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A STUDY ON FIRE SAFETY KNOWLEDGE AND PRACTICES AMONG RESIDENTS OF AN APARTMENT COMPLEX IN CHENNAI CITY

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Abstract

BACKGROUND : Fire is one of the essential elements, which provides us heat and light. It serves various purposes in both domestic and industrial settings. High rise apartments are the norm in metropolitan cities, knowledge, attitude and practices of fire safety in apartments play a huge role in preventing accidental fires.

OBJECTIVES : 1. To assess the knowledge, attitude and practices of fire safety among apartment residents of Chennai. 2. To determine the factors influencing the knowledge, attitude and practices regarding fire safety among apartment residents of Chennai.

METHODS : A community based cross sectional study was conducted from September to November 2021, among 200 residents belonging to an apartment complex in Chennai city. Data was collected using a semi-structured, self-administered questionnaire. Data were entered in Microsoft excel and analysed using SPSS version 16.

RESULTS : In this study, males (48%) and females (52%) were almost equally represented. The mean age of the participants were 43.27 ± 16.62 years. Majority of the participants were degree graduates (51%). Majority of the households had 4 members. 61.5% had a dependent (person aged below 15 years or above 60 years) living with them. More than three-fourths (76.5%) of the participants belonged to upper middle (II) socio-economic class, as per modified kuppusamy socio-economic scale updated for 2020. In this study, 25% of the participants were from a rural background and 34.5% of the study participants were tenants and the remainder were owners. The mean duration of staying in this apartment was found to be 9.78 ± 6.504 years. No fire safety mock drill had been conducted in this apartment complex. None of the participants had done a fire risk assessment of their home. Majority of the residents had fair knowledge (53%), attitude (89%) and practice (77.5%) regarding fire safety. Significant association was found between presence of dependents, urban back ground, ownership status and knowledge regarding fire safety. Significant association was found between socio-economic status, knowledge and attitude regarding fire safety. Significant association was found between attitude, knowledge and practices regarding fire safety. No significant associations were found between age, gender, education qualification, socio-economic class and knowledge regarding fire safety.

CONCLUSION : The majority of the participants had a fair knowledge, attitude and practice. Fire safety mock drills and fire risk assessment had never been conducted in this apartment, hence one such mock drill can be conducted to improve the individual perceptions regarding fire safety in residences.

KEYWORDS : Apartment residents, fire, safety, knowledge, attitude, practice.

INTRODUCTION

Fire is produced by burning combustible material with evolution of light, heat and is accompanied by flame.[1] In domestic settings, fire is mainly used to cook food and heat water.

Currently, over half of the world's population live in urban areas, which is expected to rise to two-thirds by 2050. This global trend signals an increasing number of urban disasters. Sustained growth in urban areas is leading to higher concentrations of high-rise residential and commercial buildings, and an amplified risk to people living and working in these buildings in the event of an emergency.[2] Fire in such buildings either commercial or residential often involves more than one unit. Many building occupants may be affected. [3]

An accidental fire is a mishap that could be either man made or natural. It can incur physical and economical losses.

Most people spend at least one quarter of their lives in their residence, practicing several kinds of activities that carries potential risk for accidental fires. The most common cause of residential fires is cooking fire. In most cooking fires, the ignition occurred due to the presence of flammable cooking oil, which could contribute rapidly to fire propagation. Electrical equipment and installations can

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also cause residential fires due to malfunctions, failures and lack of maintenance of electrical systems.[4]

Apart from these causes fire can also be caused by certain behaviours like indoor smoking, storage of combustibles and flammables near heat sources and poor housekeeping practices.

As per data from Tamil Nadu Fire and Rescue Services, during the year 2018, there were 22,601 fire accidents in Tamil Nadu. This accounted for loss of 36 lives and property loss amounting to 58.83 crore rupees. [5]

Fire safety can be defined as the set of practices to prevent or avert occurrence of fire and manage growth and effects of accidental or intentional fires while keeping resulting losses to an acceptable level.[6] By practicing simple fire safety tips, one can reduce the chances of experiencing a fire and subsequent injury or death.[7]

In this study, the knowledge, attitude and practices of apartment residents with respect to fire safety was assessed.

