Fire Safety Preparedness among Occupants of Selected Commercial Buildings, Kathmandu, Nepal

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Abstract: *This research is conducted to assess fire safety preparedness among the occupants of selected commercial building of Kathmandu Valley. The study is significant for concerned authority to understand the present fire safety preparation in the commercial buildings. It can create the awareness among occupants. Occupants were not prepared for fire safety. They were not aware on building features, emergency evacuation procedure and firefighting equipment's operation. Even they were not confident enough to lead themselves to safe place during emergency without assistance. Increase fire safety preparedness among occupants by conducting regular inspection, fire drills, and training on emergency services.*

Keyword: awareness on building features, emergency evacuation, equipment operation

I. INTRODUCTION

Fire is the rapid oxidation of a material in the exothermic chemical process of combustion releasing heat, light and various reactive products .Fire starts in three ways i.e. accidents, purposeful ignition and equipment failure. In today's world of electronic, office equipment increase fire incidents due to faulty electrical equipment and power distribution systems. Electrical fires arise from conditions including damaged electrical conductors, plug wires or extension cords, use of faulty, modified or unapproved electrical equipment (Ogajo, 2013).

One of the main reason for damage in commercial building is because occupants are generally assumed to be somewhat, if not totally, unfamiliar with the building arrangement. The occupants are expected to be mobile and capable of self-preservation but, due to crowding and lack of familiarity, might have some difficulties in locating and walking to exits in an emergency. Also, the display of merchandise can present a higher fire growth rate than in other occupancies (International code council, 2009).

According to United Nation Development Program important reasons of fire in Nepal are black out induced fire that is caught due to negligence of house owners, black out induced fire that is caught due to accent due to burning candles, fire was aggravated as access for fire fighting vehicles was blocked due to parking of vehicles, motor bikes and street vendors and electrical short circuit. According to report of Ministry of Home Affairs of Nepal Government 2016, 7,182 fire incidents took place with demise of 1,541 and injured of 1,379 affecting 256,445 family and damaging 83,527 houses during the period of **1971-2015 (**Government of Nepal, Ministry of Home Affairs, 2016). As NBC 107: 1994 is main techno legal document for ensuring fire safety in building which lacked detailing. Staircase plays an important role in fire safety; preference was not given to staircase type and details. There was no provision for arrangement of stairs in building, not mention where and how the door shall be placed on the stair. No provision for pressurized staircase. Fire escape and external stair was mention as single element but internal escape too could acts as a fire escape. Protected lobby and Corridors were integral part of fire escape, they lead to ultimate place of safety but no consideration has been made in NBC 107:1994. There shall be special requirement for special hazards and basement. Fire fighting system and placement of fire fighting equipments was not mentioned. No details for signs and notice were provided (Mishra and Shrestha, 2017).

Based on case study four commercial building of Kathmandu valley, it was found that not all the aspects mention in NBC 107: 1994 was complied (Mishra and Shrestha, 2017). According to Mishra and Shrestha(2017) , many aspects of door detailing and stairs detailing were considered in City Center Mall, and LABIM Mall. While,

there was an obstruction on the escape route of City Center Mall and Lalitpur Mall. All four buildings semi enclosed stairs were present, whereas they shall be completely enclosed. City Center Mall has proper signage, LABIM Mall too has proper signage for exit but informative signs like floor numbering were distractive. Lalitpur Mall had exit sign on ground floor only. Star Mall lacked signage. There were no protected corridors at Lalitpur Mall and Star Mall. All four building were designed with atrium but the smoke vent was not considered in the design. No consideration was made for special hazards and obstruction was found in the escape route.

Incomplete code which is also not complained and there is always a risk of Fire. So it could be preparedness which could result into a fire safety. Therefore, the purpose of the research is to assess the fire safety preparedness among occupants of commercial buildings.

LITERATURE REVIEW

FIRE PROTECTION IN BUILDING

Passive Fire Protection; Passive fire protection is based on the principle of suppression. The compartments of the building are constructed in such a way that, it will be restricted to one area. For example, fire doors should prevent the spread of smoke and flames from lobbies, stairwells and lift shafts. Another example of passive fire protection is the design of escape routes, which should not incorporate combustible wall, ceiling or floor linings. Fire dampers should be installed in ducts where they pass through compartment walls, and holes in such walls around cables (Furness & Muckett, 2007).

Exit route is a continuous and unobstructed path of exit travel from any point within a workplace to a place of safety. An exit route consists of three parts exit access, exit, exit discharge. Exit access is portion of an exit route to an exit. Exit is portion of an exit route that is generally separated from other areas to provide a protected way of travel to the exit discharge Exit discharge is part of the exit route that leads directly outside or to a street, walkway, refuge area, public way, or open space with access to the outside(OSHO).

