



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 4, April 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

ijirset@gmail.com

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Assessment of Awareness, Cause and Mitigation Processes to Fire hazard: A case Study of Delhi

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ABSTRACT: Delhi is a very old city and the construction was not much planned hence it invites fire hazards. Fire incidents in the populous city like Delhi are very common due to short circuit. In this research paper we conducted survey to understand causes of fire, awareness level of the residents, and mitigation measures of fire hazards. A total number of 100 persons were surveyed with close ended questionnaire. Linkert scale was used to understand perception and give a better graphical representation. The survey result indicated electric short circuit and fire-works are the major reason of fire hazards. Though the community has good knowledge level about the fire hazard but it was not aware about the mitigation strategies. Only 55% of respondents knew about the use of fire extinguisher. About 85%, 50% and 25% respondents have access to medical kit, fire extinguisher and fire alarm respectively. The densely populated places and human negligence increase the proneness of the city for fire hazard incidences and enhance probability of introducing mitigation and control measures.

KEYWORDS: Fire hazard, questionnaire survey, awareness, mitigation

I. INTRODUCTION

Fire accidents are the most frequently occurring disasters in the NCT of Delhi (Gautam & Tewari, 2020). They are mainly man-made disasters occurred due to negligence, poor maintenance and overloading or overheating of electrical cables (Rani, 2019). In Delhi, this disaster shows high risk and damage potential. Delhi is a megacity with urban ecosystem and dense population, witnessing frequent fire incidents (Tomer et al., 2018). It causes human injuries, loss of life and damage of properties (Sanu & Sharma, 2021). Occurrence of fire and resulting to a disaster in such scenario where smoke extraction, sprinklers, fire alarm system have failed, can cause huge loss of life and property (San and Luo 2014). The usage of electricity is increasing day by day along with LPG and hazardous chemicals which has resulted in increase of fire hazard potential. During summer there is abrupt increase of fire incidents as use of heavy electronic gadgets like coolers, air conditioners, refrigerators and other apparatus results into overheating of cables leading to short circuits and consequent fire breaks out.

In almost all the districts of Delhi there is risk of fire hazard or high chances of fire susceptibility (Kumar & Bhaduri, 2018). Usually there is a fire incident within every 5 to 6 days e.g. fire incident on 12 March 2022, broke out in Gokulpuri area of Delhi where 7 people lost their lives and many injured (IndiaToday). Many case studies reveal that there has been lack of awareness among the affected people or stakeholders with respect to the measures taken to mitigate and manage such disasters. Thus keeping in mind the risk of fire hazard there is a requirement of incorporating and maintaining adequate fire safety measures in the affected area. The fire service department can also greatly reduce the fire risk by organizing mock drills, common people awareness programs etc.

II. OBJECTIVES OF THE STUDY

This study was carried to assess general awareness among the stakeholders and potential causes responsible for fire hazard. It also explains the need of incorporating mitigation measures and its concern within the stakeholders.

III. STUDY AREA

The present study area, Delhi is the capital city of India located in the north-central part of the country. It is officially known as the National Capital Territory (NCT) of Delhi. It spreads between latitude 28° 24' 01 and 28° 53' 00 North and longitude 76° 50' 24 and 77° 20' 37 East. It extends to around an area of 1485 square km. (Mohanty *et. al.*, 2007).

Total population of Delhi is 16.78 million and its population density is very high which is 11320 per square km (Census of India, 2011).

