Original Research Article

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20204351

A study on reported fire incidents in major hospitals of India

Shyam Siddharth Rao Patharla, Souri Reddy Pyreddy*, Shilpa N. Panthagani

Department of Hospital Administration, KIMS, Narketpally, Telangana, India

Received: 26 February 2020 Revised: 24 August 2020 Accepted: 28 August 2020

*Correspondence:

Dr. Souri Reddy Pyreddy,

E-mail: hosp.admin@kimsmedicalcollege.org

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: An uncontrolled fire is dangerous especially in the healthcare establishments as they frequently cater to the sick who often require assistance. We studied the various aspects of fire incidents that occurred in major Indian hospitals through media reports in the past decade (January 2010 to December 2019). It is our intention that this study would act as a reference to prioritize and stimulate research in hospital fire safety.

Methods: An extensive internet search was done for news reports/articles on fire incidents in major hospitals by mainstream media outlets. Major hospitals were those with more than 100 in-patient beds.

Results: 33 major fire incidents were reported during the defined period. The most common cause of fire was due to electrical short circuit 78% with air conditioners being the most common source. Functional firefighting systems were reported in 19 incidents. Fires originated at or near intensive care units (ICU's) in 10 instances. 72.72% accidents occurred at night (8:01 p.m. to 7:59 a.m.). Casualties were reported in 39% of the fire accidents.

Conclusions: The most common cause of fire accidents is electrical short circuit. Hospitals need to prioritize periodic testing of firefighting systems and regular training of staff on their use. Judicious placement of electrical equipment combined with oxygen monitoring devices in intensive care areas is recommended. Storage of flammable materials and placement of central gas supply points should be away from the vicinity of patient care areas and always in conjunction with robust fire detection and control methods. Hospitals should adhere to their planned capacity.

Keywords: Fire, Hospital fire, Fire accidents, Fire safety, Indian hospitals

INTRODUCTION

An accidental fire is a mishap that could be either manmade or natural. Accidental fire occurs frequently and can be controlled often; but may at times result in loss of life and property. India, just like any other country, has a history of fire accidents. The incident of fire and explosion at Bombay Dock on 14 April 1944 has become an inalienable part of its history. Annually, this day is observed as National Fire Service Day in the memory of 66 firemen who lost their lives while battling this devastating fire. Eight Indian cities with a high population density are vulnerable to man-made disasters as per an executive summary published by the integrated research and action for development. The Pan American Health

Organization (PAHO) and the World Health Organization (WHO) have defined a 'safe hospital' as one that "will not collapse in disasters, killing patients and staff; can continue to function and provide its services as a critical community facility when it is most needed; and organized, with contingency plans in place and health workforce trained to keep the network operational". To be safe, hospitals need to be designed for every eventuality. At the heart of it lies poor hospital design and lack of policy implementation. There is lack of awareness of safety at the national and the state level when such policies are planned.

"Fire is a good servant but a bad master", which implies that controlled fire is a necessity of life but uncontrolled fire is dangerous for both life and property. The fire

incident at AMRI Hospital in 2011 has highlighted the necessity of an articulate preparedness plan, which can minimize the loss of life and property.⁵

In order to prevent fire from occurring and to extinguish it successfully, an understanding of the chemical and physical characteristics of fire is important. Inputs and outputs of a fire (combustion reaction) is represented in Figure 1.

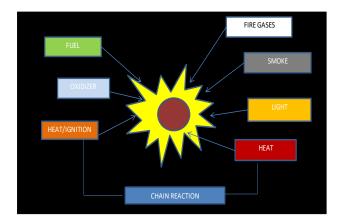


Figure 1: Inputs and outputs of fire.

The AERB monograph states that the combustion phenomena are of five types.1 They are- explosion: the rapid release of high-pressure gas into the environment, the main difference between a fire and an explosion is the rate at which energy is released; deflagration: burning of a gas or aerosol that is characterized by a combustion wave; detonation: the burning of a gas or aerosol characterized by a shock wave, the shock wave travels at a speed greater than the speed of sound, and the wave is characterized by very high pressure, which serves to create a heat source for igniting other combustibles; flashover: a fire in an enclosed area that fosters the buildup of heat, when the temperature reaches the ignition temperature of the majority of combustibles in the area, there is spontaneous combustion of the combustibles in the area and; backdraft; sometimes referred to as a smoke explosion because it is a fire in an enclosed area that consumes the oxygen supply and generated carbon monoxide and heat.