Active fire protection; Active fire protection systems may detect or extinguish a fire, with a water sprinkler or inert gas flooding installation performing both functions. An automatic fire detection installation will detect heat or combustion products of a fire in its early stages and raise the alarm (Furness & Muckett, 2007).

Fixed fire fighting systems

Fixed fire fighting systems (FFS) provide active protection for a building. At the design stage the provision for FFS can be compensatory feature to provide additional protection to a large space or vulnerable part of a building (Furness & Muckett, 2007).

Automatic water sprinklers, Drencher systems, Flooding and inerting systems, Water mist systems, Alarm Systems, Smoke and Heat Detector and Water hose reel are mostly used.

Fire Safety Management

Management is essential in fire prevention and fire safety. Fire safety design in a building comprises a number of measures concerning the layout of building, its construction and other provisions, some of which come into operation on the occurrence of a fire (Malhotra, 1993).

Fire safety management involves regular inspection, maintenance, posting of notices and exit directional signs, regular conduct of fire drills, evacuation schemes and presence of fire wardens (Ogajo, 2013).

The main purpose of fire safety management is to ensure that all the provided fire safety measures will be available so that people can use them to assist their escape (Baker, 2003).

Fire Safety Management Roles and Responsibilities

- In commercial building it is necessary to have pre-planned procedures to deal with a fire emergency by appointing a fire safety manager for the observance of the fire safety procedures, keeping a check on maintenance needs. Ensure that staff is familiar with the safety procedures and the occupants carry out their work in a safe manner. All fire detection/alarm systems, fire extinguishers, hose reels etc should have a maintenance schedule prepared and records shall be kept of their inspection and rectification. Organize regular fire drills for the staff to ensure that they remain aware of the appropriate means of escape, the location of exits and the routes they are expected to follow. Prepare plans for evacuation procedure, fire control and assistance to be given to the fire brigade on their arrival. The plan should be discussed with the fire brigade and their agreement obtained on the proposed procedures (Malhotra, 2013).

METHODOLOGY

Research was based on both qualitative and quantitative approach. The primary data was collected by direct interview, observation, discussion, and interaction with key informants. Whereas, secondary data was collected from various publications like journals, reports of government organization like NBC 107:1994, and other fire safety codes etc.

Study Area

To assess the fire safety preparedness of occupants, four commercial building has been selected purposely. Buildings selected were City center mall, Labium Mall, Lalitpur Mall and Star Mall.

City center Mall; is situated in the Kamal Pokhari, Kathmandu. It was completed in 2009, the building is shopping mall with five floors above ground floors. Building is characterized by large atrium spanning all five above ground floors. The building contains stores for different types of products and services, including entertainment facilities such as a cinema complex, a game center and bowling alleys on the highest fifth floor.

LABIM Mall; formerly known as Lalitpur Bishal bazar; is a situated in Pulchowk, Lalitpur. Lalitpur Bishal bazar was totally revitalized by contemporary design creating an exciting place in the city.

LABIM Mall spread over 20,000 sq ft has multiple accesses for pedestrian and vehicles.50% of the total area is dedicated to the circulation space; while remaining 50 % house rental space. Escalators, elevators and stairs case assists on the vertical circulation while walkways and lobby in horizontal circulation (Bhandari, 2017)

Lalitpur Mall; is mall situated in Lagankhel, Lalitpur. Building is designed with exposed brick and glass on the facade. It has used both contemporary and traditional design elements in façade. It can be accessed by two roads. It is a mercantile building with five above ground floors. Building is characterized by atrium spanning up to second floor. The building contains stores for different types of products and services, offices, pathology lab, restaurant; food court under one roof.

Star Mall; is situated in Putali sadak, Kathmandu. Mall consists of shopping, food court, multiplex, meeting rooms all at one place. It is a single complex with two large atriums, which provides an attractive visual effect. Both blocks have one capsule lift, escalator and a staircase for vertical access.

Population and sampling

The study population was the occupants of the selected commercial buildings. For conducting questionnaire survey, both technical personnel and the user of the concerned buildings were considered.Population Size was

determined by the Central limit theorem. Sample size of the City Center Mall, LABIM Mall and Lalitpur Mall was taken 30, ensuring representative from each floor. Whereas in case of Star Mall sample size was taken 10 as most of the part of building was unoccupied.

Primary Data collection

- **Questionnaire survey;** was conducted between the occupants of selected commercial buildings. This was done to understand fire safety preparedness of occupants.
  - **Key informants interview;** was conducted with engineer of consultant to understand the feature of fire safety design and current design practice of commercial building. Whereas, interview was conducted with fire authority of Judha Varun Yantra to understand fire safety management of commercial buildings.
  - **Observation;** was conducted to check their preparedness.

Secondary data collection

Secondary data was collected from the published articles, conference paper, NBC 107:1994, IS 1644:1988, website, books etc. Data obtained from the questionnaire was presented in charts tables and graphs.