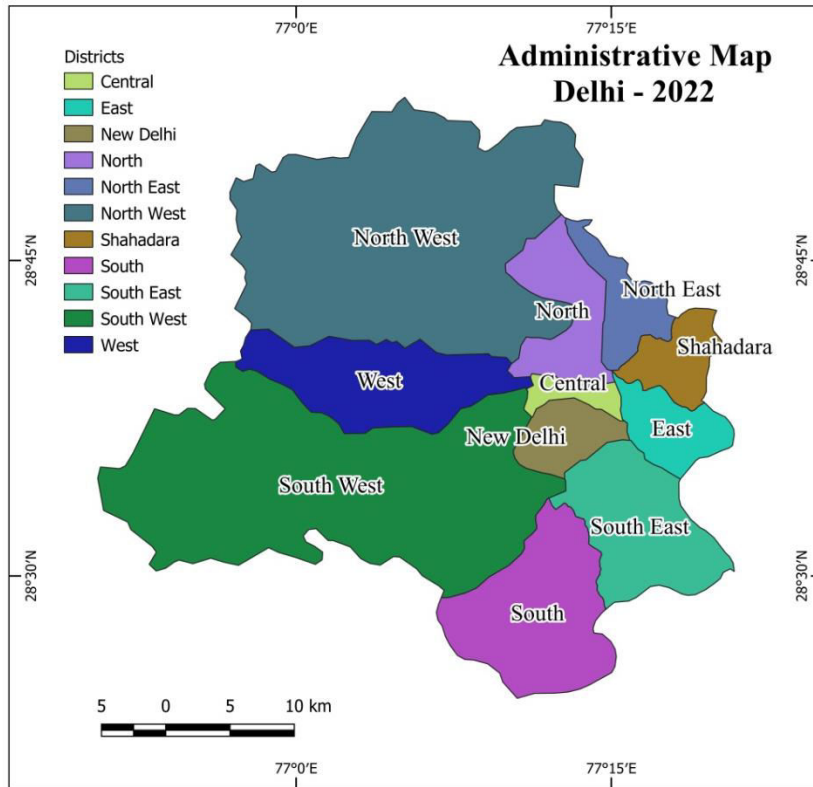


Figure 1 Administrative map of Delhi

IV. DATA SOURCE AND METHODOLOGY

The study is based on both primary as well as secondary data sources. A well prepared questionnaire was prepared to collect the primary data through online means (**Google Forms**) as well as group-discussions or personal interviews. The questionnaire was oriented to understand the perception of the people. A total sample size of 100 respondents was selected by using simple random sampling method.

Tools and Techniques: In this study MS Excel was used to analyze the primary data collected through survey as well as for analyzing and depicting the raw data we have used Thematic Cartographic techniques. QGIS – The Quantum GIS (QGIS 3.14 software) was utilized for preparation of map of study area. **Linkert scale** method (Payzin *et al.*, 1997) was used to analyze the respondents’ perception. The first section of the questionnaire deals with the assessment of the awareness among the residents as well as other stakeholders. The second section deals with causes responsible for fire hazard and mitigation measures.

V. RESULT AND DISCUSSION

AWARENESS ABOUT FIRE

1. Awareness of people about fire hazard

Out of the total respondents, 95% were familiar with the fire hazard. On the other hand only 5% respondents were found to be unaware about this. The reason may be because they live at such a place where such incidents are negligible or they never saw it as a hazard (Fig. 2 (a)). Based on the views of the respondents it was observed that they are aware about the fire hazard phenomena, however most of them do not even know how to respond in case of emergency situation arises due to fire.

2. Level of Knowledge about Fire hazard

Out of the total respondents 40% have fair knowledge, 30% good knowledge level while 25% respondents claimed to have excellent knowledge of fire hazard. On the other hand, 5% respondents admitted that their knowledge level is poor and they are not much concern about occurrence of any such hazards (Fig. 2 (b)).