Presently there is no compiled reference of such fire accidents that have been reported in the Indian health care sector. It is our intention that this study would act as a reference to prioritize and stimulate research in hospital fire safety and help learn from past mistakes.

The aim of the research was to study the fire incidents that occurred in major Indian hospitals reported via various media outlets in the past decade (January 2010 – December 2019).

The objective was to enumerate the fire incidents that occurred in major hospitals in the past decade and to analyze the various aspects such as hospital attributes, details of the incident and extent of damage.

METHODS

The study design was a descriptive study which included an extensive internet search using the keywords "fire accidents", "fire tragedy" and "fire in Indian hospitals". News reports/articles by mainstream media outlets in English language which mentioned fire accidents in major hospitals across India and which were reported widely and extensively were included. A major hospital was defined as one with more than 100 in-patient beds for the purpose of this study. The study period was defined to include all fire incidents reported between January 2010 and December 2019. Information was entered into a spreadsheet and analyzed on hospital attributes, nature of the accident and extent of damage.

Statistical methods and tools

Mathematical summations, means and averages.

Study setting

Geographical location of India.

Inclusion criteria

All fire incidents reported by mainstream media/new media through websites/web pages. Multiple news reports of the same incident were also included.

Exclusion criteria

News reported on social media e.g. Facebook, Twitter and in clinics, nursing homes or hospitals with less than 100 inpatient-beds.

Data sources

Media/press article available on internet.

RESULTS

The details of fire incidents were compiled and tabulated as in Table 1.

A total of 33 fire incidents were reported online by mainstream media sources. A total of 131 fatalities were occurred in 8 of these incidents. 25 incidents were reported to have occurred in government owned establishments, 7 in private hospitals and 1 in a trust hospital. In 19 incidents occurred in hospitals which reported having functional firefighting measures. 7 fire incidents each were reported from states of West Bengal, Orissa and National Capital Region (NCR). West Bengal reported the highest number of hospital fire related deaths in the past decade (n=117); most of these were due to the AMRI hospital incident. The most common cause of fire was reported as due to electrical short circuit 78%. Air conditioners were the most common source of origin for short circuit.

Table 1: Major fire incidents reported in the past decade (2010-2019).

No.	Date	Hospital name	Govt./ pvt./ trust	Location of hospital	Time of incident	Location	Reported cause of fire	No. of people injured /dead	Functional status of existing firefighting systems, Additional fire tenders used	No. of patients shifted to nearby hospitals	Time taken till control achieved (hour)	Damage as reported
1.	2019 November 8	KEM hospital	Govt.	Mumbai, Maharashtra	Night	Pediatric ward	Short circuit	1 injured				
2.	2019 October 22	Shine Children's Hospital	Pvt.	Hyderabad, Telangana	Night	NICU 4 th floor	Short circuit from refrigerator	1 dead 4 injured				
3.	2019 September 27	North Bengal Medical College and Hospital	Govt.	Siliguri, West Bengal	Morning	Critical Care Unit		1 dead		9		
4.	2019 August 17	AIIMS	Govt.	New Delhi	Afternoon	Dispensary at ground floor	-	Nil	Functional, 34 fire tenders	_	6	-
5.	2019, May 10	SMS Hospital	Govt.	Jaipur, Rajasthan	Night	Medical shop in ground floor	Short circuit	Nil	12 fire tenders	125	4	
6.	2019 April 10	Lok Nayak Jai Prakash Narayan Hospital	Govt.	Central, Delhi	Night	First floor plastic surgery ward	-	-	4 fire tenders			
7.	2019, March 8	SCB Medical college and Hospital	Govt.	Cuttack, Orissa	Night	Pathology Department	Short circuit [AC were left on during the night]	Nil	Functional	_		Lab equipment's, crores worth of material were burnt, Complete department was destroyed
8.	2019 March 24	AIIMS Trauma Centre	Govt.	New Delhi	Afternoon	Ground floor (operation theatre)	Short circuit (leakage of oxygen supply pipe behind the manifold)	Nil	Functional, 24 fire tenders	50	2	- Continued.