Results and Discussions

Awareness of Building Planning of City Center Mall, LABIM Mall, Lalitpur Mall and Star Mall

Fire safety preparedness among occupants of all selected commercial buildings are presented in table 1.1.

Table 1.1Awareness of Building Feature

	City Center Mall (nos. of occupants)			LABIM Mall (nos. of occupants)			LALITPUR Mall (nos. of occupants)			STAR Mall (nos. of occupants)		
Awareness on building feature	**Yes**	**No**	**Can't Say**	**Yes**	**No**	**Can't Say**	**Yes**	**No**	**Can't Say**	**Yes**	**No**	**Can't Say**
Building plan	13	11	6	14	12	4	13	10	7	3	4	3
Location of exit	15	13	2	17	7	6	20	7	3	4	2	4
Visibility of emergency sign	18	8	4	17	8	5	8	19	3	1	5	4

Respondents were asked to state their awareness on building feature. Table 1.1 shows response of respondent. 13 respondents of City Center Mall were aware about building plan, 15 were aware about location of exit and for 18 respondents emergency sign were visible. 11 respondents were not aware about building plan, 13 were unaware about location of exit and for 8 respondents emergency sign were not visible. Whereas, 6 respondents had no idea about building plan, 2 respondents had no idea about location of exit and 4 respondents had no idea about emergency sign.

17 respondents of LABIM Mall were aware about building plan, 17 were aware about location of exit and for 17 respondents emergency sign were visible. 12 respondents were not aware about building plan, 7 were unaware about location of exit and for 8 respondents emergency sign were not visible. Whereas, 4 respondents had no idea about building plan, 6 respondents had no idea about location of exit and 5 respondents had no idea about emergency sign.

13 respondents of Lalitpur Mall were aware about building plan, 20 were aware about location of exit and for 8 respondents emergency sign were visible. 10 respondents were not aware about building plan, 7 were unaware about location of exit and for 19 respondents emergency sign were not visible. Whereas, 7 respondents had no idea about building plan, 3 respondents had no idea about location of exit and 3respondents had no idea about emergency sign.

3 respondents of Star Mall were aware about building plan, 4 were aware about location of exit and for 1 respondent emergency sign were visible. 4 respondents were not aware about building plan, 2 were unaware about location of exit and for 5 respondents emergency sign were not visible. Whereas, 3 respondents had no idea about building plan, 4 respondents had no idea about location of exit and 4 respondents had no idea about emergency sign.

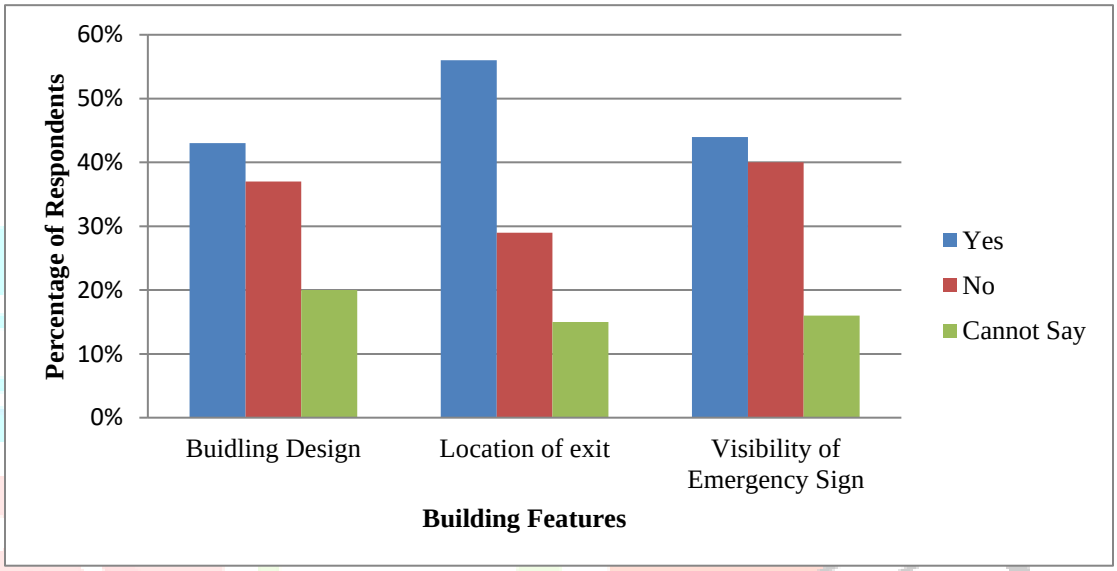

Figure 1.1 Awareness of Building Feature

43% of respondents were aware about building design, 56% of respondents can locate the exits and for 44% emergency sign were visible. Figure 1.1 shows that occupants lacked awareness on building feature. As respondent were unaware about building design, it became difficult to locate the exits. During KII, experts mentioned that, emergency sing shall be clear and visible and well lit in absence of day light. This helps occupants to direct towards the exit.