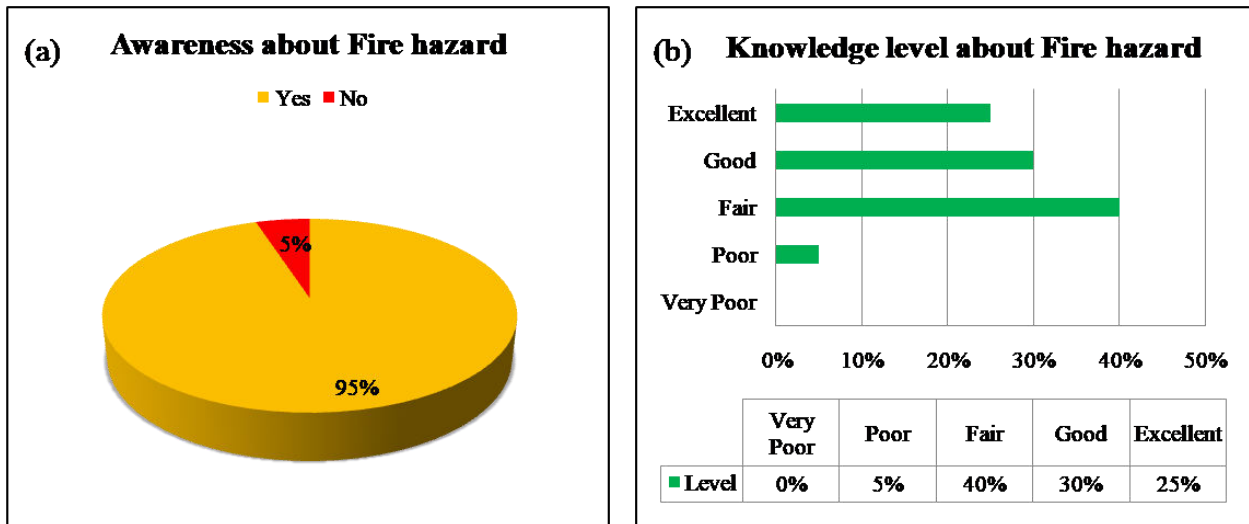


Figure 2 (a) Awareness about fire hazard (b) Knowledge level about fire hazard

3. Delhi's Proneness to Fire Hazard

Out of the total respondents 40% respondents agreed that Delhi is prone to fire hazard, they added that there are many places where fire incidents occur almost every day. About 35% respondents strongly agreed on this question and pointed out the recent incidents of fire. On the other hand, 10% respondents preferred to be neutral on this question while 15% strongly disagreed with this point (Fig. 3 (a)).

