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# Fire Disaster Preparedness among Residents in A High Income Community

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## Abstract

Fire disaster preparedness (FDP) is of paramount importance in preventing the globe's most prevalent disaster. This has been a big issue for developing nations. The study investigated FDP among residents in a high-income community of a part in Southwestern Nigeria. The aim of the study was to identify the preparedness of residents regarding fire disasters in residential buildings in Parakin, Ife Central Local Government Area of Osun State, Nigeria. To achieve the objectives, a quantitative study was carried out, primary data was sourced from structured, self-administered questionnaires. 80 buildings was purposively selected for the study. Affiliated literature was reviewed. Descriptive statistical tools such as frequency distribution and percentage was used in analysing the data. Chi-square tests at a significance level of 0.05 was done. SPSS version 23.0 was used in analysing all the data. Findings revealed that FDP is very low in the study area as respondents have very little or no firefighting facilities or gadgets, awareness, training about FDP. Chi-square tests revealed that there was no statistical significance between age of respondents and preparedness, ownership of home and preparedness, education and preparedness and sex and preparedness. It was established that preparedness for fire is very low. The study, however, recommended the provision of active and passive fire protection facilities in buildings, proper training of building users on FDP, enabling laws are also needed to promote the installation of fire protection, prevention, detection and suppression.

**Keywords:** Fire disaster preparedness; protection; prevention; detection; suppression.

## Introduction

Fire disaster preparedness (FDP) comprises pre-fire disaster actions and activities taken to prepare and respond to fire disasters in the built environment. They are also sets of pre-incident actions taken in readiness to improve the capability to responding to a fire disaster and thus seeking to minimise the scale of the fire disaster (Ayonga, 2016; Nestory, 2017). FDP is an ongoing process of planning, organising, training, evaluating, equipping, exercising and improving methods and systems to sustain effective and efficient coordination, collaboration and enhancement of competence to respond to fire disasters. (Stikova, 2016; Agyekum, Ayarkwa and Opoku, 2017). Studies have stressed how vital FDP is to the built environment and equally to the society at large (Nouban and Yunusa, 2020). This is because, economically, socially and environmentally, prevention and preparedness are far better and cheaper than response and recovery operations (Westcott, Ronan, Bambrick and Taylor, 2017). Hence, the need for proactive rather than retroactive actions in order to avert disasters in the built environment.

The concept of FDP is aimed at reducing destruction to assets, population and maintaining the built environment in a safe condition so as to attain sustainable disaster management practices (Kihila, 2017). Records of fire incidences across the globe abound in the literature such as the Shanghai fire in 2010, Grenfell Tower fire in London in 2017 (Barboza, 2010; Mohamed, Edwards, Mateo-Garcia, Costin and Thwala, 2019). While the causes of these fire incidences can be attributed to various factors, causes of such incidences may vary across nations and so is the level of preparedness, to combat or respond to the occurrence whenever it happens (Anyanwu, Akaranta and Nwaogazie, 2016).



For instance, Murage (2012) reports a high level of FDP in developed countries like the UK, Canada, Japan and New Zealand. On the other hand, lack of FDP is quite noticeable in buildings in sub-Saharan Africa (Murage, 2012; Ayabei, 2016; Agyekum et al., 2017; Nestory, 2017; Kihila, 2017; Adeleye, Ajobiwe, Shaibu and Oladapo, 2020). Specifically, Nigeria's fire incidence prevention preparedness has been unappreciable when compared to her counterparts in the developed nations of the world. For instance, Adeleye et al. (2020) reported that the Nigerian economy lost about N6 trillion from 2015 to 2020 due to unceasing fire disasters, with Lagos, Abuja, Kano and Port Harcourt as the cities most affected. This unfortunate situation could have been averted with effective and efficient FDP. Also, Nigeria is ranked first on the death by fire list compiled by the WHO and this is attributed to constant power surge and power outages, sparks, lack of firefighting apparatus needed to forestall fire outbreaks (Nouban and Yunusa, 2020). This situation is likely going to deteriorate if nothing is done to curb this ugly trend, because, as population increases, there is a commensurate rise in building construction, thereby extending the urban and rural fabric (Adeleye et al., 2020). Thus, a study of this nature is necessary to know the perception of citizens about fire incidence and examine their preparedness to prevent and combat fire occurrence as the case may be.