JUSTIFICATION

Fire is always unexpected. The dense nature of apartment buildings allows for the increased spread of smoke, heat, and fire. Responding to a fire needs fast decisions and actions in an environment that can be loud, smoky, dark, and hot. Lives and property can be saved by being prepared before fire strikes. Most of the studies conducted in different settings are on infrastructure preparedness. However, there is no study on the level of awareness and knowledge regarding fire safety among apartment residents in Chennai. Hence, in this study an attempt was made to gain an idea about the existing knowledge, attitude and practices of fire safety among apartment residents in Chennai.

OBJECTIVES

1. To assess the knowledge, attitude and practices of fire safety among apartment residents of Chennai.
2. To determine the factors influencing the knowledge, attitude and practices regarding fire safety among apartment residents of Chennai.

METHODOLOGY

A community based cross-sectional study was carried out during the period from September to November 2021 among residents of an apartment complex in Chennai city. This study was carried out after getting ethical clearance from the Institutional Ethics Committee of Madras Medical College, Chennai. The sample size was calculated from a previous study, with 87.13% having correct fire safety practices. 8 The sample size was calculated using the formula (N = 3.84PQ/d2) with α being at 5% significance level, 5% absolute precision, which gives sample size of 172, considering a non-response rate of 10% the sample size was calculated to be 189 and rounded of to 200.

Out of the cities in Tamilnadu, Chennai was selected by simple random sampling method. Of the 15 zones in Chennai, Zone 7 (Ambattur) was selected by simple random sampling. Of the wards 79 to 93 under Zone 7 (Division 93) was selected. From the list of residential apartments in Division 93, DABC Sahithyam apartment was chosen. The residents who were above 18 years of age and staying in the apartment for 1 year or longer were included in the study. Residents less than 18 years of age were not included in the study.

Pretested, semi-structured, self-administered questionnaire was used for data collection. The residents were visited at their doorstep and explained in detail about the study and rapport was established. Informed consent was obtained and questionnaire form was distributed. Participants were assured of the confidentiality of their data. Participants were asked to fill their responses in the form and a contact number was provided to them to clarify their doubts. The filled questionnaires were collected the next day. Those participants who did not find time to fill the forms by the first day were given one more day and were requested to fill the questionnaire.

Data was collected using a pretested, semi-structured, self-administered questionnaire, which had five parts.

- Part I – Comprises of questions related to the socio-demographic profile of the participants.
- Part II – Comprises of questions related to the basic details of the participants.
- Part III - Comprises of 11 questions related to knowledge. Every correct answer was awarded with one mark and wrong answer was awarded with zero mark. The total score of knowledge related questions were 11.
- Part IV - Comprises of 9 questions related to attitude. One mark was awarded to each response agreeing with the statement and zero mark was awarded for response disagreeing with or having no idea related to the statement. The total score of the attitude related questions were 9.
- Part V - Comprises of 10 questions related to fire safety practice. One mark was awarded for each response of positive practice and zero mark was awarded for each negative practice. Total score of the practice related questions were 10.

The knowledge, attitude and practice scores were assessed as good (>mean+SD), fair (mean-SD to mean+SD) and poor

(<mean-SD).

The collected data was entered in Microsoft Excel and analysed using SPSS version 16. Descriptive statistics such as proportions, mean and standard deviation were used. Inferential statistics such as chi-square test was used. P-value <0.005 was considered significant. Pie-chart and tables were used to express data where necessary.

RESULTS

200 apartment residents participated in this community based cross sectional study. Males (52%) and females (48%) were almost equally represented (Figure 1). Majority of the participants (30.5%) were below 30 years of age. (Table 1) The mean age of the participants were 43.27 ± 16.62 years, the eldest participant was 80 years old. Majority of the participants were degree graduates (51%) followed by post graduates (25%) and higher secondary school graduates (21%). Majority of the households had 4 occupants. 61.5% had a dependent (person aged below 15 years or above 60 years) living with them. More than three-fourths (76.5%) of the participants belonged to upper middle (II) socio-economic class, as per modified kuppusamy socio-economic scale updated for 2020. 25% of the participants were from a rural background. None of the participants were physically challenged. 34.5% of the study participants were tenants and the remainder were owners. The mean duration of staying in this apartment was found to be 9.78 ± 6.504 years. No fire safety mock drill had been conducted in this apartment complex. 39 (19.5%) of the study participants had participated in a fire safety mock drill elsewhere, of which 71.79% had participated in such drills at their work place (Table 2). None of the participants had done a fire risk assessment of their home. 45% of the study participants were of the opinion that owner, tenant, flat owners association and government regulatory body were responsible for the fire safety of the apartment.