No.	Date	Hospital name	Govt./ pvt./ trust	Location of hospital	Time of incident	Location	Reported cause of fire	No. of people injured /dead	Functional status of existing firefighting systems, Additional fire tenders used	No. of patients shifted to nearby hospitals	Time taken till control achieved (hour)	Damage as reported
9.	2019 February 27	SCB Medical college And Hospital,	Govt.	Cuttack, Orissa	Night	Main Operation Theatre of Surgery Departent	Short circuit	Nil	Functional	Nil		-
10.	2019, February 7	Metro Hospital and Heart Institute	Pvt.	Noida, Uttar Pradesh (NCR)	Morning	2 nd floor of the hospital [ICU]	Short circuit [water heater inside recovery area]	No	Non functional, 10 fire tenders	>40		-
11.	2019, February 2	Apollo Hospital	Pvt.	Bhubaneswar, Orissa	Morning	5 th floor battery room [ICU is present beside]	Short circuit	Nil	Non functional	26	1	-
12.	2019, January 23	Chhattisgar h Institute of Medical Sciences	Govt.	Bilaspur, Chattisgarh	Morning	Paediatric ward	Short circuit	3 people fainted (fire fighting employees)	Functional	40 children	40 mins	-
13.	2019, January 9	ESIC hospital	Govt.	Noida, Uttar Pradesh	Morning	Basement of 7 storey building		Nil	5 fire tenders	100120 people	2	
14.	2019, January 1	Geetanand Hospital	Govt.	Alwar, Rajasthan	Night	NICU	Oxygen pipeline linked to a radiant warmer	1 dead				
15.	2018 December 20	ESIC Kamgar Hospital	Govt.	Suburban Andheri, Mumbai, Maharashtra	Afternoon	Third/Fourt h floor	Short circuit [AC]	8 dead 145 injured incl. a firefighter	Non functional, 810 fire tenders	147	3	-

Continued.

No.	Date	Hospital name	Govt./ pvt./ trust	Location of hospital	Time of incident	Location	Reported cause of fire	No. of people injured /dead	Functional status of existing firefighting systems, Additional fire tenders used	No. of patients shifted to nearby hospitals	Time taken till control achieved (hour)	Damage as reported
16.	2018 December 31	Calcutta Medical College and Hospital	Govt.	Kolkata, West Bengal	Night	Second floor haemato- logy department	Short circuit in a refrigerator in haematology deptt.	Nil	Functional, 3 fire tenders	-	-	-
17.	2018 November 20	Chittaranjan National Cancer Institute	Govt.	South Kolkata, West Bengal	Afternoon	Genetic research wing [laboratory]	Short circuit [AC]	Nil	Functional, 3 fire tenders	_	1.5	-
18.	2018 November 12	Calcutta School of Tropical Medicine	Govt.	Calcutta, West Bengal	Morning	Ground floor	Short circuit [AC]	Nil	Non functional, 3 fire tenders	7	1.5	-
19.	2018, October3	Calcutta Medical College & Hospital	Govt.	Calcutta, West Bengal	Morning	Pharmacy [ground floor]	Short circuit	Nil	Functional, 10 fire tenders	250	1.5	Rs.5 crore worth medicines were damaged
20.	2018, September 14	Apollo Hospital, Jubilee Hills,	Pvt.	Hyderabad, Telangana	Morning	Cellar	Short circuit	Nil	Functional, 2 fire tenders	-	-	-
21.	2018 September 13	Safdarjung Hospital	Govt.	New Delhi	Morning	4 th floor [eye Operation Theatre] in new OPD	Overheating of chemical [spirit]	3 injured	Functional, 7 fire tenders	-	0.5	No damage
22.	2017 July16	Trauma Center, King George Medical University	Govt.	Lucknow , Uttar Pradesh	Afternoon	Second floor [Disaster managemen t ward]	Short circuit	Nil	Functional	250	3	Continued.