## **Literature Review**

Various studies have highlighted the significance of FDP in the built environment. Adeleye et al. (2020) ascertained that the importance of FDP in buildings cannot be overstressed; however, much has not been done to improve the level of FDP in Nigeria. Buildings need firefighting facilities, detection (alarms), suppression (automatic sprinklers), prevention and protection (fire extinguishers, fire sand buckets, fire blankets, wet and dry risers, hose reels, hydrants) equipment which are unavailable in buildings in developing countries (Murage, 2012; Ayabei, 2016; Kihila, 2017; Nestory, 2017). This indicates a low level of FDP. The enforcement of the building code and other regulatory standards, involvement of professionals in building design and costing, building production management, installing all the necessary firefighting equipment and facilities will help in elevating FDP in developing nations. It is pertinent that simulated fire drills, training and awareness be organised for building occupants so as to make them acclimatise to fire emergency situations and using firefighting paraphernalia (Ayabei, 2016; Adeleye et al., 2020).

FDP is a methodical process of using administrative actions, rules, effective skills and knowledge to apply techniques, laws and enhanced capacities in order to reduce detrimental effects of accidents and diminish the chances for starting a fire outbreak in institutions. Preparedness is pivotal in effective disaster mitigation and it entails appropriate planning, earmarking resources, simulation of disaster response exercises (Stikova, 2016). Fire detection systems are vital in buildings in order to discover fire outbreak (Celik, 2010). A proactive fire detection system using temperature, flame spread and heat signature is more efficient than the reactive systems. The use of gas, smoke, flame and thermal detectors performs better than just a fire alarm system (Singla and Kaur, 2020; Poulussen, 2018). A good detection system should have suppression devices like sprinklers, notifies the fire service and the first responders (Ristic, Blagojevic, Haznadarevic and Simic, 2019). Fire suppression systems are prefabricated devices that have been designed to automatically suppress, control and extinguish fires by using water or other substances. The sprinklers are capable of repressing fire with an adequate supply of water that is steadily pressurised. The sprinklers system must be reliable in order to prevent the spread of fire so as to avert fire disasters (Kironji, 2015; Ristic et al., 2019).

Fire protection systems are a collaboration of approach and equipment that are fashioned to mitigate the spread of fire to other parts of the building and protect the facility. Fire protection facilities need constant maintenance, inspection and testing so as not to lose their functionality (Kironji, 2015). Fire protection should be considered during the design, construction and post-construction stages of a building (Kironji, 2015). Fire protection systems can be active or passive systems. Active systems require some action for it to be effective against fire (fire

extinguishers, sprinklers, fire, smoke, heat and thermal alarms and detectors) they can be manually operated or automated systems (Brennan, 2019; Darby, 2018). Passive systems need no activity to start working as they are part of the design and construction that limit fire spread and help to control fire in buildings before fire service arrives (Darby, 2018). Passive fire includes fire resistant walls, floors and glasses, compartmentalisation, firefighters access to building (David, Mlangi, Kyauta and Dickson, 2019).

Evacuation is leaving a building via designated exits which are unobstructed at all times from a point in the building to the outside of a building to avoid a life-threatening situation (Olanipekun and Nunayon, 2017). The overall goal during evacuation is to save the lives of the building occupants. Zhang, Guo, Xiong, Liu and Zhang (2019) highlighted the factors influencing evacuation to include; the speed of the occupants, number of occupants, evacuation route, evacuation travel distance and the density of the occupants (number of occupants per square meter). Dube and Orodho (2016) stated that awareness about FDP is crucial for building occupants. Poor and inadequate awareness about FDP has contributed to fire disasters. When occupants are aware, they know what to do in order to avert a fire disaster, they identify risks in the building and immediately eliminate these risks. The occupants behavior are positively affected too because they know what to do in case of a fire outbreak (Murage, 2012 and Zhou, 2017).

