

Risk Perception and Knowledge in Fire Risk Reduction in an Urban Environment: A Study of Srinagar City



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Abstract

Fire is one of the major disasters in an urban environment but evidence of the effectiveness of education interventions against fire risks is limited. Fire is the rapid oxidation of a material in the exothermic chemical process of combustion releasing heat, light and various reactive products. Fires start in three main ways i.e. accidents (misuse of appliances), deliberate ignition and equipment failure (electrical malfunction) and produce smoke and toxic gases which could be extremely fatal to those exposed to it hence the need for prevention and protection from spreading fires by delaying ignition period to allow people more time to escape and for the fire brigade to arrive at the incident. Fire can make homes unsafe; can lead to the collapse of houses, loss of property or even deaths. Urban disasters especially fires have tended to receive a baffling lack of response from aid agencies indicating major gaps in urban preparedness. Srinagar city is faced with inadequacy in responding to fire disasters of high magnitude and rescue teams have failed in many of the occasions to live up to expectations. The study area i.e. Srinagar city, Jammu and Kashmir has recorded highest number of fire incidents in last so many years, claiming dozens of lives and damaging property worth crores. The present study is an attempt to assess the levels of prevention, mitigation and preparedness measures in residential, commercial, educational and health related buildings regarding fire risks and hazards. For this purpose both primary as well as secondary data has been used. The overall scenario reveals that the perception of selected respondents gives a very poor result, as more than 40% of them either have no knowledge about the fire fighting equipments or lack their use during fire incidents. Factor identification has been done on prior knowledge upon which emphasis was on preparedness and mitigation measures adopted by building owners, managers and occupants as well as preparedness of the local authorities.

Keywords: Fire Risk Perception, Hazard Assessment, Preparedness; Mitigation, Exothermic, Combustion.

Introduction

Fire is a severe global health hazard that causes great losses in disability-adjusted life years (DALYs) and damage. Due to suboptimal fire extinguishing facilities and lack of timely disaster responses both rural as well as urban communities that live in wooden and congested housing structures and have lower socio-economic status are usually at higher risk for fire disasters. Fire is the rapid oxidation of a material in the exothermic chemical process of combustion releasing heat, light and various reactive products (Pyne, 1982). Fires start in three main ways i.e. accidents (misuse of appliances), deliberate ignition and equipment failure (electrical malfunction) and produce smoke and toxic gases which could be extremely fatal to those exposed to it hence the need for prevention and protection from spreading fires by for instance delaying ignition period to allow people more time to escape and for the fire brigade to arrive at the incident. Fire can make homes unsafe. It can lead to the collapse of houses, loss of property or even death (Supermedia, 2011). Fires start when a flammable and/or a combustible material, in combination with a sufficient quantity of an oxidizer such as oxygen gas or another oxygen-rich compound (though non oxygen oxidizers exist that can replace oxygen), is exposed to a source of heat or ambient temperature above the flash point for the

fuel/oxidizer mix, and is able to sustain a rate of rapid oxidation that produces a chain reaction.

Historically, many fires occurred in buildings due to the careless disposal of smoking material into wastepaper baskets. As a result of the no-smoking ban inside most buildings, such fires have become very uncommon. However, in today's world of electronic office equipment, are as a result of an increase in fire incidents due to faulty electrical equipment and power distribution systems. Many common causes of fire can be related to open flames, electrical fires, cooking and spontaneous ignition and the ignition of waste materials. Open Flames arise from such unsafe conditions as negligence in conducting hot work, such as welding, cutting or grinding; improper use of candles; improper handling of flammable or combustible liquids or flammable gases in near-to-potential ignition sources; and matches and cigarettes that are improperly disposed of, or left unattended near combustibles. Electrical fires arise from conditions including damaged electrical conductors, plug wires or extension cords; use of faulty, modified or unapproved electrical equipment; insufficient space or clearance between electrical heating equipment and combustibles; short or overloaded circuits; loose electrical connections; and lighting.

Spontaneous ignition and the ignition of Waste Materials occur when there is improper disposal of materials susceptible to spontaneous combustion, such as oily rags from wood finishing or polishing; accumulation of organic materials, such as green hay, grain or woodchips; and accumulation of waste combustible materials near potential sources of ignition (Pyne, 1982). The World Bank and US Geological Survey estimated that economic losses worldwide from natural disasters in the 1990^s could be reduced by \$280 billion if \$40 billion were invested in preparedness, mitigation and prevention strategies (Dilley and Heyman, 1995).

Srinagar district has recorded highest number of fire incidents than other districts in Kashmir from last so many years, claiming six lives and damaging property worth 22 crores. According to the data of Directorate of Fire and Emergency services, the summer capital witnessed 446 fire incidents, highest in comparison with other districts. As per the reports the fire incident data, the fire occurrence caused death of six people which is second highest number of casualties across the district in Kashmir. The data also revealed that 25 people were also injured in the fire incidents across the Srinagar. In these fire incidents property worth Rs 22.45 crore was destroyed in Srinagar. Pertinently, 10 structures were gutted at waniyar area of Safakadal on January 30th 2016. In other fire incident, eight houses were gutted at Zaina Kadal area of Shahre-e- khaas on February 04 2015. While the increasing fire incidents are being reported in Srinagar, the officials in F&ES blame the congestion and faulty building structures as the major reason for rise in fire incidents in the summer capital city. The damage in the Srinagar particularly in the old city is higher in comparison to other places as the houses are located closely. Pertinently Srinagar city

witnesses 15 to 20 fire incidents on an average per day. According to reliable sources the Fire and Emergency Service is facing dearth of about 1500 employees, hampering the relief and rescue operations in the summer capital. Several cases of fire incidences have previously occurred in Srinagar with most of them having been fatal. The cases include the 1993 Lal Chowk fire (literally Red Square) occurred in main commercial centre of downtown Srinagar that took place on 10th April 1993. The fire spread and engulfed the locality consuming over 50 homes and 260 shops. When the paramilitary forces arrived in response of the situation, they became engaged in a fire fight for over four hours. In this and other incidents in the ensuing days, over 260 lives were lost due to terrorism related violence.