Table 1. Age wise distribution of the study participants

S. No.	Age category	Frequency	Percentage
1	18 to 30 years	61	30.5%
2	31 to 40 years	30	15%
3	41 to 50 years	36	18%
4	51 to 60 years	38	19%
5	61 to 70 years	25	12.5%
6	71 to 80 years	10	5%
7	Total	200	100%

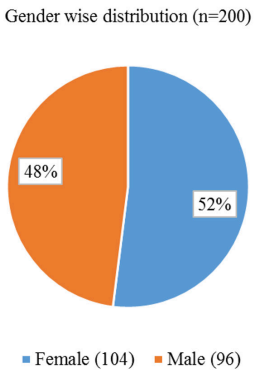

Figure 1. Gender wise distribution of the study participants

Table 2. Demographic characteristics and basic details

S. No.	Demographic Characteristic and basic details		Frequency (n=200)	Percentage
1	Educational status	Degree	102	51%
		Diploma	3	1.5%
		High School	3	1.5%
		Higher Secondary School	42	21%
		Post graduate	50	25%
2	Dependents	Present	123	61.5%
		Absent	77	38.5%
3	Socio-economic class	Upper class (I)	45	22.5%
		Upper middle class (II)	153	76.5%
		Lower middle class (III)	2	1%
4	Background/Nativity	Urban	150	75%
		Rural	50	25%
5	Ownership	Owner	131	65.5%
		Tenant	69	34.5%
6	Participated in a fire mock drill elsewhere	Participated	39	19.5%
		Not participated	161	80.5%

There were 11 questions regarding knowledge on fire safety. 79.5% were aware of the fire service emergency contact number. 84.5% had knowledge that pouring water on electrical or oil fires will be dangerous. Three-fourths (75%) of the participants were aware that different types of fire extinguishers are needed for fires from different sources. 79.5% had knowledge that fire produces gases which can causes drowsiness. 94% were aware that staircase is best means to evacuate in case of a fire accident. 85% had knowledge that an accidental fire can affect multiple units in an apartment. 71.5% answered that if an accidental fire originates in a room, the room must be closed after evacuating all the occupants. 71.5% answered that its necessary to crawl low to avoid smoke. 60% felt that rapid evacuation is a limitation in high rise buildings. 99% answered correctly that windows and doors must be opened to ventilate the room in case of a gas leak. 93.5% were aware about the presence of a fire station in the neighbourhood. (Table 3) The mean score obtained by the study participants was found to be 8.93 ± 1.817. Among the study participants 53% had a fair knowledge regarding fire safety (Table 4).

Table 3. Knowledge regarding fire safety

S. No.	Knowledge based questions	Yes	No	Do not know
1	101 is the fire department emergency contact number.	159 (79.5%)	7 (3.5%)	34 (17%)
2	Pouring water on electrical or oil fires will be dangerous.	169 (84.5%)	22 (11%)	9 (4.5%)
3	Fires originating from different sources need different types of fire extinguishers?	150 (75%)	31 (15.5%)	19 (9.5%)
4	Fire produces gases that can make you drowsy.	159 (79.5%)	7 (3.5%)	34 (17%)
5	In case of a fire accident in high rise buildings, using staircase is the best means to escape.	188 (94%)	8 (4%)	4 (2%)
6	Accidental fire in an apartment can affect more than one unit.	170 (85%)	30 (15%)	0
7	If a fire starts in your room, after all the people in the room had been evacuated, the door must be closed to prevent rapid spread of fire.	143 (71.5%)	20 (10%)	37 (18.5%)
8	In case of an accidental fire, one must crawl low when escaping to avoid smoke.	143 (71.5%)	24 (12%)	33 (16.5%)
9	In case of fire accidents, total evacuation is a limitation in high rise buildings.	120 (60%)	26 (13%)	54 (27%)
10	In case you suspect gas leak, the room must be ventilated by opening all the windows and doors and not by turning on the Fan/Exhaust fan.	198 (99%)	0	2 (1%)
11	Is there a fire station in Mogappair?	187 (93.5%)	2 (1%)	11 (5.5%)