No.	Date	Hospital name	Govt./ pvt./ trust	Location of hospital	Time of incident	Location	Reported cause of fire	No. of people injured /dead	Functional status of existing firefighting systems, Additional fire tenders used	No. of patients shifted to nearby hospitals	Time taken till control achieved (hour)	Damage as reported
23.	2016 October 18	SUM Hospital ,Shiksha 'O' Anusandha n Univ.	Govt.	Bhubaneswar, Orissa	Afternoon	First floor [dialysis] Spread to near by ICU	Short circuit	22 dead, 120 injured	Functional, 7 fire tenders	_	_	_
24.	2016 September 21	Safdarjung Hospital	Govt.	New Delhi	Afternoon	Ground floor, near Casuality	Short circuit from meter box	Nil	Functional, 4 fire tenders	Nil	few minutes	-
25.	2016 May 31	SCB Medical College	Govt.	Cuttack, Orissa	Afternoon	2 nd floor Duty room [cardiac wing] 5 stored building	Short circuit [AC]	Nil	Functional, 3 fire tenders	104	0.5	-
26.	2016 August 27	Murshidaba d Medical College Hospital	Govt.	Baharampur, West Bengal	Morning	Second floor [ward]	Short circuit [AC]	3 dead , 50 injured	Nonfunctional	-	-	-
27.	2015 November 29	Sardar Vallabhai Patel Postgraduat e Institute of Pediatrics (Sishu bhawan)	Govt.	Cuttack, Orissa	_	Neonatal Intensive Care Unit (NICU)	Short circuit [Electrical warmer]	nil	Functional	22 newborns		Medical equipment other infrastructure in NICU
28.	2015 October16	Acharya Harihar Regional Cancer Centre	Govt.	Cuttack, Orissa	Afternoon	3 rd floor [Store Room], operation theatre	Short circuit [AC]	1 dead	Non functional, 4 fire tenders	80		– Continued.

Patharla SSR et al. Int J Community Med Public Health. 2020 Oct;7(10):3896-3906

No.	Date	Hospital name	Govt./ pvt./ trust	Location of hospital	Time of incident	Location	Reported cause of fire	No. of people injured /dead	Functional status of existing firefighting systems, Additional fire tenders used	No. of patients shifted to nearby hospitals	Time taken till control achieved (hour)	Damage as reported
29.	2015 September 19	Surana Sethia Hospital	Trust	Chembur, Mumbai	Afternoon	[ICU] 5 th floor	Short circuit [AC]	Nil	Functional, 4 fire engine 3 tankers 2 special fire appliances	48	2	-
30.	2013 January 13	PBM	Govt.	Bikaner, Rajasthan	Morning	ICU	Short circuit [AC]	3 injured	Functional, 2 fire tenders	107 children	few minutes	_
31.	2012 May 26	Medi Point Hospital	Pvt.	Aundh, Pune, Maharashtra	Morning	3 rd floor [store room located on the terrace]	Short circuit	Nil	Functional, 3 fire tenders, 2 water tankers	36	45 min	Rs.1.5 lakh worth documents
32.	2011 December 9	AMRI Hospital	Pvt.	Kolkata, West Bengal	Night	Basement	Flammable materials	90 dead	Functional, 28 fire tenders and 3 sky lifts	70	5	_
33.	2010 February 2	Park Super Specialty Hospital	Pvt.	Hyderabad,Te langana	Morning	Ground floor	Short circuit	43 injured	Non functional	42	2	_

Other causes of the fire incident such as overheating of chemicals (spirit), storage of flammable materials in the basement and materials used in renovation of the building constituted 9%. In the remaining 13% incidents, no specific cause was reported. 39.39% of the accidents occurred during morning hours (8:00 a.m. to 2:00 p.m.); 33.33% during afternoon (2:01 p.m. to 8:00 p.m.) and 72.72% at night (8:01 p.m. to 7:59 a.m.). Causalities were reported in 39% incidents. Based on the nature of reported casualties these were further classified as: only injuries (15%), only deaths (12%) and; both deaths and injuries (12%). Non-functional firefighting systems were reported in 4 government and 3 private hospitals. In 10 incidents fires originated from within or nearby intensive care areas (ICU's). More than a hundred patients had to be evacuated to nearby hospitals in more than 7 incidents. In more than 9 instances control over the fire was achieved beyond 2