A major fire destroyed a 200 year old reverted Sufi Shrine of Syed Abdul Qadir Geelani (R.A) in Khanyar area of Srinagar on 25th of June 2012. A major fire at a premier hospital of Bone And Joints at Barzulla in Srinagar gutted the outpatient department completely but no casualties and injuries were reported. A mysterious fire broke out in one of the office blocks of the old secretariat Srinagar on 27 December 2015 at around 09:00 pm. A major fire broke out in a building at a civil secretariat premises in Srinagar on 11 July 2013 in which five fire fighters were injured and a huge loss of property occurred. It is very evident from the above facts that the Srinagar City is most vulnerable to the fire hazards and other types of hazards as being witnessed by a number of such factors which lead to its vulnerability such as, congested area, unplanned construction, faulty entrance and evacuation routes, mostly wooden structures are at the peak of the construction.

Significance of the Study

This study was undertaken after several rampant cases of fires had been reported in different parts of the Srinagar city hence raising fears on the issue of fire preparedness and safety measures in place. This study thus sought to investigate fire risk perception, mitigation and preparedness among occupants of the different types of buildings. The findings of this study can give policy makers in the City Council of Srinagar, owners of buildings as well as occupiers the information useful in making and redefining fire safety in their premises hence enhancing perception & awareness. The study was narrowed down to cover residential, educational, health, commercial and orphanage buildings. Factor identification was done on prior knowledge upon which emphasis was on preparedness and mitigation measures adopted by building owners, managers and occupants as well as preparedness of the local authorities.

Objectives of the Study

1. To assess the fire safety measures adopted by owners of buildings in the study area.
2. To evaluate the levels of fire preparedness among the occupants and local authority of the buildings in the study area.
3. To assess the levels of perception of satisfaction of building owners, occupants and the local

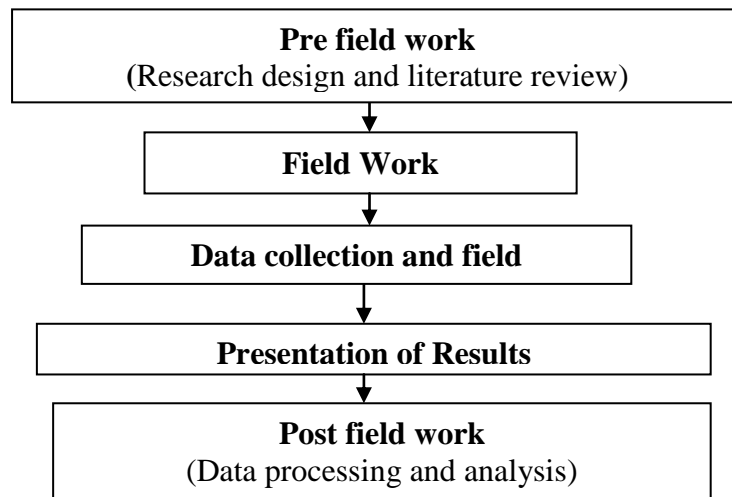
authorities on fire preparedness and mitigation measures.

Data Base and Methodology

The present study is based on primary as well as secondary sources of data. The secondary data has been obtained from Census of India handbook Jammu and Kashmir Series, Directorate of Fire and Emergency Services, Srinagar, Journals, books, etc. The data has been tabulated and different statistical techniques have been used to analyse the data. For primary data, the target population for this study included all owners, property managers and occupants of different premises in Srinagar city. Due to the limited time and financial resources available for the study a sample size of 50 respondents was selected as a representative of the entire population. Respondents from the fire officers were obtained from the Gawkadal fire station and the F&ES Headquarter, Batmaloo, Srinagar while the owners/managers and

occupants from the different types of buildings. Three buildings were then randomly selected from each cluster with two respondents from the occupants/tenants being selected from each building among those sampled. One owner/property manager from each of the clusters was also randomly selected. In the category of fire officers, two respondents were interviewed from the fire stations. To ensure reliability, the scholar's instruments were pre-tested on a few respondents in the study area. This technique involved administering the same question twice to the same group of subjects, but after an interval of two weeks between April and May 2016. The study ensured that there was no sensitization to the respondents which could influence the responses given in the test. The results from both the first and the second test were accurately recorded. The responses from each administration were correlated to determine the extent of consistency.

Figure: 1 Flow chart for Methodology



Review of Literature

Risk aspects namely ,applicability, risk perception and perceived benefit for general, strategic and operational risks have not been undertaken for risks inventoried specific to the urban environment. Earlier studies are seen in area of risk perception alone and that too less researched in different infrastructural areas. The objectives have been designed accordingly to bridge the research gap in the areas of risk perception, knowledge and risk reduction in the study area.

