps in responding to an emergency easily and returning back to normal in a shorter period of time (sherriff, 2021). The study recommended on the following;

Fire emergency preparedness policies

The Occupation Safety and Health Act of 2003 stipulates that every office should have safety policies to act as guidance to their workers. The government should insist that every institution including markets weather be public or private should have fire emergency preparedness policies and be reviewed at least annually. This will help build market culture in preparation to fire emergencies.

Sufficient instalment of fire safety equipment, signage and infrastructure

Fire emergency preparedness equipment, signage and infrastructure should be proper installed in markets according to the ratio as stipulated by Fire and Rescue Force Act of 2007. Fire and Rescue Force should delegate the responsibilities market fire inspections to other agents so that all markets can be checked and hold accountable in a convenient time.

Training and drills to improve fire preparedness skills

Markets should maintain provision of training and conduct drills to help improve fire preparedness skills to their workers. Fire emergency preparedness training and drills will help people to know the right move to take and how to minimize risk before a real emergency. There is a huge difference between a person who has knowledge and the one who does not at all and the one who has knowledge and skills.

Conduct Monitoring and Evaluation of fire emergency preparedness

Markets should have a culture of doing monitoring are evaluation of fire emergency preparedness items. This will help acknowledge hazardous areas, update training and drills and making sure that equipment, signage and infrastructure are well placed and in good condition to reduce the fire risk and offer better response in case of an emergency.

Emergency preparedness plan

In order to be prepared, there is a need to have good plans for fire emergencies in the markets based on a risk and vulnerability analysis. The plans should be detailed to help emergency responders to understand the procedures for preparing and responding to fire emergency including; resource inventory planning; stockpiling planning; logistical planning; evacuation planning; communication planning; needs assessment planning.

Allocation of specific budget for fire emergency preparedness

There is a need for markets to have separate budget for fire emergency preparedness. This budget will help allocate funds for purchase of fire safety equipment, training and drills conduction and periodic monitoring and evaluation.

Creation of fire awareness programs

TAMISEMI and Local Government Authority should collaborate with Fire and Rescue Force to create fire emergency awareness programs to prepare people's mindset on what to do in case of real emergencies. This will also create emergency preparedness culture among people.

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