Table 4. Knowledge score category

S. No.	Knowledge score category	Frequency	Percentage
1	Good	48	(24%)
2	Fair	106	(53%)
3	Poor	46	(23%)
4	Total	200	100%

Table 5. Attitude related to fire safety

S. No.	Attitude related questions	Agree	No idea	Disagree
1	A fire accident can occur in a residential building.	184 (92%)	12 (6%)	4 (2%)
2	Every resident should know about do's and don'ts in case of fire emergency.	196 (98%)	4 (2%)	0
3	Every resident should be trained in fire prevention control.	195 (97.5%)	5 (2.5%)	0
4	Investing in fire prevention and control equipment, is definitely NOT a waste of money.	180 (90%)	13 (6.5%)	7 (3.5%)
5	Everyone should respond to fire alarm.	196 (98%)	4 (2%)	0
6	Everyone should know emergency telephone numbers.	194 (97%)	4 (2%)	2 (1%)
7	Everyone should actively participate in mock fire drills.	184 (92%)	15 (7.5%)	1 (0.5%)
8	In case of an accidental fire in the apartment, able residents should volunteer in rescue operations until professional help arrives?	199 (99.5%)	1 (0.5%)	0
9	Smoking indoors can be a potential hazard for accidental fires.	183 (91.5%)	17 (835%)	0

Table 6. Attitude score category

S. No.	Attitude score category	Frequency	Percentage
1	Good	0	(0%)
2	Fair	178	(89%)
3	Poor	22	(11%)
4	Total	200	100%

More than 90% of the participants agreed to all the questions regarding fire safety. (Table 5) The mean score obtained by the study participants was found to be 8.56 ± 0.878. Majority (89%) of the study participants had a fair attitude regarding fire safety practices. (Table 6)

Table 7. Practice related to fire safety

S. No.	Practice related questions	Yes	No
1	Do you have any fire safety inventory available?	23 (11.5%)	177 (88.5%)
2	Do you keep walkways, stairs and exits free from obstructions at all times?	167 (83.5%)	33 (16.5%)
3	Do you turn OFF the LPG cylinder regulator knob when not in use?	172 (86%)	28 (14%)
4	Do you regularly inspect the tubing connecting your LPG cylinder with your stove?	177 (88.5%)	23 (11.5%)
5	Do you keep things that can catch fire, such as dishtowels, paper or plastic bags, potholders, and curtains at least 3 feet away from the stove top?	184 (92%)	16 (8%)
6	Do you check the plugs and cables of your electrical appliances for fraying or other damage regularly?	178 (89%)	22 (11%)
7	Do you use splitters and plug more than one extension cord into a single wall outlet?	98 (49%)	102 (51%)
8	Do you make sure electrical appliances in house such as water heater, clothing irons, mixers, grinders etc. are turned off when not in use?	198 (99%)	2 (1%)
9	Do you regularly service or maintain the electrical appliances in your house?	171 (85.5%)	29 (14.5%)
10	Have you ever discussed with your family members about a fire escape plan?	43 (21.5%)	157 (78.5%)

Table 8. Practice score category

S. No.	Practice score category	Frequency	Percentage
1	Good	25	(12.5%)
2	Fair	155	(77.5%)
3	Poor	20	(10%)
4	Total	200	100%