A number of studies have been carried out on the fire hazards and their mitigation measures from time to time at Global, National as well as at Regional level. The study carried out by Garry Davis (2003), regarding fire hazard planning in USA is to help provide a robust fire hazard preparedness and mitigation program to California communities. The study carried out by Anderson Petra (1997) entitled "Evaluation and Mitigation of Industrial Fire Hazards" is a tool suitable for conducting industrial fire and explosion hazard analysis is presented, together with an identification of weak links in the hazard evaluation chain. The tool, "FREIA", evaluates the consequences for humans and components due to fires and

accidental releases indoors and outdoors using established engineering methods.

Risk perception and risk reduction is the enterprises combined effort to identify, evaluate and manage risk within its risk appetite. Risk needs to be defined equally from probability / expected values and from perspective of events / uncertainties / consequences (Aven & Renn 2009). Henderson in 2007 stated economic, political, terrorism, socio cultural, environmental, health, technical, and commercial risks. Bharwani and Mathews in 2012 identified hospitality risks and listed 38 key risks. These included strategic (8), commercial and finance risk (9), others external (5) and operational (16). Many other risks were not considered here. Risk is used to express a set of scenarios each having two dimensions -probability and severity (Kaplan and Garrick, 1981). It is a combination of probability of event and consequences (ISO, 2002) and more recently defined as being equal to expected loss (Willis and Dekay, 2007). Hence, it refers to uncertainty about and severity of the consequences (or outcomes) of an activity with respect to something that human beings value. (Aven and Renn, 2009).

Risk perception is defined as cognitive structure of beliefs, feelings and appraisal regarding risks. (Rohrman and Chenn, 1999). It is the subjective assessment of the probability of a specific type of risk and how concerned we are with the consequences. To perceive risk includes evaluation of the probability as well as consequences of negative outcome of a happening of risk. The two important aspects of risk perception are the risk and the perceiver.

Risk reduction and mitigation is combination of taking self-protection steps -reducing frequency of loss and taking self-protection steps- reducing severity of loss. (Ehrlich and Becker, 1972). Another study considers it as combination of taking measures to reduce damage due to risk and to reduce the incidence of harmful event (Chichilnisky and Heal, 1993).

The study carried out by the Dale D. Rowley (2004) entitled "The Costs and Benefits of Individual Hazard Mitigation" primarily signifies the cost and benefits of individual hazard mitigation, where mitigation is defined as "activities designed to reduce or eliminate risks to persons or property or to lessen the actual or potential effects or consequences of an incident. Mitigation measures may be implemented prior to, during, or after an incident. Granot (1988) suggested humanity has had to live with potential dangers from time immemorial. Sime (1990) has discussed the panic behaviour of some people in emergencies. Wood (1990) has analysed the way people react to fires. For example in findings reported by Wood (1990), some people went only short distances through the smoke, but many of them advanced farther than they could see. Knowing the fact that people navigate through smoke, it is a responsibility to provide evacuation systems that are visible in smoke, wherever feasible. Ouellette, (1993) discovered that exit signs are essential components of evacuation systems. This study seeks to identify the current fire safety condition in residential colleges located in a local university. It also seeks to identify important human involvement elements that need concentration to achieve a higher standard in fire safety management for a local university.

The study carried out by the Chandrakantan Subramanian (2004) entitled "Human factors influencing fire safety measures", Disaster Prevention and Management:" mainly focuses on the human factors influencing fire safety measures in India. Ramachandran, (1999) analysed that fires cause fatal and serious injuries to occupants of buildings and inflict direct material damage to buildings and their household goods. G.B. Menon in his handbook on building fire codes clearly defines the various building codes and bylaws for buildings, whether used for

living, working, entertainment or for other purposes, forms an integral and major constituent of human habitat. With the technological advances on all fronts, not only the factor of susceptibility, but the complexity of fires, explosions and the hazards which these buildings are exposed to have also increased manifold.

There are different behaviours that people may experience when they are facing a fire emergency. For instance, once an occupant receives the first cue, they may try to help other occupants evacuate, extinguish the fire or warn the rest of people (Hurley, 2016).