.Table 1.2Awareness of Emergency Egress

	City Center Mall (nos. of occupants)			LABIM Mall (nos. of occupants)			LALITPUR Mall (nos. of occupants)			STAR Mall (nos. of occupants)		
Awareness on emergency Egress	**Yes**	**No**	**Can't Say**	**Yes**	**No**	**Can't Say**	**Yes**	**No**	**Can't Say**	**Yes**	**No**	**Can't Say**
Emergency evacuation	12	10	8	12	12	6	10	17	3	1	5	4
Assembly point	5	16	9	6	20	4	8	15	7	1	4	5

12 respondents of City Center Mall were aware about emergency evacuation, only 5 respondents were aware about assembly point. 10 respondents were not aware emergency evacuation, 16 were unaware about assembly

point. Whereas, 8 respondents had no idea about emergency evacuation, 9 respondents had no idea about assembly point**.**

12 respondents of LABIM Mall were aware about emergency evacuation, only 6 respondents were aware about assembly point. 12 respondents were not aware emergency evacuation, 20 were unaware about assembly point. Whereas, 6 respondents had no idea about emergency evacuation, 4 respondents had no idea about assembly point**.**

10 respondents of Lalitpur Mall were aware about emergency evacuation, only 8 respondents were aware about assembly point. 17 respondents were not aware emergency evacuation, 15 were unaware about assembly point. Whereas, 3 respondents had no idea about emergency evacuation, 7 respondents had no idea about assembly point**.**

Only 1 respondent of Star Mall was aware about emergency evacuation, only 1 respondent was aware about assembly point. 5 respondents were not aware emergency evacuation, 4 were unaware about assembly point. Whereas, 4 respondents had no idea about emergency evacuation, 5 respondents had no idea about assembly point**.**

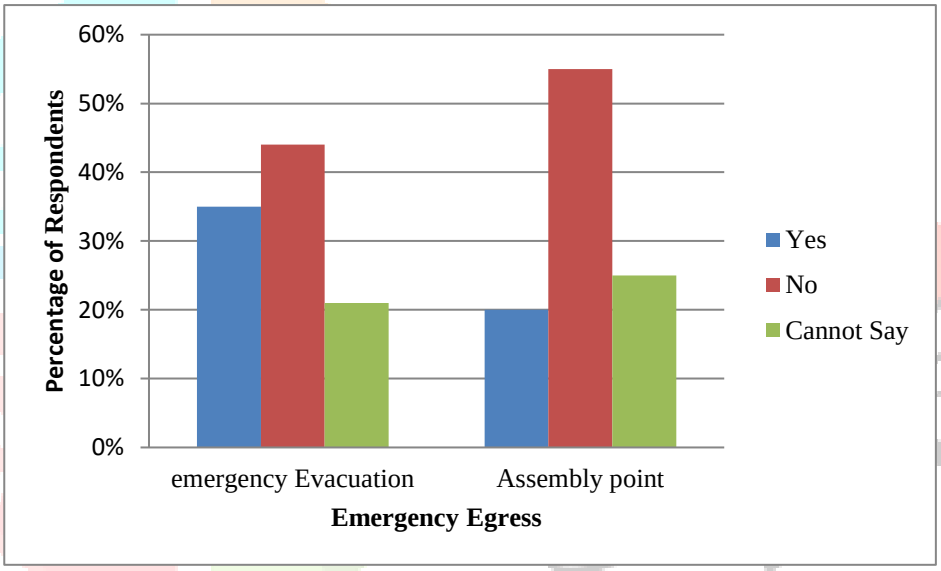

Figure 1.2 Awareness of Emergency Egress

35% of respondents were aware about emergency evacuation, 20% of respondents were aware about assembly point. Whereas 44% of respondents were unaware about emergency evacuation and 55% of respondents were unaware about assembly point. Figure 4.5 shows that occupants lacked awareness on emergency egress. Management team shall organize regular fire drills to ensure that occupants remain aware of the appropriate means of escape and where they shall wait after emergency evacuation.

Table 1.2Awareness of Emergency Egress

	City Center Mall (nos. of occupants)			**LABIM Mall (nos. of occupants)**			**LALITPUR Mall (nos. of occupants)**			**STAR Mall (nos. of occupants)**		
Awareness on Fire Alarm	**Yes**	**No**	**Don't know**	**Yes**	**No**	**Don't know**	**Yes**	**No**	**Don't know**	**Yes**	**No**	**Don't know**
Provision of alarm	14	8	8	17	5	8	15	9	6	5	3	2
Raise for alarm	10	14	6	11	12	7	9	16	5	3	5	2

14 respondents of City Center Mall were aware about provision of alarm in the building, 10 respondents were able to raise alarm during fire emergency. 8 respondents were not aware about provision of alarm in the building, 6 respondents were not able raise alarm during fire emergency. Whereas, 8 respondents had no idea about provision of alarm, and 6 respondents had no idea if they could raise alarm during emergency.