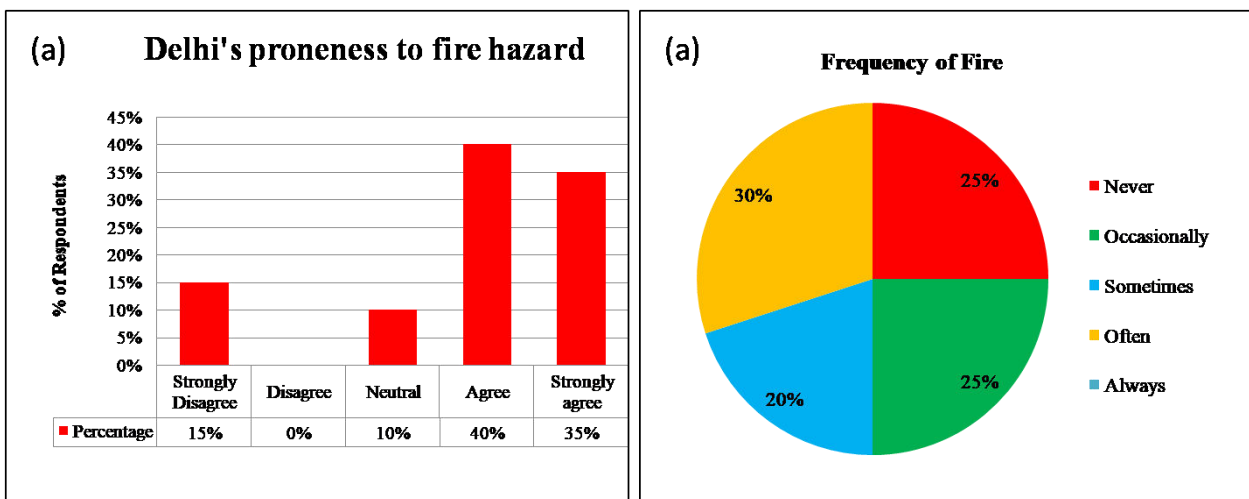


Figure 3 (a) Delhi's proneness to fore hazard (b) Frequency of fire

4. Frequency of fire hazard

Out of the total respondents 30% replied that they often get to see a fire outbreak in their area. 25% respondents occasionally see any fire outbreak, and interestingly 25% have never seen any fire outbreak in their surrounding areas. On the other hand 20% respondents seemed to be bothered about this hazard and replied that they always see such incidents happening around them (Fig.3 (b)). Therefore we can infer that the frequency of fire hazard is such that it occurs every now and then.

5. Areas vulnerable to fire

In the opinion of 75% respondents industrial areas are most vulnerable place where fire hazard can take place, out of total respondents 15% informed that the high rise buildings are more vulnerable to fire, whereas 5% respondents think that residential areas are vulnerable to fire hazard. Similarly 5% respondents opined that public places like Bus stops, parking areas are vulnerable to fire hazard because of illegal smoking and other activities of this type can cause fire (Fig. 4).

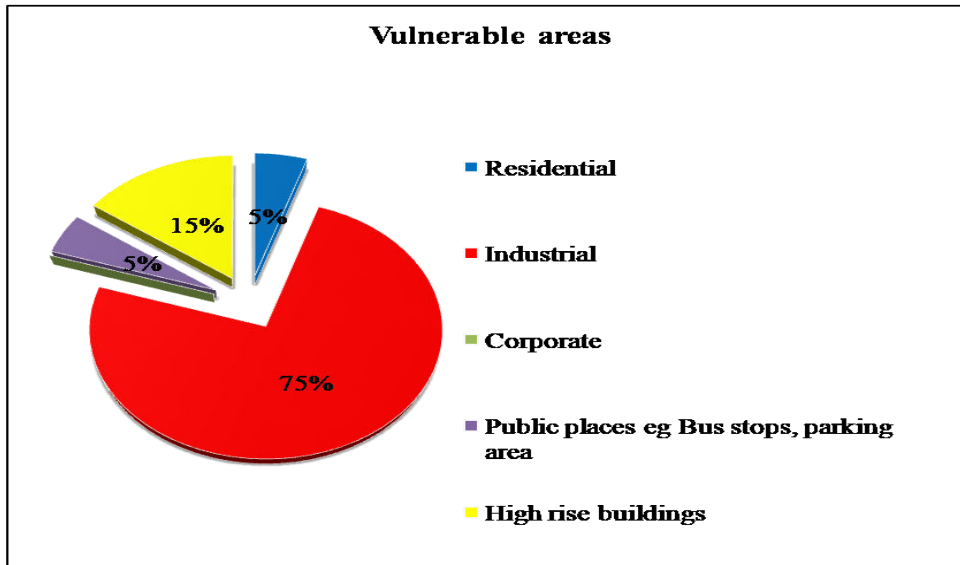


Figure 4 Areas vulnerable to fire hazard

POTENTIAL CAUSES OF FIRE HAZARD

In order to know the potential causes of fire hazard in Delhi, we asked the respondents to rate some items which may cause potential fire hazard, the items were: electricity short circuit, fireworks, chemical induced explosion, lack of ventilation, burning of garbage heaps, LPG leakage and radiation.