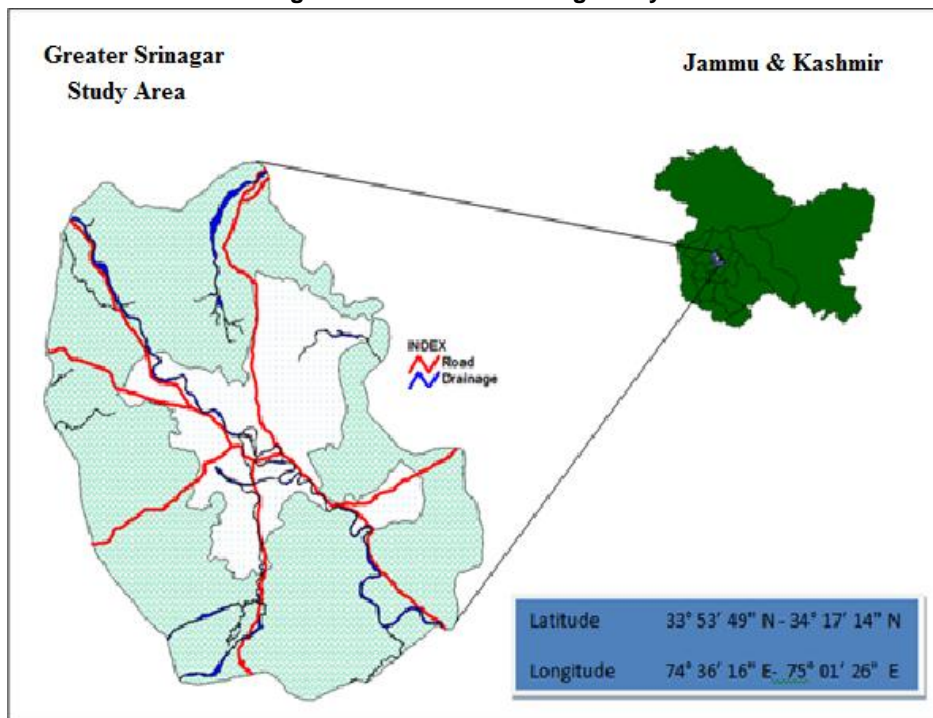
Human behaviour in fires varies significantly between individuals. These differences in behaviour during fire may be due to several factors such as gender, age, cultural background, previous experiences and even media may have an important impact on how people perceive the environment (Fahy, Proulx, & Aiman, 2009). Experiments have shown that people may not perform an accurate assessment of fire growth at early stages and for most cases, the fire is not truly estimated because people are not aware of the severity of it and evacuation takes some time in order to start (Fridolf, 2010). In evacuation, an important parameter which must be taken in consideration is pre-evacuation time. Pre-evacuation time includes two phases; recognition time and response time, which are the times when people recognized alarm cues and begin to respond before traveling to a safe location (Ronchi & Nilsson, 2016). On the experiment carried out by Canter, Powell and Booker (1987) participants were shown pictures of fire at different stages. It was found people overestimated the time between distinct stages of fire. Fridolf and Nilsson (2011) experiment was conducted using a different technology to evaluate people's perception regarding fire growth and to evaluate their ability to estimate whether or not they could extinguish a specific fire with the help of a fire extinguisher. Occupants in a building will not evacuate unless a dangerous or risky situation is perceived (Kinatader, Kuligowsky, & Reneke, 2014). Evaluating how people perceive and evaluate the situation when they are looking directly to the fire will provide a better understanding of human behaviour during fires.

Results and Discussions

The Study Area

Srinagar the summer capital of Jammu and Kashmir is located in the Kashmir valley, surrounded by the Himalayas on all sides. The city is located between 34°5' N and 74°47' E at an elevation of 1585 meters and spread out in an area of 294 sq. kms. The city is located on both sides of the Jhelum River, which is called vyath in Kashmir. Srinagar city has a population of 1273312 as per census January 2011.

Figure: 2 Location of Srinagar City



Source: Generated from SOI toposheets -1971

Srinagar City: Fire Profile

The Housing sector is vibrant in Srinagar city with the public and private sector putting up more housing programmes in the city both residential and

commercial. Disaster management is thus gaining momentum in the city. Several accidents identified as susceptible to people in the city have been classified as road, railway, water and air accidents.

Table: 1 Fire Statistical data from the year 1991 to 2015 and property involved in crores of Rs.

S.No	Year	No. of Fire Calls	Structure	Property Involved	Property Damaged	Property Saved
01	1991	359	652	41.97	10.55	31.42
02	1992	535	918	70.26	16.63	53.63
03	1993	546	915	143.31	79.24	64.07
04	1994	499	687	54.96	11.13	43.83
05	1995	574	1122	203.07	25.09	177.98
06	1996	490	740	112.41	12.76	99.65
07	1997	423	456	154.37	08.06	146.31
08	1998	439	411	148.57	14.51	134.06
09	1999	560	478	100.84	09.64	91.20
10	2000	553	518	413.55	09.95	403.60
11	2001	551	458	188.15	11.67	176.48
12	2002	517	406	107.92	06.25	101.67
13	2003	483	373	204.23	19.83	184.40
14	2004	587	463	153.85	19.36	134.49
15	2005	577	592	181.39	37.70	143.69
16	2006	530	460	201.30	17.20	184.10
17	2007	560	510	205.78	15.51	190.27
18	2008	440	463	281.47	13.75	281.47
19	2209	628	478	250.09	13.86	236.23
20	2010	499	343	135.96	16.65	119.31
21	2011	497	334	166.79	10.90	155.89
22	2012	545	434	261.41	13.52	247.89
23	2013	531	424	239.76	10.82	228.94
24	2014	435	407	202.24	15.11	187.13
25	2015	446	261	308.46	20.01	288.45