DISCUSSION

The major fire accident which occurred in AMRI Hospital in the year 2010 was a watershed moment in fire safety among hospitals.⁵ It has since become infamous for having the single largest number of casualities (n=94) reported from any hospital fire in India. Multiple lapses were reported in the management of this disaster. Combustible items like empty and full liquefied petroleum gas (LPG) cylinders, rejected mattresses, wooden boxes and diesel for the generators were being stored in the basement which acted as fuel.³⁷ However, the fire did not spread to the other levels and was confined to the basement only. The fire detection and alarm systems were reportedly switched off as a routine practice rendering them ineffective. As the hospital was centrally air-conditioned, the smoke started billowing out of the basement and spread fast to all the floors through the air-conditioning duct.

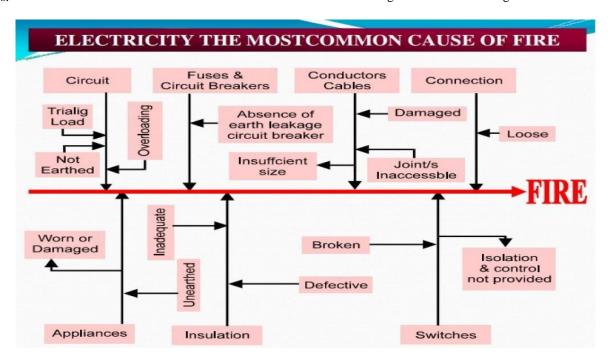


Figure 2: Fishbone diagram showing short circuit as a cause for fire.

Power cut in response to the fire turned the floors above into smoke chambers. This effect was magnified due to the glass facade of the centrally air conditioned hospital with unopenable windows causing poor ventilation of smoke. This was attributed to the main reason behind increased number of casualties.⁵

Multiple fire incidents had occurred in SCB Medical College and Hospital, Cuttack. The first one being in 2016 and others during a period of three consecutive months in 2019. Other hospitals similar to SCB Medical College such as Calcutta Medical College, Kolkata and Sardar Vallabhai Patel Postgraduate Institute of Pediatrics (Sishubhavan), Cuttack suffered huge losses due to fire incidents that destroyed equipment, infrastructure and medicines worth millions of rupees. All these institutions were reported as

having functional firefighting systems. It could be inferred that staff were unaware of the fire policy and were poorly trained. In a study conducted in Maharashtra, 83.3% respondents reported a lack of awareness of fire service preparedness policy of their hospital and it was concluded that the availability of firefighting equipment did not correspond to staff knowledge of its use.³⁹ Fires frequently started as an electrical short circuit which was accentuated by the presence of flammable materials stored in areas such as labs, operation theatres and intensive care areas (n=15). Electric short circuit as the most common source of fire is graphically represented as a cause and effect diagram (Ishikawa diagram) in Figure 2. The presence of oxygen rich environment especially in ICU's and operating rooms reduces the amount of ignition energy required to initiate fires. Split air conditioners in ICU's should not be placed above the patients bed where the oxygen concentration is expected to be high (above 23.5%).⁴⁰ In a significant number of the incidents (n=19) fire could not be controlled by existing firefighting systems which were reported to be functional. Further, in 21 incidents additional firefighting equipment was pressed into service. This indicates that these hospitals did not conduct fire safety audits. Though there were fire incidents where no casualities were reported, expensive equipment and a number of important documents were destroyed.

It took more than 2 hours to achieve fire control in 9 incidents and that all of them occurred in big cities is further evidence that our cities ate truly 'at risk' of fire related disasters.⁵ Instead, internal fire control measures should be strengthened. In more than 100 patients were evacuated to nearby hospitals in 5 fire incidents underscoring the need to maintain buffer capacity in surrounding hospitals. This should be made mandatory during the grant of hospital license. Dr. R. K. Dave former senior specialist on policy and plans, National Disaster Management Authority in an interview had remaked: "at any given time, hospital gadgets consume 5-10 times of the permissible electricity usage and it is estimated that the load goes up nearly 25% annually. No hospital or authority ever estimates correctly, at the time of licensing, the number of patients it will get, how many machines it will have to install, and the required safety checks. This situation is worse in government and private hospitals where the sheer number of people overwhelm the resources every minute, every single day".4

Limitation

Fire incidents which may have occurred but were not reported by mainstream media and by news agencies which do not have internet presence may have been overlooked. Reports published in printed newspapers and news reports in vernacular language were not included due to logistical reasons and language barrier respectively.