Most of the respondents (35%) said electric short circuit is a cause which has maximum potential to cause fire and they rated it as 7 on a scale of 1-7, while 30% respondents rated fireworks as 5 which is maximum in that category, similarly 35% respondents rated chemical induced explosion as 5. 60% respondents opinion supported lack of ventilation can cause fire and rated it as 4. On the other hand the burning of garbage heaps has been rated with varying units. LPG leakage and Radiation may also be minor causes of fire (Fig.5)

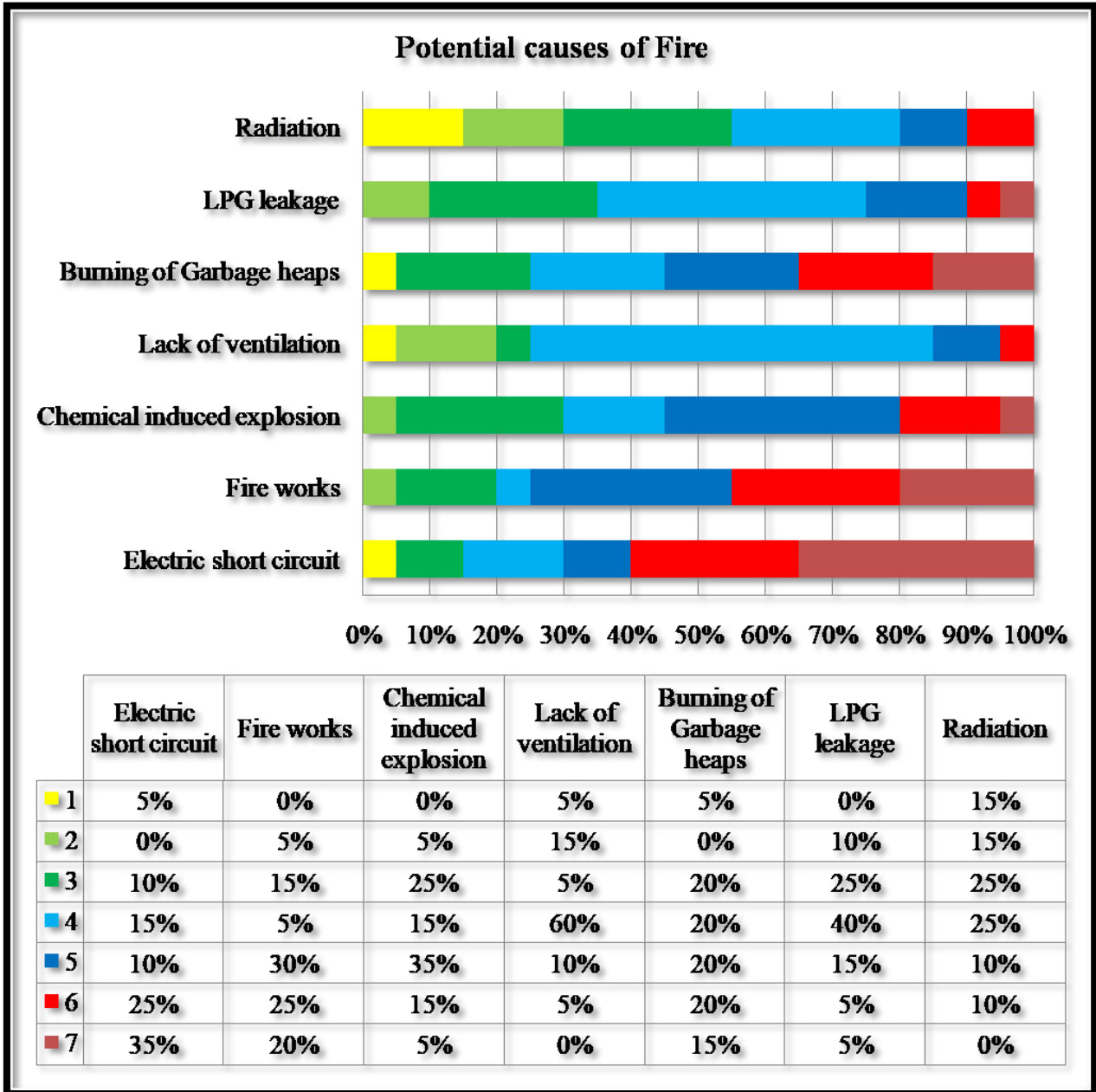


Figure 5 Potential causes of fire

FIRE HAZARD MITIGATION MEASURES

1. Suggested fire hazard mitigation measures: The respondents were asked to rate some items as per their role in mitigation of fire hazard, the items were: smoke detectors, fire extinguishers, sand buckets, mock drills and clear evacuation routes. Out of the total respondents 55% found fire extinguishers most effective measure and rated 5 on a scale of 1 -5 and 20% respondents rated 5 to smoke detectors other mitigation measures have been rated lower than these (Fig. 6).