17 respondents of LABIM Mall were aware about provision of alarm in the building, 11 respondents were able to raise alarm during fire emergency. 5 respondents were not aware about provision of alarm in the building, 12 respondents were not able to raise alarm during fire emergency. Whereas, 8 respondents had no idea about provision of alarm, and 7 respondents had no idea if they could raise alarm during emergency.

15 respondents of Lalitpur Mall were aware about provision of alarm in the building, 9 respondents were able to raise alarm during fire emergency. 9 respondents were not aware about provision of alarm in the building, 5 respondents were not able to raise alarm during fire emergency. Whereas, 5 respondents had no idea about provision of alarm, and 3 respondents had no idea if they could raise alarm during emergency.

5 respondents of Star Mall were aware about provision of alarm in the building, 3 respondents were able to raise alarm during fire emergency. 3 respondents were not aware about provision of alarm in the building, 5 respondents were not able to raise alarm during fire emergency. Whereas, 2 respondents had no idea about provision of alarm, and 2 respondents had no idea if they can raise alarm during emergency.

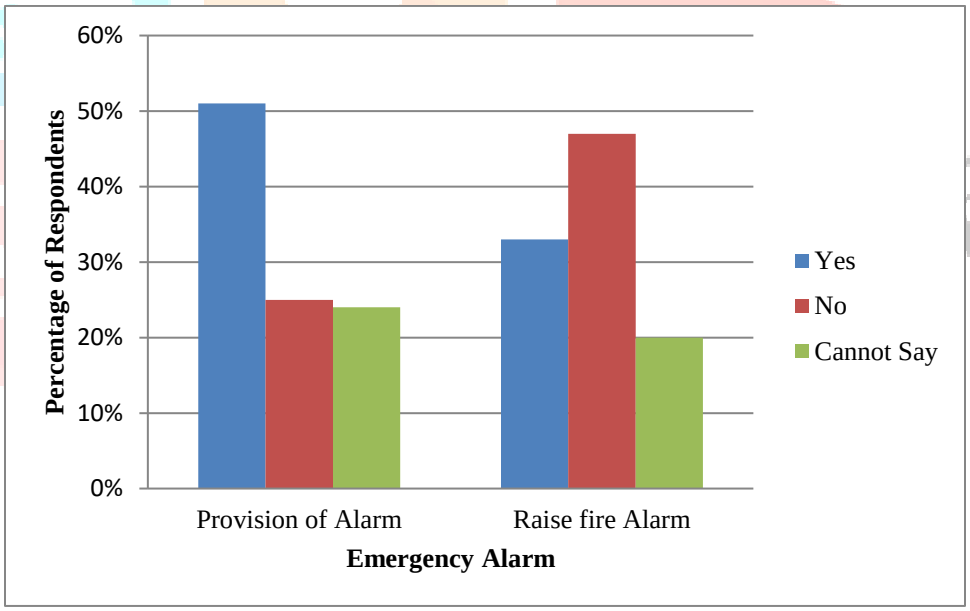

Figure 1.3 Awareness of Emergency Alarm

51% of respondents were aware about provision of alarm in the building, and only 33% of respondents were able to raise them. 47% of respondents were not able to raise fire alarm during fire emergency. Figure 4.6 shows that occupants lacked the awareness on emergency alarm. There is no use of fire alarm useless occupants can raise them at time of emergency. Management team shall organize training for occupants to use fire alarm to mitigate the effect of fire.

Table 1.3Provision of Assistance

	City Center Mall (nos. of occupants)			LABIM Mall (nos. of occupants)			LALITPUR Mall (nos. of occupants)			STAR Mall (nos. of occupants)		
Provision of assistance	**Yes**	**No**	**Can't say**	**Yes**	**No**	**Can't say**	**Yes**	**No**	**Can't say**	**Yes**	**No**	**Can't say**
Need emergency assistance	13	9	8	16	8	6	10	14	6	6	2	2
Assistance provided	12	10	8	12	12	6	8	19	3	3	6	1

13 respondents of City Center Mall need assistance to reach place of safety, 12 respondents assumed assistance will be provided during fire emergency to reach place of safety. 9 respondents do not need assistance to reach place of safety, 10 respondents assumed assistance will not be provided during fire emergency to reach place of safety. Whereas, 8 respondents could not say if they needed assistance, and 6 respondents had no idea if assistance would be provided during fire emergency.