Practice

88.5% of the participants did not have any fire safety inventory. 83.5% of them keep walkways, staircase and exits free from obstructions. 86% of the participants had a good practice of turning off the LPG cylinder regulator knob when not in use. 88.5% regularly inspected LPG tubing for damages. 92% do not keep any flammable things for 3 feet from the stove. 89% regularly check plugs and cables of electrical appliances for damages. 51% had a bad practice of using splitters to plug more than one extension cord in a single wall outlet. 99% make sure electrical appliances are switched off when not in use. 85.5% regularly service electrical appliances in their homes. 78.5% had not discussed with their family members regarding a fire escape plan (Table 7). The mean score obtained by the study participants was found to be 7.06 ± 1.334. Majority (77.5%) of the study participants had a fair attitude regarding fire safety practices. (Table 8)

Associations

Knowledge

Significant association was found between presence of dependents, urban back ground, ownership status and knowledge regarding fire safety (p-value < 0.05). (Table 9)

Table 9. Association between Socio-economic status and Attitude regarding fire safety practices.

		Knowledge			Total	p-value
		Good knowledge	Fair knowledge	Poor knowledge		
Presence of dependents	Yes	35 (28.5%)	67 (54.5%)	21 (17.1%)	123	**0.022**
	No	13 (16.9%)	39 (50.6%)	25 (32.5%)	77	
Back ground	Rural	22 (44%)	20 (40%)	8 (16%)	50	**0.001**
	Urban	26 (17.3%)	86 (57.3%)	38 (25.3%)	150	
Ownership status	Owner	35 (26.7%)	73 (55.7%)	23 (17.6%)	131	**0.037**
	Tenant	13 (18.8%)	33 (47.8%)	23 (33.3%)	69	

Attitude

Significant association was found between socio-economic status, knowledge and attitude regarding fire safety (p-value < 0.05). (Table 10)

Table 10. Association between Socio-economic status and Attitude regarding fire safety practices.

		Attitude		Total	p-value
		Fair attitude	Poor attitude		
Socio-economic status	Upper class (I)	45 (100%)	0	45	**0.022**
	Upper middle class (II)	131 (85.6%)	22 (14.4%)	153	
	Lower middle class (III)	2 (100%)	0	2	
Knowledge	Good knowledge	48 (100%)	0	48	**0.008**
	Fair knowledge	93 (87.7%)	13 (12.3%)	106	
	Poor knowledge	37 (80.4%)	9 (19.6%)	46	

Practice

Significant association was found between attitude, knowledge and practices regarding fire safety (p-value < 0.05). (Table 11)

Table 11. Association between attitude, knowledge and practices regarding fire safety practices.

		Practice			Total	p-value
		Good practice	Fair practice	Poor practice		
Attitude	Fair attitude	25 (14%)	133 (74.7%)	20 (11.2%)	178	**0.028**
	Poor attitude	0	22 (100%)	0	22	
Knowledge	Good knowledge	8 (16.7%)	34 (70.8%)	6 (12.5%)	48	**0.008**
	Fair knowledge	17 (16%)	82 (77.4%)	7 (6.6%)	106	
	Poor knowledge	0	39 (84.8%)	7 (15.2%)	46	

DISCUSSION

Fire has varied uses in residential and industrial settings. Fire is ubiquitously used by almost all households in cooking, during religious pooja, celebrations, as a source of light during electrical power failure, etc. Fire is an essential element, but it can become a danger when it occurs where it is not needed. An accidental fire can cause destructive and expensive damage to personnel and property. The knowledge, attitude and practices on fire safety, plays a major role in preventing and/or reducing these damages and losses.

In this study conducted among 200 apartment residents it was found that, majority of the residents had fair knowledge (53%), attitude (89%) and practice (77.5%) regarding fire safety, this was similar to a finding by Musigapong P et al. who found that most students in Thailand had fair knowledge (57.8%), attitude (64.8%) and practices (57%) towards fire safety and prevention. 9 Conversely, Kumara KAT et al. who conducted a study among government office workers reported that 7.4% had average knowledge on fire safety. [14] Mkharem M et al. reported that 80% had average knowledge regarding fire safety awareness. [15]

No fire safety mock drills were conducted, and only 19.5% had participated in a fire drill conducted elsewhere, this was almost similar to the finding by Musigapong P et al. who found that 18.8% students in Thailand had attended a fire mock drill and Kihila JM et al. where only 4.4 % had participated in a fire drill. [9, 10]