Fire prevention is the best defence against a fire outbreak. Every prevention approach and efforts aim to save lives which is the priority, as buildings and belongings can be replaced. Fire prevention entails avoiding the starting of fire, controlling and extinguishing the fire when it starts and preventing the spread of fire in a building (Kironji, 2015; Benson, 2020). Nimlyat, Audu, Ola-Adisa and Gwatau (2017) stated that Nigeria records about 7000 fire incidents annually and over a 1000 casualties as a result of the fires, assets worth 250 million dollars are lost to fire disasters every year. Studies on FDP in buildings include Anyanwu et al. (2016) and Kihila (2017) these studies focused on buildings in Higher Education Institutions, while Adeleye et al. (2020) and Obasa, Mbamali and Okolie (2020b) worked on public buildings and Nimlyat et al. (2017) concentrated on high-rise buildings. Nonetheless, none of these studies investigated FDP in residential buildings; hence the need for this study. Thus, this study aims to investigate FDP among residents in a high-income community in Ile-Ife, a part of Southwestern Nigeria.

## **Data and Methods**

This study focuses on examining and describing FDP among residents in a high income community using a quantitative approach. The study area is Parakin area in Ile-Ife. Ile-Ife, Osun State, Nigeria, is an ancient city with two local government areas, namely, Ife Central and Ife East Local Government Areas (Olapoju, 2020). Parakin is a highbrow, high income, gated community where elitists, politicians, academicians, business moguls and civil servants live. The community is very close to the Obafemi Awolowo University, Ile-Ife. Lack of FDP in many Nigerian buildings and in sub-Saharan Africa is well documented in Literature (Murage, 2012; Ayabei, 2016; Adeleye et al. 2020; Nouban and Yunusa, 2020). However, Parakin was chosen to determine if the rich socio-economic background of the area will influence the FDP in the area. Quantitative data collected via questionnaire was used for this study. Data was collected using purposive sampling technique. This technique was used because most of the houses in the study area are either not easily accessible or occupants are not always at home. Therefore, 80 buildings were purposively selected from Parakin axis for the study. The survey was conducted between May and August 2020. Structured questionnaires were given to 80 participants from the 80 buildings which were sparsely selected to give a fair representation for all the buildings in Parakin. The questionnaires which were self-administered had two sections, the first section was used to collect demographic information of respondents, while the second section focused on the fire incidence experience, available firefighting facilities and equipment, fire safety training and evacuation routes and exits. Frequency distribution analysis was done to understand the demographic characteristics, fire incidence experience, available firefighting facilities and gadgets, fire safety training and education of the respondents. Chi-square tests were used determine the

association between some selected variables in the questionnaire administered. All the data were analysed using the Statistical Package for Social Sciences (SPSS) version 23.0.

## Results and Discussion

### *Profile of the respondents in relation to fire occurrence*

Table 1 shows that 58.8% of the respondents were between 21 and 30 years of age while 13.8%, 6.2% and 21.2% were between 31 and 40, 41 and 50 and 50 years of age and above respectively. It shows that 66.2% of the respondents were male and 33.8% were female, 33.8% are the owners of their homes while 66.2% are tenants. Also, 86.2% had more than secondary education while 13.8% had secondary education. Observations made about fire incidence experience indicated that 76.2% have not experienced a fire outbreak in their homes while 23.8% had experienced it earlier. Table 1 also shows 87.5% of the respondents do not have the emergency contact of the fire service while 12.5% had the contact. This corroborates the study of Okon and Njoku (2018) in Calabar, where 84% of those surveyed didn't have the fire service contact. Out of the 23.8% that had experienced fire incidents in their homes, 8.8% of the fire was caused by electricity related issues (power surge, electrical faults from electrical grid, stabilizer sparks, overloading a fuse, blowing up of a socket), 12.5% were caused by cooking gas cookers and kerosene stove and 2.5% was caused by matches or fire lighter. This study revealed that the highest cause of fire outbreaks in the study area was cooking appliances, this is different from what was obtainable in other parts of the country as Obasa, Mbamali and Okolie (2020a) and Anyanwu et al. (2016) identified sub-standard and faulty electrical gadgets and appliances and electrical fire as the highest cause of fire outbreak. However, the finding supports study from Hamida and Hassanian (2019) that the most common cause of residential fire is cooking fire.