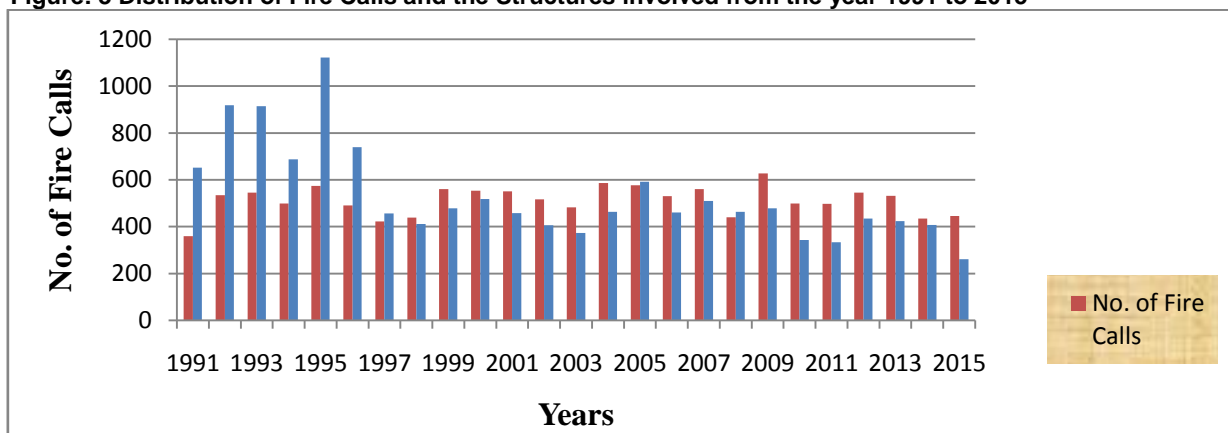
Source: Generated from SOI toposheets -1971

The government has therefore recommended equipping buildings, vehicles, trains and lake vessels with firefighting equipment to avert fire accidents. Fire and Emergency services department which is charged among others with ensuring all buildings within the municipality conform to the building standards and safety measures are in place. Among fire safety measures the F&ES Department targets achieving include fire inspections, installation of fire extinguishers in the Town hall and the inspection of buildings within the municipality fire brigades. Fire statistical data reveals that how the Srinagar city particularly Down Town area of Srinagar city is prone to fire hazards.

446 fire incidents, highest in comparison with other districts. As per the reports the fire incident data, the fire occurrence caused death of six people which is second highest number of casualties across the district in Kashmir. The data also revealed that 25 people were also injured in the fire incidents across the Srinagar. In these fire incidents property worth Rs 22.45 crore was destroyed in Srinagar. The alarming fire incidents in the Srinagar City as revealed from the fire statistical data has made it necessary to adopt full-fledged fire hazard planning for mitigation and preparedness measures so as to lesser the fire hazard risks associated in the study area particularly in the down town area of the Srinagar City.

According to the data of Directorate of Fire & Emergency services, the summer capital witnessed

Figure: 3 Distribution of Fire Calls and the Structures involved from the year 1991 to 2015



Source: Deputy Directorate F & ES Command Srinagar.

Levels of Fire Hazard Preparation and Mitigation Measures in the Study Area

The results of the study have been discussed under different sub-sections in line with research objectives. The themes include; assessing fire Safety measures adopted by owners of buildings, assessing level of preparedness among the occupants in the buildings, assessing the level of preparedness of local authorities and providing recommendations on mitigation measures to improve on Fire Safety in the buildings. The data to answer research questions were collected from 50 respondents out of 50 sampled giving a response rate

of 100%. The respondents were requested to fill the data as the researcher waited and this ensured 100% return rate. Two of the respondents who had requested to remain with the questionnaires were found to have misplaced them but were issued with new ones to ensure 100% return rate.

Distribution of Respondents by Age

Knowing the age group of respondents assisted the researcher to know which age group was being housed in the business premises and the distribution by age group of perception/knowledge of fire safety. The respondents were asked to indicate their ages.

Table: 2 Distribution of Respondents by Age (Years)

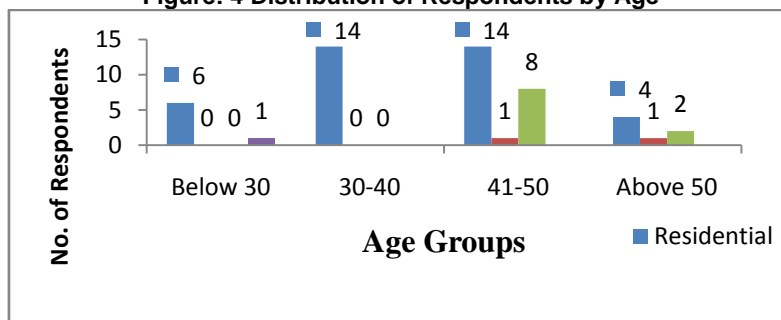
Age	Below 30	30-40	41-50	Above 50
Residential	6	14	14	4
Fire experts	0	0	1	1
Owners/managers	0	0	8	2

Source: Field survey, 2016

The above table and figure shows that majority of the respondents 23 (46%) were in the age bracket of 41-50, 14 (28%) were in the age group of 30-40, and 7 (14%) in age group above 50 years. Only 6 (12%) were below the age of 30 years. This finding signifies that majority of the respondents were

within the age of 41-50. All the age groups studied were found to have least knowledge of Fire safety and skills. From the study it can be concluded that majority of the respondents were adults hence could have a reliable knowledge that was being sought.

Figure: 4 Distribution of Respondents by Age



Analysis of Questionnaires for Occupants and Owners/Property Managers

The respondents were asked to identify firefighting equipment available in buildings they occupied. From the total number of 100% respondents studied, majority (20.83% respondents) stated that dry chemical extinguishers did exist in buildings against 75% who stated that it did not exist. Halogen extinguishers similarly do not exist in

buildings as stated by 89.58% respondents. However, none confirmed their existence. Foam cylinders also do not exist in buildings as stated by 91.66% respondents. The carbon dioxide extinguishers exist in most buildings as stated by 20.83% respondents. Wet chemical and fire blankets do not exist in most buildings as stated by 95.83% and 91.66% respondents respectively.