CONCLUSION

Hospital fires are disruptive in terms of threat to life, damage to property and interruption of services. People losing their lives at a place which is supposed to be a beacon of health is a tragic phenomenon. The consequences are economically and socially disastrous. Our study showed that electrical short circuit is the most common cause for fire. Simple measures such as judicious placement of electrical devices (particularly air conditioners) and monitoring equipment in oxygen rich areas is the need of the hour. Safety audits should be conducted on periodical basis to check the functioning of firefighting equipment Training programs dissemination of fire preparedness policy among staff members should be given priority. Internal fire control systems need to be strengthened and buffer capacity is to be ensured. Flammable materials should be stored away from the patient care areas, never in the basement and always in conjunction with robust fire detection and control systems. Hospitals, especially in the government sector, should strictly adhere to their planned capacity both in terms of physical space as well as energy needs. It is the responsibility of every healthcare establishment to ensure that fire safety standards and regulations are followed to prevent fire accidents and the consequent human suffering.

Funding: No funding sources Conflict of interest: None declared Ethical approval: Not required

REFERENCES

- 1. Fire safety A monograph. Atomic Energy Regulatory Board. 2019. Available at: https://aerb.gov.in/images/pdf/fire.pdf. Accessed on: 24 January 2020.
- Parikh J, Jindal P, Sandal G. Climate Resilient Urban Development: Vulnerability Profiles of 20 Indian Cities. New Delhi: COE-IRADe. 2013. Available from:
 - https://irade.org/Executive%20Summary_RF.pdf. Accessed on: 20 May 2020.
- National Guidelines for Hospital Safety. National Disaster Management Authority, GoI. 2016. Available at: https://ndma.gov.in/images/guidelines/Guidelines-Hospital-Safety.pdf. Accessed on: 24 January 2020.
- 4. Hospital fires human-made disaster? India fails to learn lessons from past mistakes, most critical facilities ignore safety norms. Firstpost. 2018. Available at: https://www.firstpost.com/india/hospital-fires-human-made-disaster-india-fails-to-learn-lessons-from-past-mistakes-most-critical-facilities-ignore-safety-norms-5756481.html. Accessed on: 24 January 2020.
- 5. Pal Indrajit, Gosh Tuhin. Fire incident at AMRI Hospital, Kolkata (India): A real time assessment for urban fire. JBM SSR. 2014;3(1):9-13.
- 2-month-old boy, who suffered burn injuries in Mumbai Hospital fire, dies. PTI. 2019. Available at: https://www.ndtv.com/mumbai-news/2-month-oldboy-prince-rajbhar-who-suffered-burn-injuries-inmumbais-kem-hospital-fire-dies-2136642. Accessed on: 24 January 2020.
- Sudhir U. Baby electrocuted inside incubator after fire at hospital in Hyderabad. NDTV. 2019. Available at: https://www.ndtv.com/hyderabad-news/babydies-in-incubator-after-fire-breaks-out-at-hospitalin-hyderabad-2120219. Accessed on: 24 January 2020
- 8. Bhasin S. One killed as major fire breaks out at Hospital in Siliguri. NDTV. 2019. Available at: https://www.ndtv.com/cities/one-killed-as-major-fire-breaks-out-at-hospital-in-siliguri-2108192. Accessed on: 24 January 2020.
- Fire breaks out at AIIMS Delhi due to short circuit;
 34 tenders rush to the spot Business Today. 2019.
 Available at:

- https://www.businesstoday.in/latest/trends/breaking-fire-breaks-out-at-aiims-delhi/story/373221. Accessed on: 24 January 2020.
- PTI. Patient suffocated to death in major fire at Jaipur hospital. NDTV. 2019. Available from: https://www.ndtv.com/jaipur-news/patientsuffocated-to-death-in-major-fire-at-jaipur-hospitalsays-family-2035719. Accessed on: 24 January 2020.
- PTI. Fire breaks out at Hospital ward in Delhi, 4 fire engines on spot. 2019. Available at: https://www.ndtv.com/delhi-news/fire-breaks-outat-lok-nayak-jai-prakash-narayan-hospital-ward-indelhi-4-fire-engines-on-spot-2021175. Accessed on: 24 January 2020.
- Saswat S. Fire breaks out at SCB Hospital in Cuttack, property worth crores gutted. Odisha TV. 2019. Available from: https://odishatv.in/odisha/fire-breaks-out-at-scb-hospital-in-cuttack-property-worth-crores-gutted-357020. Accessed on: 24 January 2020.
- PTI. Fire breaks out at AIIMS Trauma centre. The Hindu Bussiness Line. 2019. Available at: https://www.thehindubusinessline.com/news/firebreaks-out-at-aiims-traumacentre/article26627013.ece. Accessed on: 24 January 2020.
- 14. Shambad English Bureau. Fire breaks out at SCB hospital. Sambad English. 2019. Available at: https://sambadenglish.com/odisha-fire-breaks-out-at-scb-hospital/. Accessed on: 24 January 2020.
- 15. TOI. Fire breaks out in Metro Noida Hospital; no casualties reported. The Times of India. 2019. Available at: https://economictimes.indiatimes.com/news/politics-and-nation/massive-fire-at-metro-hospital-noida-over-two-dozen-patients trapped/articleshow/67881060.cms. Accessed on: 24 January 2020.
- 16. Hemanta P. Fire in Bhubaneswar's Apollo Hospital creates panic. The Times of India. 2019. Available from: http://timesofindia.indiatimes.com/article show/67809053.cms?utm_source=contentofinterest &utm_medium=text&utm_campaign=cppst. Accessed on: 24 January 2020.
- 17. PTI. Fire at Chhattisgarh Hospital, 3 employees faint due to suffocation. NDTV. 2019. Available from: https://www.ndtv.com/cities/fire-at-chhattisgarh-hospital-3-employees-faint-due-to-suffocation-1981799. Accessed on: 24 January 2020.
- Nair A. Fire breaks out at Hospital in Noida near Delhi, no reports of injuries. NDTV. 2019. Available from: https://www.ndtv.com/india-news/fire-breaksout-at-hospital-in-noida-near-delhi-no-reports-ofinjuries-2161091. Accessed on: 24 January 2020.
- 19. Infant dies in Rajasthan hospital fire, 2 doctors, 4 staffers suspended. PTI. 2019. Available at: https://www.ndtv.com/india-news/infant-dies-in-rajasthan-hospital-fire-2-doctors-4-staffers-suspended-2157413. Accessed on: 24 January 2020.
- 20. Mumbai fire: six-month old among 8 deceased at ESIC Kamgar Hospital in Andheri. Business Today.