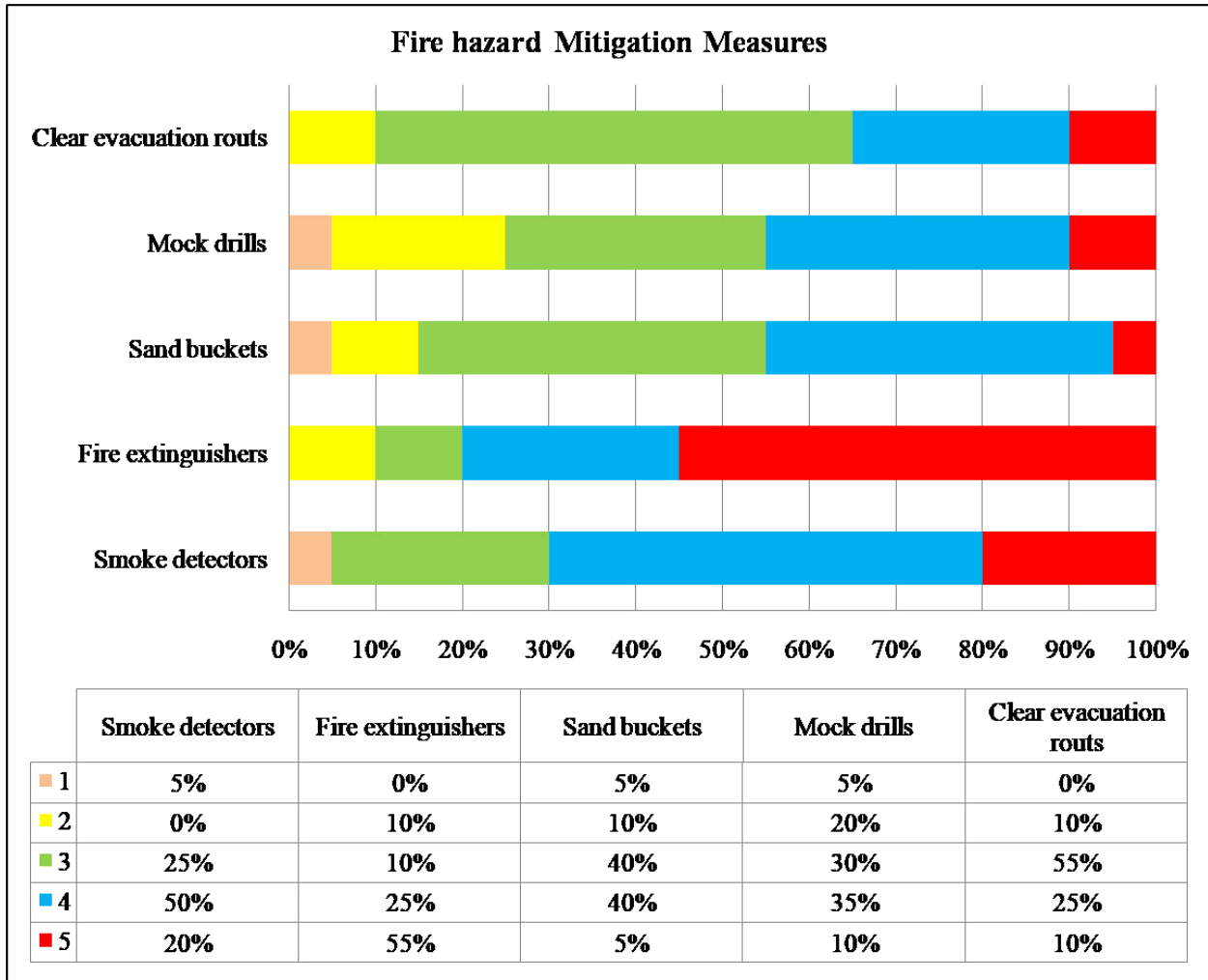


Figure 6 Fire hazard mitigation measures

1. Availability of fire safety instruments

Out of the total respondents 85% have first aid kit or medical facility at their home in case of an emergency as a safety measure. 50% respondents replied that they have access to fire extinguishers while 25% respondents said about fire alarms availability. On the other hand, only 15% respondents have smoke detectors in their area, 10% emphasized on clear evacuation routes and surprisingly 5% respondents said that they have no safety measure in their area (Fig. 7 (a)).

2. Immediate response to fire hazard

In order to tackle fire hazard which requires an immediate response some procedures must be followed. Out of the total respondents 50% respondents said they