**Table 1.** Frequency of the observations.

| Variable                                           | Frequency | % Frequency |
|----------------------------------------------------|-----------|-------------|
| Age                                                |           |             |
| 21-30 years                                        | 47        | 58.8        |
| 31-40 years                                        | 11        | 13.8        |
| 41-50 years                                        | 5         | 6.2         |
| 51 years and above                                 | 17        | 21.2        |
| Sex                                                |           |             |
| Male                                               | 53        | 66.2        |
| Female                                             | 27        | 33.8        |
| Home ownership                                     |           |             |
| Landlord                                           | 27        | 33.8        |
| tenant                                             | 53        | 66.2        |
| Level of Education                                 |           |             |
| Secondary                                          | 11        | 13.8        |
| Post-secondary                                     | 69        | 86.2        |
| Fire Incidence Experience                          |           |             |
| Respondents who have experienced fire outbreak     | 19        | 23.8        |
| Respondents who have not experienced fire outbreak | 61        | 76.2        |
| Respondents who have fire service contact          |           |             |
| Respondents who have fire service contact          | 10        | 12.5        |
| Respondents who do not have fire service contact   | 70        | 87.5        |

In another vein, Table 4 shows that Pearson Chi-square analysis revealed that there was no statistical significance between age of respondents and preparedness (0.52), ownership of homes and preparedness (0.48), education and preparedness (0.41) and sex and preparedness (0.70).

*Actions taken to put out the fire*

Analysis of the actions taken by the respondents to fight fire outbreak shows that 3.8% removed the fuse in order to put off the electricity and put out the fire, 7.5% tried using water to quench fire regardless of the cause of the fire, 3.8% called fire service, 1.3% used a wet cloth to put out the fire, 5.0% shut out gas supply for the gas cookers and 2.4% threw the gas cooker or cooking stove away. This indicates that a lot has to be done in order to orientate building users about each class of fire and its own peculiar way of extinguishing it as it is a fire started by an electrical gadget which is a class C fire cannot be put out by water.

*Damage caused by fire*

Out of the 23.8% of the respondents that had experienced fire outbreaks, 8.8% recorded significant damage in their homes while 15.0% did not experience fire (Table 1). This further buttresses the need for awareness and training on FDP.

*Evacuation and training on fire disaster preparedness*

Evacuation is a critical part of FDP as building users may need to egress a building immediately in order to save their lives from an impending inferno. Table 2 shows that about 90% of respondents know what an evacuation route/exit is while 10% do not know what it means, and 95% believe that it is imperative to have an evacuation route/exit while 5% do not think it is important to have one. About 70% have an evacuation route/exit and 30% do not have an evacuation route/exit, only 30% have received fire safety training while the greater 70%, have not been trained at all. The number of times occupants have received fire safety training varies, while it is established that 70% have not been trained, 16.2% have only received training once, 7.5% received training twice, 1.3% received training thrice and 5.0% received have training more than thrice. 95% of occupants think it is important to prepare for fire disasters while 5% do not think it is important.

**Table 2.** Training of the respondents on the provision of evacuation route/exit.

| Variable                                                                     | Frequency | % Frequency |
|------------------------------------------------------------------------------|-----------|-------------|
| Evacuation route/exit                                                        |           |             |
| Respondents who know what an evacuation route/exit is                        | 72        | 90          |
| Respondents who don't know what an evacuation route/exit is                  | 8         | 10          |
| Importance of evacuation route/exit                                          |           |             |
| Respondents who think it is important to have an evacuation route/exit       | 76        | 95          |
| Respondents who don't think it is important to have an evacuation route/exit | 4         | 5           |
| Respondents who have an evacuation route/exit                                |           |             |
| Respondents who have an evacuation route/exit                                |           |             |
| Respondents who do not have an evacuation route/exit                         |           |             |
|                                                                              | 56        | 70          |
| Fire safety training                                                         | 24        | 30          |
| Respondents who have received fire safety training                           |           |             |
| Respondents who have not received fire safety training                       |           |             |
|                                                                              | 24        | 30          |
| Number of times occupants received fire safety training                      | 56        | 70          |
| None                                                                         |           |             |

|                                                                     |    |      |
|---------------------------------------------------------------------|----|------|
| Once                                                                |    |      |
| Twice                                                               | 56 | 70   |
| Thrice                                                              | 13 | 16.2 |
| More                                                                | 6  | 7.5  |
|                                                                     | 1  | 1.3  |
| Respondents who think it is important to prepare for fire disasters | 4  | 5    |
| Respondents who think it is important to prepare                    |    |      |
| Respondents who do not think it is important to prepare             | 76 | 95   |
|                                                                     | 4  | 5    |