16 respondents of LABIM Mall needed assistance to reach place of safety, 12 respondents assumed assistance will be provided during fire emergency to reach place of safety. 8 respondents do not need assistance to reach place of safety, 12 respondents assumed assistance will not be provided during fire emergency to reach place of safety. Whereas, 6 respondents could not say if they needed assistance, and 6 respondents had no idea if assistance would be provided during fire emergency.

10 respondents of Lalitpur Mall needed assistance to reach place of safety, 8 respondents assumed assistance will be provided during fire emergency to reach place of safety. 14 respondents do not need assistance to reach place of safety, 19 respondents assumed assistance will not be provided during fire emergency to reach place of safety. Whereas, 6 respondents could not say if they need assistance, and 3 respondents had no idea if assistance would be provided during fire emergency.

6 respondents of Star Mall needed assistance to reach place of safety, 3 respondents assumed assistance will be provided during fire emergency to reach place of safety. 6 respondents do not need assistance to reach place of safety, 6 respondents assumed assistance will not be provided during fire emergency to reach place of safety. Whereas, 2 respondents could not say if they required assistance, and 1 respondents had no idea if assistance would be provided during fire emergency.

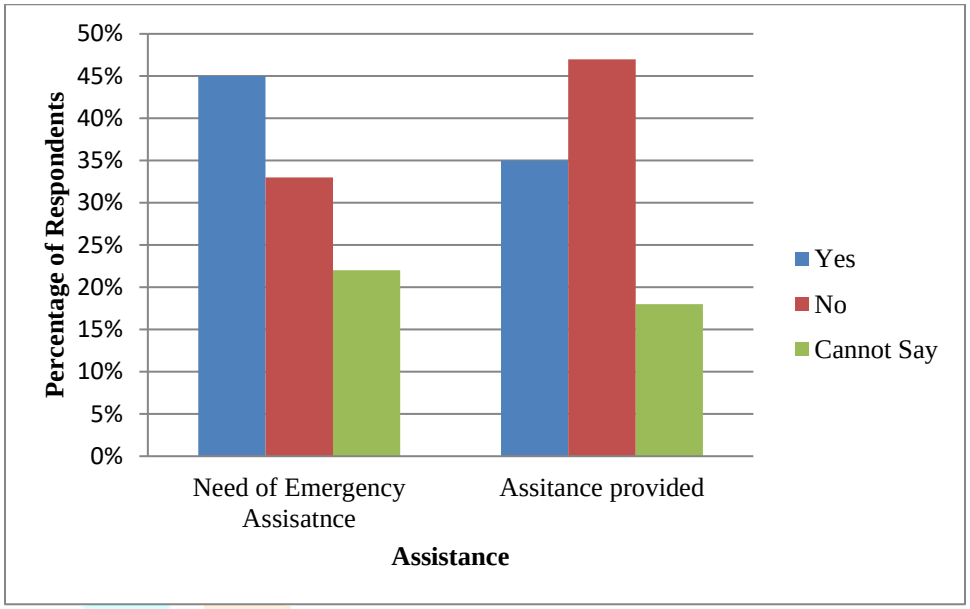

Figure 1.4 Awareness on Assistance

45% of respondents required assistance to lead them to place of safety during fire emergency and 35% assumed that assistance would be provided to the during emergency. 47% of respondents think that assistance would not be provided during emergency. Figure 4.7 shows that of occupants needed assistance and majority of them assumed assistance would not be provided to the. During KII, experts mentioned that, during emergency occupants get panic, provision of assistance help to conduct emergency evacuation smoothly.

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Table 1.4 Awareness on Fire Safety Measures

	City Center Mall (nos. of occupants)			LABIM Mall (nos. of occupants)			LALITPUR Mall (nos. of occupants)			STAR Mall (nos. of occupants)		
Fire safety Measures	**exit**	**Do not exit**	**Not sure**	**exit**	**Do not exit**	**Not sure**	**exit**	**Do not exit**	**Not sure**	**exit**	**Do not exit**	**Not sure**
Fire extinguisher	14	9	7	17	6	7	14	10	6	3	6	1
Water hose reel	10	11	9	13	15	2	14	12	4	2	7	1
Fire hydrant	6	20	4	19	6	5	5	23	2	1	8	1

14 respondents of City Center Mall were aware about the existence of fire extinguisher , 10 respondents were aware about the existence of water hose reel in building and 6 respondents were aware about the existence of water hydrant. 9 respondents were unaware about the existence of fire extinguisher, 11 respondents were unaware about the existence of water hose reel and 20 respondents unaware about the existence of water hydrant. Whereas, 7 respondents were not sure about presence of fire extinguisher, and 6 were not sure about presence of water hose reel 4 respondents were not sure about presence of water hydrant in building.