Table: 3 Fire Safety Measures and Responses

Fire Equipment	Exists	Do Not Exist	Not Sure	Total
Dry chemical extinguishers	10	36	2	48
Halon extinguishers (vaporising liquids)	0	43	5	48
Foam cylinders	0	44	4	48
Carbon dioxide extinguishers	10	34	4	48
Sprinklers/ Hose reels (pressurized water extinguishers)	0	48	0	48
Wet chemical	0	46	2	48
Fire blankets	0	44	4	48
Any other (specify)	0	48	0	48

Source: Field Survey, 2016

In all the buildings studied, none of the respondents confirmed existence of wet chemical and blankets. Asked whether any other fire equipment exists in the building occupied by the respondent, none of them stated the existence while 100% respondents confirmed that no any other fire equipment exists. No respondents' supported existence of sprinklers/hose reels.

Perception on Availability of Fire Equipment

The respondents were asked to give their view on the existence of the firefighting equipment. Out of the total 100% respondents studied, a majority 43 (90%) stated that they are not satisfied while 5 (10%) expressed their satisfaction. From the study, it

can be concluded that dissatisfaction from the availability of fire equipment is high.

Table: 4

Perception on Availability of Fire Equipment

Perception	Satisfied	Not satisfied	Total
Respondents	5	43	48
Percentage	10	90	100

Source: Field survey, 2016

Ability to Operate Fire Equipment

The respondents were asked to state whether they were able to operate the existing firefighting equipment if any. The following table shows how respondents were able to respond to the questions.

Table: 5 Ability to Operate Fire Equipment

Fire Equipment	Able to operate/use	Not able to operate	Not Sure	Total
Dry chemical extinguishers	8	37	3	48
Halon extinguishers (vaporising liquids)	0	45	3	48
Foam cylinders	0	46	2	48
Carbon dioxide extinguishers	8	38	2	48
Sprinklers/ Hose reels (pressurized water extinguishers)	0	46	2	48
Wet chemical	0	46	2	48
Fire blankets	0	47	1	48
Any other (specify)	0	0	0	0

Source: Field Survey, 2016

An analysis of the table reveals that 77% and 94% of the respondents stated that they were not able

to operate dry chemical extinguishers and halon extinguishers respectively. 17% respondents each

could operate the dry chemical extinguishers and carbon dioxide extinguishers respectively. 96% of each respondents stated that they were not able to operate foam cylinders, sprinklers/ hose reels and wet chemicals while two each of them were not sure how to handle them. A large number of respondents (98%) could not handle Fire Blankets while 2% respondents were not sure. There was no any other fire equipment specified. From the study it can be concluded that most of the occupants of these buildings who can operate firefighting equipment can only operate those that were available (in existence) though the number is fairly distributed on the ability to operate.

Perception on the Ability to operate Fire Equipment

The respondents were asked to state their ability to operate the firefighting equipment in their buildings. The table and figure below shows how respondents responded to the questions they were asked for.

Table: 6 Perception on the Ability to operate Fire Equipment

Perception	Satisfied	Not satisfied	Total
Respondents	10	38	48
Percentage	21	79	100

Source: Field survey, 2016

Asked about their perception on the ability to operate fire equipment, (21%) respondents indicated that they were satisfied while (79%) were not

satisfied. From the study it can be concluded that most of the occupants of these premises don't understand or are not able to operate firefighting equipment installed in those buildings.

Preparedness to Fire Disasters

Respondents were asked to indicate their awareness on fire preparedness measures available in the buildings. The following table shows the responses to the questions asked. All respondents (100%) were aware of an emergency communication system in case of fire occurrence. Further probing showed that they had fire alarm systems where they could press to alert firefighting personnel in addition to an emergency number 101. A question on regular inspection and maintenance of fire equipment showed that majority of the respondents (73%) said that it was not carried out with a paltry 4% respondents being aware. Only 23% respondents indicated that they were not sure whether inspection and maintenance was regularly carried out or not. Asked if they had been trained in fire emergency services, majority of the respondents (98%) indicated they had not while only 2% respondents indicated they didn't know. Responses to the existence of fire assembly points showed that some buildings had them with 21% respondents indicating their existence. 75% respondents indicated that their buildings had no fire assembly points while 4% respondents were indifferent.

Table: 7 Preparedness to Fire Disasters

Preparedness	Yes	No	Not Sure	Total
Awareness of an emergency communication system in case of fire occurrence (alarm, telephone, mobile no. etc.)	48	0	0	48
Frequent regular inspection and maintenance of firefighting equipment's	2	35	11	48
Training on emergency services in case of fire outbreak	0	47	1	48
Existence of a fire assembly point/emergency shelters for the building in case of fire occurrence	10	36	2	48
Availability of an emergency fire disaster kit is available in the building.	0	47	1	48
Accessibility and efficiency to Fire hydrants during fire outbreaks.	2	45	1	48
Existence of Emergency population warning methods in the building.	8	36	4	48
Conducting of Regular fire drills	0	46	2	48
Other preparedness strategies	0	-	-	0

Source: Field Survey, 2016

Respondents were also asked on availability of emergency fire disaster kit and majority of them (98%) indicated it did not exist in their building. No one respondent acknowledged its existence. 2% respondents were indifferent. Casual observation only showed that fire extinguishers existed but no emergency kits in most buildings. Asked about ease of accessibility to fire hydrants during fire disasters, most respondents (94%) were of the opinion that they are not easily accessible and are inefficient and mostly remain non-functional. Only 4% respondents indicated it was easily accessible. 2% respondents were indifferent. Further probing indicated that in previous cases of fire in residential areas, the hydrants (which are majorly operated by the local authorities) had no water in cases of fire outbreaks hence being ineffective. Respondents were also asked about the existence of emergency population warning methods and 8 respondents indicated that they existed while 36 indicated that it did not exist in

their buildings. Only 4 were indifferent. Casual observation showed that the most common population warning sign was "No Smoking" sign and was inscribed on the walls.