will call fire emergency no101 immediately after fire outbreak, 20% respondents said that they will press fire alarm immediately if available there. On the other hand, 15% respondents opined that they will try to extinguish fire forthwith, while 15% preferred the option of evacuation of the area (Fig. 7 (b)).

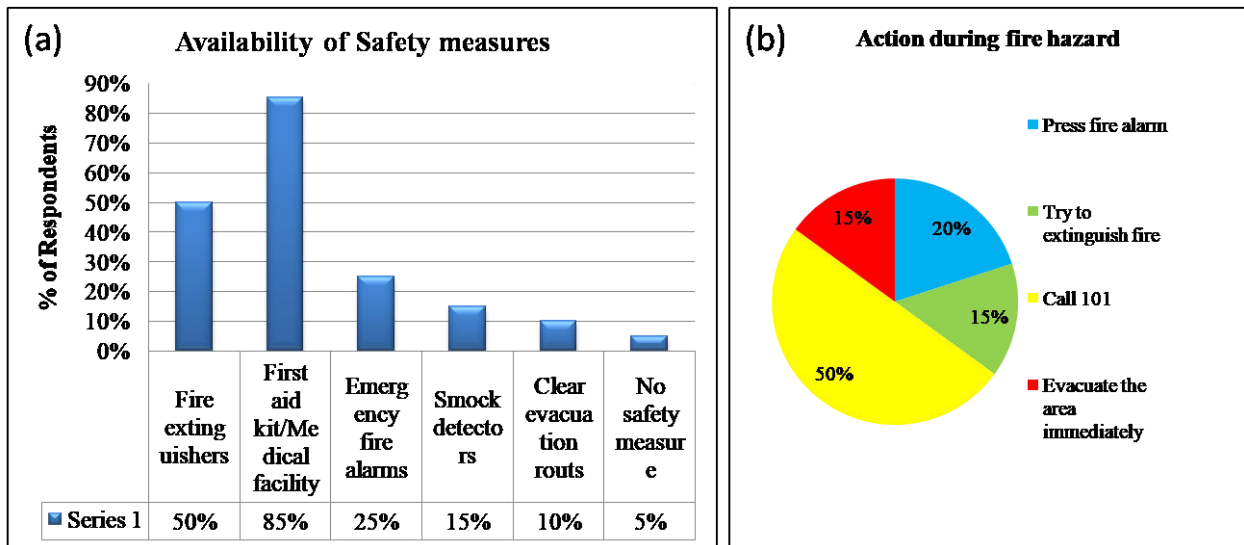


Figure 7 (a) Availability of safety measures (b) Immediate action during fire hazard

3. Fire management Agencies

There is some gap in the knowledge about the fire management agency in Delhi. Out of the total respondents only 65% said it is the Department of Fire Service which looks after such matters. Sadly, On the other hand 30% people are totally unaware about it, while 5% opted for DDMA as fire management agency in Delhi (Fig. 8 (a)).