#### *Available firefighting facilities*

Observations made about available firefighting facilities indicate that 25% of respondents has fire extinguishers and 75% do not have fire extinguishers (Table 3). 100% of the respondents had no fire hydrants available within their vicinity. Only 6.2% had fire blankets while 93.8% had no fire blankets. 10% has fire alarms and 90% had no fire alarms. 11.2% had heat/smoke or gas detectors while 88.8% had no detectors installed. About 11.2% has fire sand buckets in their homes while 88.8% had no fire sand buckets, 1.2% had fire hose and nozzles and 98.8% had no fire hose and nozzles. 15% had fire assembly points and 85% had no fire assembly points. 30% had fire escape ladder and 70% had no fire escape ladder. Also, 78.8% had water for firefighting and 21.2% had no water for firefighting. 37.5% had first aid while 62.5% had no first aid, 16.2% had water sprinklers and 83.8% do not have water sprinklers, while only 7.5% had fire signage to aid evacuation while 92.5% had no fire signage. 5% had gas masks to protect them from smoke in a fire outbreak while 95% do not have gas masks. This shows a very low level of FDP, respondents generally are ill-prepared towards fire outbreaks, respondents know that fire incidents can strike at any time and they need to prepare, but a few really do (Kapucu, 2008). This is similar to the findings of a study conducted in Calabar, Nigeria, where fire hydrants were grossly inadequate (Okon and Njoku, 2018).

**Table 3.** Available firefighting facilities in homes surveyed.

| Variable                   | Frequency | % Frequency |
|----------------------------|-----------|-------------|
| Fire extinguisher          |           |             |
| Yes                        | 20        | 25          |
| No                         | 60        | 75          |
| Fire hydrants              |           |             |
| Yes                        | 0         | 0           |
| No                         | 80        | 100         |
| Fire blankets              |           |             |
| Yes                        | 5         | 6.2         |
| No                         | 75        | 93.8        |
| Fire alarm                 |           |             |
| Yes                        | 8         | 10          |
| No                         | 72        | 90          |
| Heat/smoke or gas detector |           |             |
| Yes                        | 9         | 11.2        |
| No                         | 71        | 88.8        |
| Fire sand bucket           |           |             |
| Yes                        | 9         | 11.2        |
| No                         | 71        | 88.8        |
| Fire hose and nozzle       |           |             |
| Yes                        | 1         | 1.2         |
| No                         | 79        | 98.8        |
| Fire assembly              |           |             |

|                            |    |      |
|----------------------------|----|------|
| Yes                        | 12 | 15   |
| No                         | 68 | 85   |
| Fire escape ladder         |    |      |
| Yes                        | 24 | 30   |
| No                         | 56 | 70   |
| Water for firefighting     |    |      |
| Yes                        | 63 | 78.8 |
| No                         | 17 | 21.2 |
| First aid                  |    |      |
| Yes                        | 30 | 37.5 |
| No                         | 50 | 62.5 |
| Water Sprinklers           |    |      |
| Yes                        | 13 | 16.2 |
| No                         | 67 | 83.8 |
| Fire signage or indication |    |      |
| Yes                        | 6  | 7.5  |
| No                         | 74 | 92.5 |
| Gas masks                  |    |      |
| Yes                        | 4  | 5    |
| No                         | 76 | 95   |

**Table 4.** Chi square tests: n the results of the analysis between the selected variables.

| Selected variable                   | Pearson Chi-square |
|-------------------------------------|--------------------|
| Age of respondent and preparedness  | 0.52               |
| Ownership of homes and preparedness | 0.48               |
| Education and preparedness          | 0.41               |
| Sex and preparedness                | 0.7                |

## Conclusions and Recommendations

Despite ground-breaking inventions in fire safety, fire disasters are still causing loss of lives and properties. This study reveals that FDP in terms of fire detection, protection, suppression and prevention which is vital in buildings are mostly unavailable, this makes the respondents ill-prepared towards fire. Chi-square test showed that age, sex, education and home ownership do not influence FDP. The following recommendations are necessary in order to improve FDP; government should make it compulsory by enacting laws for all buildings to have active and passive fire protection, adequate firefighting gadgets and facilities (fire extinguishers, fire alarms, fire blankets, water sprinklers, drenchers, hose reels, smoke detectors, wet risers, dry risers and fire sand buckets) and enough water in their homes so as to forestall any fire disaster. Extensive awareness, training, orientation and sensitization are also needed.

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## Conflict of Interest

The authors declare that there is no conflict of interests in the publication of this work.

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