The respondents were also asked to indicate if fire drills were carried out in the buildings and how often it was carried out if at all. None of the respondents indicated ever witnessing or experiencing a fire drill being carried out. Majority of the respondents (96%) indicated it had never been done while 4% respondents were indifferent. The respondents from the fire station were also asked about the existence of other fire preparedness strategies in the station other than those covered by the questionnaire. The 10% respondents indicated the existence of ambulances. From the study it can be concluded that occupants of the building premises are mostly aware and concerned with emergency communication system, warning signs and fire assembly points.

Perception on Level of Preparedness

Respondents were asked to indicate their perception on level of preparedness in their buildings which is shown in the following table. Majority of the respondents (69%) indicated they were not satisfied while (31%) were satisfied. From the study it can be concluded that most of these buildings lack satisfactory fire preparedness measures.

Table: 8 Table gives the response data obtained

Perception	Satisfied	Not satisfied	Total
Respondents	15	33	48
Percentage	31	69	100

Source: Field Survey, 2016

Mitigation against Fire Hazards

The question sought to identify fire mitigation measures available to the Residents/ owners/ managers of their buildings. The following table shows responses obtained to the question from the respondents.

Table: 9 Mitigation against Fire Hazards

Mitigation	Measures Exist	Measures do not Exist	Do not Know	Total
Holding a Fire Insurance Policy	3	45	0	48
Availability of a Fire Safety Policy	0	47	1	48
Knowledge of Evacuation Plans	5	40	3	48
Sanctions against fire Regulation Breakers	0	46	2	48

Source: Field Survey, 2016

As to whether the occupants/owners/ managers held a fire insurance policy for both the building and/or the businesses, whichever the case, it was established that majority of the respondents (94%) did not hold while only 6% respondents had fire insurance policies. None of the respondents was indifferent. Respondents were also asked to find out if the management of the buildings had a fire safety policy and nearly all the respondents (98%) indicated they did not have while only 2% respondents were indifferent. No respondent indicated they had such a policy.

Respondents were also asked to indicate whether they understood fire evacuation plans. Most of them (83%) indicated they did not know. Only (10%) respondents indicated they understood the evacuation plans in buildings they occupied. (6%) respondents were indifferent. Further probing as to what they will do in case of fire outbreak showed that respondents had no definite formula but would rather do it haphazardly in evacuating people.

When asked to indicate if there was a sanctions policy against those who disobey fire regulations, nearly all respondents (96%) indicated that it did not exist. 4% respondents were indifferent and none of them indicated that any policy exists. It came to know that there exists no Fire Prevention Act which is the need of the hour. From the study it can be concluded that most of the occupants, owners and managers have not put in place fire mitigation measures in their buildings and/or businesses and are thus vulnerable to fire disasters.

Perception on the Level of Mitigation

The question sought to establish the perception of respondents on the level of mitigation in buildings.

Table: 10

Perception on the Level of Mitigation

Perception	Satisfied	Not satisfied	Total
Respondents	7	41	48
percentage	15	85	100

Source: Field survey 2016.

The above table reveals that the majority of the respondents, (85%) were not satisfied while (15%) were satisfied. From the study it can be concluded that majority of the occupants/owners/managers of buildings are not satisfied with the level of mitigation in their respective buildings.

Strategies on Improvement of Mitigation and Preparedness in Buildings

The question sought to elicit proposals from the owners of buildings, property managers, occupiers and the local authority on what ought to be done to improve on preparedness and mitigation against fires in different types of buildings. (94%) respondents proposed that training in fire safety is critical for fire preparedness. (50%) were of the view that fire compensation schemes be provided while (73%) want stairs and exit routes be opened in the buildings. (96%) were of the view that adequate fire equipment be acquired and installed in government, business and corporate buildings. (58%) respondents fire insurance to be put in place while (92%) want servicing and equipping of local authority engines so as to be ready to combat fire at any one given time.

Table: 11 Proposals on Mitigation and Preparedness

Proposed Issue	No.	Percent age
Training in Fire Safety	45	94
Establish compensation schemes	24	50
Opening Exit stairs/Routes	35	73
Acquiring adequate fire equipment	46	96
Provision of fire insurance	28	58
Regular servicing and equipping local authorities with fire engines	42	88

Source: Field Survey, 2016

From the study it can be concluded that most of the respondents want fire safety and preparedness measures to be put in place since they are not available as most of them are of the idea that would help increasing awareness and protection against fire.

Existence of Firefighting Equipment

Fire officers were also asked to state their view on the existence of firefighting equipment in buildings in the Srinagar city. They were also asked to indicate particular fire equipment that exists in the buildings if at all they existed.