17 respondents of LABIM Mall were aware about the existence of fire extinguisher 13 respondents were aware about the existence of water hose reel in building and 19 respondents were aware about the existence of water hydrant. 6 respondents were unaware about the existence of fire extinguisher, 15 respondents were unaware about the existence of water hose reel and 6 respondents unaware about the existence of water hydrant. Whereas, 7

respondents were not sure about presence of fire extinguisher, 2 were not sure about presence of water hose reel and 5 respondents were not sure about presence of water hydrant in building.

14 respondents of Lalitpur Mall were aware about the existence of fire extinguisher, 14 respondents were aware about the existence of water hose reel in building and 5 respondents were aware about the existence of water hydrant. 10 respondents were unaware about the existence of fire extinguisher, 12 respondents were unaware about the existence of water hose reel and 23 respondents unaware about the existence of water hydrant. Whereas, 6 respondents were not sure about presence of fire extinguisher, 4 were not sure about presence of water hose reel and 2 respondents were not sure about presence of water hydrant in building.

3 respondents of Star Mall were aware about the existence of fire extinguisher, 2 respondents were aware about the existence of water hose reel in building and 1 respondent was aware about the existence of water hydrant. 6 respondents were unaware about the existence of fire extinguisher, 7 respondents were unaware about the existence of water hose reel and 8 respondents unaware about the existence of water hydrant. Whereas, 1 respondent was not sure about presence fire extinguisher, 1 was not sure about presence of water hose reel and 2 respondents were not sure about presence of there is water hydrant in building.

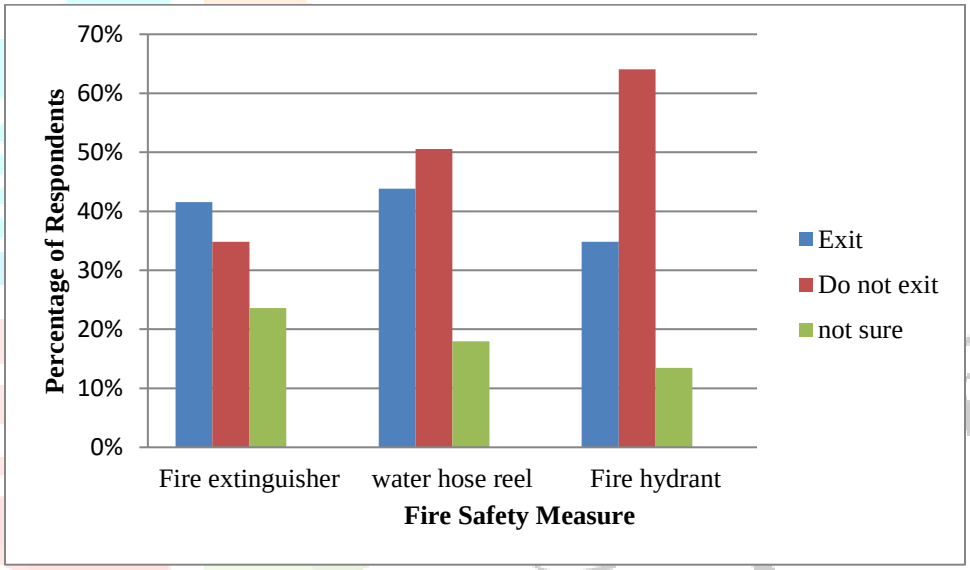

Figure 1.5 Awareness of Fire Safety Measure

42% of respondents were aware about presence of fire extinguisher, 44% of respondent were aware about water hose reel and 35% were aware about fire hydrant. 35% were unaware about presence of fire extinguisher and, 51% were unaware about presence of water hose reel and 64% were unaware presence of fire hydrant. Figure 4.8 shows that of occupants were unaware about the presence of fire safety equipment in building. To make proper use of available equipments they shall be displayed properly. In case of Star Mall, fire fighting equipments were kept inside the locked room and in LABIM Mall they were enclosed in the semi transparent cabinet. During KII, experts mentioned that, fire fighting equipments shall be easily reachable to occupants and located at proper height.

Table 1.5Ability to Operate Fire Safety Equipment

	City Center Mall (nos. of occupants)			LABIM Mall (nos. of occupants)			LALITPUR Mall (nos. of occupants)			STAR Mall (nos. of occupants)		
Ability To Operate Fire Equipment	**Able to**	**Not able to**	**Not sure**	**Able to**	**Not able to**	**Not sure**	**Able to**	**Not able to**	**Not sure**	**Able to**	**Not able to**	**Not sure**
Fire extinguisher	12	14	4	12	10	8	10	12	8	3	3	4
Water hose reel	4	18	8	9	16	5	9	17	4	5	3	2
Fire hydrant	7	19	4	8	21	1	6	18	6	2	4	4

12 respondents of City Center Mall think they were able to operate fire extinguisher, 4 respondents assumed they were able to operate water hose reel and 7 respondents assumed they were able to operate fire hydrant. 14 respondents were unable to operate fire extinguisher, 18 respondents were unable to operate water hose reel and 19 respondents were unable to operate fire hydrant. Whereas, 4 respondents were not sure if they could operate fire extinguisher, 8 respondents were not sure if they could operate water hose reel and 4 respondents were not sure if they could operate fire hydrant.