4. Monitoring of area by fire hazard mitigation authorities

The efficacy of any system lies with its flexibility and resilience. The local authority has the onus to check/monitor the fire hazard related conditions of the respected area. Out of the total respondents 55% showed positive gesture towards the local authority and replied positively that they do check the condition, while 45% which is little less than half respondents denied of such monitoring by any local authority in the area (Fig. 8 (b)).

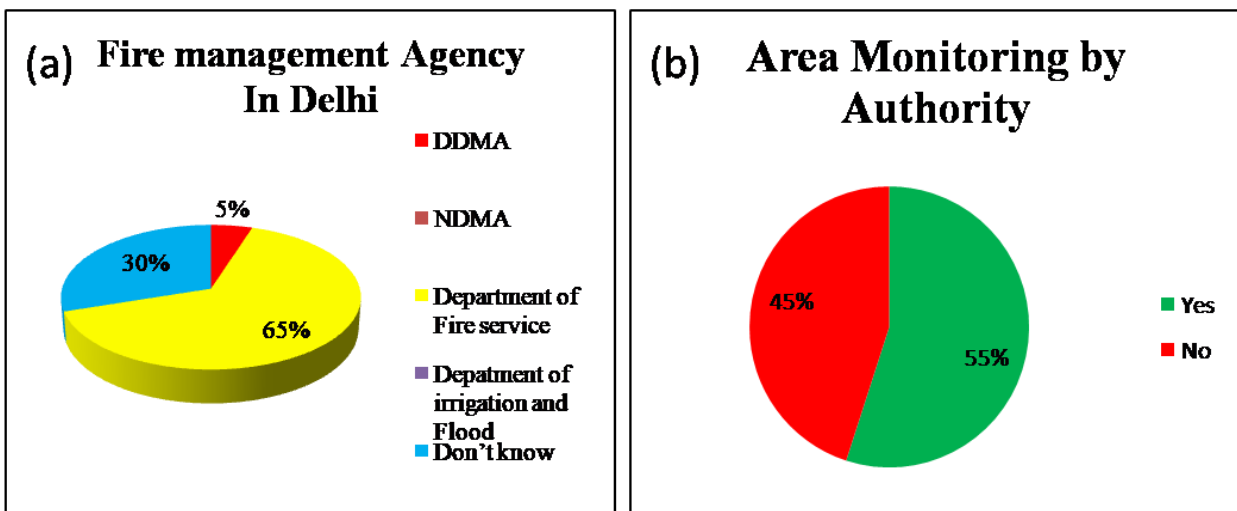


Figure 8 (a) Fire hazard management agencies in Delhi (b) Area monitored by authority

V. CONCLUSION

Fire hazard is one of the most deadly events, which has high risk and damage potential in Delhi. Fire accidents are most frequently occurring events in the NCT of Delhi. They are mainly man-made disasters occurred due to negligence, poor maintenance and overloading or overheating of electrical cables. Indeed, Delhi is prone to fire hazard and result of the

study showed that the electric short circuit is major cause of fire hazard in industrial areas. Industrial zone mainly comprises of firework places and chemical activities. The individuals are less concerned about mitigation measures. So to tackle fire hazards and avoid risk of increasing incidents, it is much required to understand the perception and knowledge level of growing population and increase awareness level within them. The Government of NCT of Delhi has done a lot to tackle such disasters. Delhi Fire service is available whenever and wherever required. Building codes designed by Disaster Management Authority should be taken into consideration which is widely violated due to shortage of land resource and growing demand of settlements. The building codes and other fire management rules and regulation must be followed to avoid such catastrophic disasters. Further study in broader range and regular awareness program through mass media would control fire havoc.

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