Table: 12 Existence of firefighting equipment

Item	Yes	No	Total
Exists	1	1	2
Percentage	50	50	100

Source: Field Survey, 2016

They indicated that fire equipment exist in only in some buildings in Srinagar City. The respondents also identified Dry chemical extinguishers and carbon dioxide cylinders as the most commonly existing firefighting equipment in the buildings. It can therefore be concluded that only few fire equipment literally exist in different types of the buildings in the Srinagar City.

Perception on availability of firefighting equipment

Fire experts were asked to state how satisfied they were with the available firefighting equipment. Following table below shows their responses.

Table: 13 Perception on availability of firefighting equipment

Perception	Satisfied	Not Satisfied	Total
Respondent	0	2	2
Percentage	0	100	100

Source: Field Survey, 2016

Both (100%) fire experts indicated that they were not satisfied with the availability of firefighting equipment. This study clearly indicates that satisfaction to existence of fire equipment is not even 1% hence more needs to be done.

Preparedness to Fire fighting

The respondents were asked to indicate their preparedness by assessing if firefighting equipment including water hydrants were well equipped to combat fire in case of an outbreak. The following table below shows the responses obtained.

Table: 14 Preparedness to firefighting

Item	Yes	No	Total
Well equipped	1	1	2
Percentage	50	50	100

Source: Field Survey, 2016

One fire officers (50%) felt that the firefighting equipments were well equipped to fight fire. But one fire officer (50%) indicated that the hydrants are not well equipped to fight fires.

Strategies to improve on Fire Preparedness and Mitigation

The respondents were asked to provide in their opinion suggestions that could help improve the state of fire preparedness and mitigation in different types of buildings. Among the suggestions they suggested are as shown in the following table.

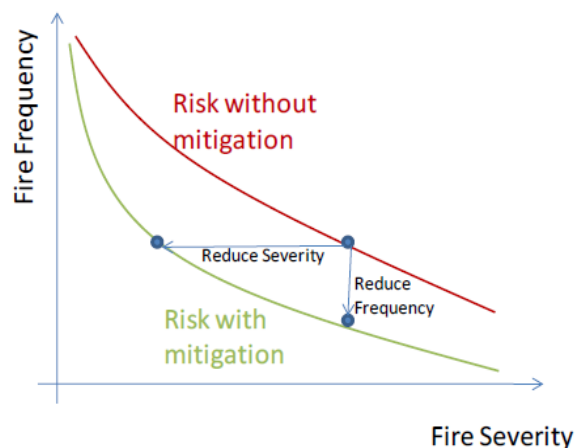
Table: 15 Strategies to improve Fire Preparedness and Mitigation

S.No.	Suggestion	Frequency
1.	Enhanced funding towards fire safety	2
2.	Increased public participation in fire safety training	2
3.	Full compliance with set building by laws	2
4.	Seeking approval before building works	2
5.	Installing fire equipment in all buildings	1
6.	Implementation of fire force Act	2

Source: Field Survey, 2016

The impact of mitigation on fire risk consequences can be well understood by the relationship between fire frequency and the fire severity. This relationship clearly shows that by employing the fire mitigation measures to fire risks we can reduce both the fire frequency and the fire severity to a great extent.

Figure: 5 Impact of Mitigation on Fire Risk Consequence



Conclusion

The study assessed the influence of past fire disasters on mitigation and preparedness among owners, occupants and managers of different types of properties in Srinagar City. This was in relation to the fact that fire had occurred in many other towns resulting into fatalities and loss of property and hence fire authorities in Srinagar City could act on these premises to put in appropriate preparedness and mitigation measures. In this respect it was important to consider various measures put in place in various types of premises which could prevent, protect and mitigate against fire hazards that may occur. In assessing fire safety measures including fire equipment adopted by the owners in the various types of buildings, the study established that only Dry chemical extinguishers and carbon dioxide extinguishers were available in most buildings. Similarly, despite the fact that the two equipment's are the commonly existing, very few occupants were found to be able to operate them hence there is need to train them so that they will be able to handle any fire eventuality.

This study sought to assess the level of fire preparedness among the occupants of different types of buildings. Since from the findings most of the respondents did show preparedness in only emergency communication system and knowledge of the fire assembly point, it clearly shows that the level of preparedness is still below expectation and hence it is imperative that the concerned authorities take necessary measures that will aim at increasing the level of preparedness such as conducting regular inspection, fire drills, training on emergency services as well as availing fire disaster kits.

The study also sought to obtain perceptions of owners, occupiers and property managers as well as local authorities on how satisfied they were on the level of mitigation and preparedness. The study concluded that most occupants, building owners/managers and local authority fire officers were not fully satisfied. The occupants in this case proposed that they be regularly trained in fire safety to boost their satisfaction and that warning signs be strategically placed and visible even to visitors, tourists and customers to the buildings. They further want exit routes properly marked and insurance policy be provided for them by the owners. Owners and property managers on their part wanted inspection to be regularly done on fire equipment. Therefore collaboration between owners, property managers and occupiers of buildings is critical in increasing their satisfaction as well as skills in fire fighting. The study also sought to obtain perceptions of owners, residents and property managers as well as the local authority on how satisfied they were on the level of functionality of the Fire Hydrants in the city area as these hydrants play an important role in case of fire emergencies by providing backup for water availability. The study concluded that the fire hydrants existed in the city but were either inefficient or non-functional.

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