12 respondents of LABIM Mall assumed they were able to operate fire extinguisher, 9 respondents assumed they were able to operate water hose reel and 8 respondents assumed they were able to operate fire hydrant. 10 respondents were unable to operate fire extinguisher, 16 respondents were unable to operate water hose reel and 21 respondents were unable to operate fire hydrant. Whereas, 8 respondents were not sure if they could operate fire extinguisher, 5 respondents were not sure if they could operate water hose reel and 1 respondent were not sure if he could operate fire hydrant.

10 respondents of Lalitpur Mall assumed they were able to operate fire extinguisher, 9 respondents assumed they were able to operate water hose reel and 6 respondents assumed they were able to operate fire hydrant. 12 respondents were unable to operate fire extinguisher, 17 respondents were unable to operate water hose reel and 18 respondents were unable to operate fire hydrant. Whereas, 8 respondents were not sure if they could operate fire extinguisher, 4 respondents were not sure if they could operate water hose reel and 6 respondents were not sure if they could operate fire hydrant.

3 respondents of Star Mall assumed they were able to operate fire extinguisher, 5 respondents assumed they were able to operate water hose reel and 2 respondents assumed they were able to operate fire hydrant. 3 respondents were unable to operate fire extinguisher, 5 respondents were unable to operate water hose reel and 2 respondents were unable to operate fire hydrant. Whereas, 4 respondents were not sure if they could operate fire extinguisher, 2 respondents were not sure if they could operate water hose reel and 4 occupants were not sure they could operate fire hydrant.

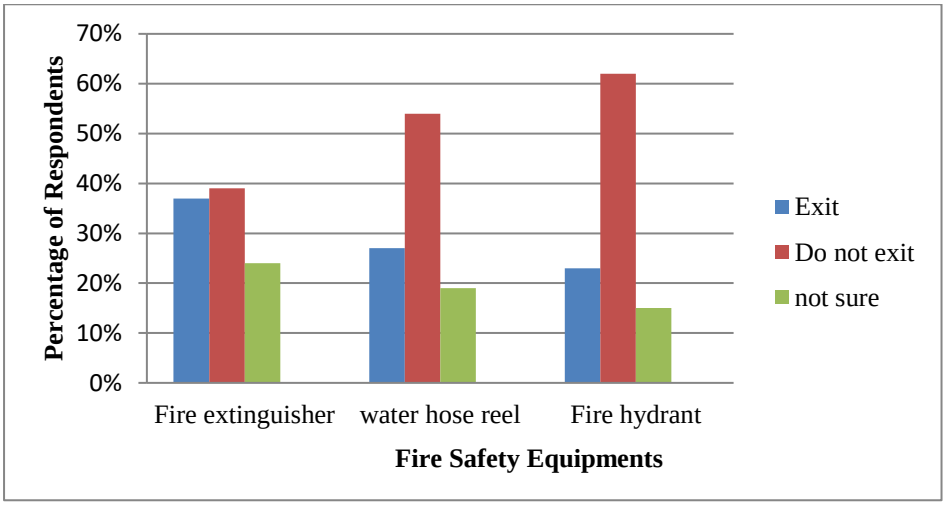

Figure 4. 9 Ability to operate Fire Safety Equipments

37% of respondents were able to operate fire extinguisher, 27% of respondent were able to operate water hose reel and 23% were able to operate fire hydrant. Whereas, 39% of respondents were not able to operate fire extinguisher, 54% of respondent were not able to operate water hose reel and 23% were not able to operate fire hydrant. Figure 4.9 shows that of occupants lacked ability to operate the fire fighting equipments. There is no value of fire fighting equipments if they could not be used during emergency. Therefore, proper training on shall be provided to the occupants.

CONCLUSION

Occupants of selected commercial buildings lacked fire safety preparedness. They were unaware about the general feature of the building like building plan and location of exits. Similarly, occupants lacked awareness on assembly point and emergency evacuation procedure. They needed assistance to reach place of safety. They were unaware about the safety measures present in the building and were unable to operate them. There was no fire safety management, no fire drills were conducted, and no awareness and training were given to occupants.

Recommendation

- Fire safety Management should practice fire drill. There should be maintenance and management of fire equipment. Fire safety measures and fire preparedness should enhance through fire safety programs. Further study on Problems encountered in evacuation based on human behavior and Fire resistance construction and specification should be conducted.

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