In this study, the level of knowledge was significantly associated with attitude (p-value <0.05) and the level of knowledge and attitude was significantly associated with practices (p-value <0.05), whereas Musigapong P et al. observed that only the level of knowledge was statistically significant association with attitude.[9] 71.5% of the participants in this study, answered correctly that one must crawl when escaping an accidental fire to avoid smoke, this finding was similar to a finding by Jaslow D where 72%

gave a similar answer. [11] In this study, 94% had the correct knowledge to avoid using elevator in case of an accidental fire, but, Zmud M et al. found that 73% of residential building occupants also gave a similar response. [12]

In this current study 79.5% knew the fire emergency number, as compared to Kulkarni RS et al. who conducted a study among healthcare workers who reported that only 27.72% knew the emergency fire number. 8 Kihila JM et al, reported that 81.5% were not aware of the fire emergency contact number. 10 Sravan Kumar Yeteru et al. who conducted study undergraduates, post graduates, teaching faculty in a dental college reported that only 50.4% knew the emergency contact number. [13] In the current study 98% participants agreed that everyone should know about the do's and don'ts in case of a fire emergency, similarly, Sravan Kumar Yeteru et al. found that 98.6% agreed to the same. [13]

The current study found that 97.5% participants agreed that everyone should be trained in fire prevention and control, similarly, Sravan Kumar Yeteru et al. found that 97% agreed to the same. [13] Kumara KAT et al. found that 97% agreed that fire safety and prevention should be taught to everyone. [14]

In this study, 90% agreed that it is not a waste of finances to invest in fire safety and prevention, similarly, Sravan Kumar Yeteru et al. reported that 83% answered that it was not a waste of finances to invest in fire safety and prevention.[13] No significant association was found between education level and knowledge of fire safety, in the current study, Sravan Kumar Yeteru et al. also reported a similar finding. 13 Kumara KAT et al. also reported that no significant associations were found between level of education, age and knowledge regarding fire safety. 14 In this study, 98% should respond to fire alarm, similarly, Kumara KAT et al reported that 95.8% should respond to fire alarm. [14] In this study, 97% agreed that they should know emergency contact number, similarly Kumara et al 95.7% reported that everyone should know emergency contact number. [14] In the current study 49% participants reported that they use splitters to plug more than one extension cord into a single wall outlet, whereas, Kumara et al reported that 19.3% respondents had a similar practice. [14]

In this study, 99.5% agreed that in case of a fire accident, all occupants should be involved in rescue till emergency services arrives. Mkharem M reported that 43.33% agreed to the same. [15] In this study, 84.5% participants knew that, water should not be used to put out an electrical fire, in a study conducted among health care professionals by Holla R et al., it was found that 61% gave a similar response. [16]

LIMITATIONS

Since, this study relied on self-reported responses, some participants could have given socially acceptable responses. Moreover, since there was time duration of more than 1 day between giving the questionnaire and collecting the forms, they had ample time to modify their answers. This study only covered a single apartment complex in the city and so the findings may not be generalised.

CONCLUSION

In this study conducted among 200 residents of an apartment complex in Chennai. Both the genders were almost equally represented. The majority of the participants had a fair knowledge, attitude and practice. Significant association was found between presence of dependents, urban back ground, ownership status and knowledge regarding fire safety. Significant association was found between socio-economic status, knowledge and attitude regarding fire safety. Significant association was found between attitude, knowledge and practices regarding fire safety. Nearly half of the participants had a bad practice of using splitters to plug multiple devices into a single wall outlet. Moreover majority felt that owners, tenants, flat owners association and government regulatory body all are responsible for fire safety and prevention in residential buildings.

RECOMMENDATIONS

Fire safety mock drills should be conducted at least once a year. Each individuals can do a fire risk assessment of their own homes to know where they are lacking and rectify the same. Fire safety inventory should be maintained by each family. Practice of using splitters to plug more than one extension cord into a single wall outlet should be avoided. Each family should discuss among their family members about a fire emergency preparedness and escape plan.

CONFLICT OF INTERESTS - Nil

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