- 2018. Available at: https://www.businesstoday.in/current/economy-politics/mumbai-fire-six-month-old-among-8-deceased-esic-kamgar-hospital-andheri/story/301792.html. Accessed on: 24 January 2020
- 21. Fire in Kolkata's Calcutta Medical College and Hospital; fourth incident in 3 months. Hindustan times. 2018. Available at: https://www.hindustan times.com/india-news/fire-in-kolkata-s-calcutta-medical-college-and-hospital-fourth-incident-in-3-months/story-emfttaizolzudjksjlzvkj.htm. Accessed on: 24 January 2020.
- Fire breaks out at Chittaranjan National Cancer Institute, none hurt. Millennium post. 2018. Available at: http://www.millenniumpost.in/delhi/ fire-breaks-out-at-chittaranjan-national-cancerinstitute-none-hurt-328251. Accessed on: 24 January 2020.
- 23. Fire in CCU at school of tropical medicine. The Times of India. 2018. Available at: http://timesofindia.indiatimes.com/articleshow/6660 0207.cms?utm_source=contentofinterest&utm_medi um=text&utm_campaign=cppst. Accessed on: 24 January 2020.
- 24. Ghosh D. Kolkata medical college pharmacy catches fire; 10 fire tenders at spot. The Times of India. 2018. Available at: http://timesofindia.indiatimes.com/articleshow/66049314.cms?utm_source=contentofin terest&utm_medium=text&utm_campaign=cppst. Accessed on: 24 January 2020.
- 25. Roja M. Fire breaks out at Apollo Hospitals in Jubilee Hills. The Hans India. 2018. Available at: https://www.thehansindia.com/posts/index/latest-news/2018-09-14/hyderabad-fire-breaks-out-at-apollo-hospitals-in-jubilee-hills/411824. Accessed on: 24 January 2020.
- Fire at Safdarjung Hospital's operation theatre, three injured. Hindustan Times. 2018. Available on: https://www.hindustantimes.com/delhi-news/fire-atsafdarjung-hospital-s-operation-theatre-threeinjured/story-hbwavltcclnoposff79jzk.html. Accessed on: 24 January 2020.
- 27. Major fire in KGMU, trauma centre hit. The Times of India. 2017. Available at: http://timesofindia.indiatimes.com/articleshow/5961 4001.cms?utm_source=contentofinterest&utm_medi um=text&utm_campaign=cppst. Accessed on: 24 January 2020.
- 28. Bhubaneshwar fire mishap: medical facility at Hospital sealed. The New India express. 2016. Available at: https://www.newindianexpress.com/states/odisha/2016/oct/18/bhubaneshwar-fire-mishap-medical-facility-at-hospital-sealed-1529205.html?pm=179. Accessed on: 24 January 2020.
- 29. PTI. Minor fire breaks out at safdarjung hospital; no casualties reported. Firstpost. 2016. Available at: https://www.firstpost.com/india/minor-fire-breaks-out-at-safdarjung-hospital-no-casualties-reported-3014472.html. Accessed on: 24 January 2020.

- Sharma V. Fire at SCB, safety on sickbed. Telegraph India. 2016. Available at: https://www.telegraphindia.com/states/odisha/fire-at-scb-safety-onsickbed/cid/1506112. Accessed on: 24 January 2020.
- 31. ANI. Mamata Banerjee orders probe in Murshidabad fire tragedy. Bussiness Standard. 2016. Available at: https://www.business-standard.com/article/news-ani/mamata-banerjee-orders-probe-in-murshidabad-fire-tragedy-116082700522_1.html. Accessed on: 24 January 2020.
- 32. Jaiswal B. Fire at Cuttack's Sishu Bhawan. The Times of India. 2015. Available at: http://timesofindia. indiatimes.com/articleshow/49968962.cms?utm_sou rce=contentofinterest&utm_medium=text&utm_cam paign=cppst. Accessed on: 24 January 2020.
- 33. Das A. Minor killed in fire mishap at Odisha Hospital. Sambadenglish. 2015. Available at: https://sambadenglish.com/minor-killed-in-fire-mishap-at-odisha-hospital/. Accessed on: 24 January 2020.
- Sadaguru P, Ranjeet J. Fire at Chembur Hospital: Patients find safe haven in chapel. Mid-day. 2015. Available at: https://www.mid-day.com/articles/fire-at-chembur-hospital-patients-find-safe-haven-in-chapel/16547190. Accessed on: 24 January 2020.
- Chhajer LK. Close shave for 100 kids in Bikaner hospital fire. The Times of India. 2013. Available at: http://timesofindia.indiatimes.com/articleshow/1801 2306.cms?utm_source=contentofinterest&utm_medi

- um=text&utm_campaign=cppst. Accessed on: 24 January 2020.
- 36. Fire guts Aundh Hospital's storeroom on terrace. The Times of India. 2012. Available at: https://timesofindia.indiatimes.com/city/pune/fire-guts-aundh-hospitals-storeroom-on-terrace-in/articleshow/13540747.cms. Accessed on: 24 January 2020.
- 37. 94 people die as private hospital in India burns. The New York Times. 2011. Available at: https://www.nytimes.com/2011/12/10/world/india-hospital-fire-kolkata-west-bengal.html. Accessed on: 24 February 2020.
- 38. Srinivas M. 43 injured in city Hospital fire. The Hindu. 2010. Available at: https://www.thehindu.com/news/cities/hyderabad/43-injured-in-city-hospital-fire/article16811830.ece. Accessed on: 24 January 2020.
- 39. Kulkarni RS, Giri PA, Gangwal PR. Int J Community Med Public Health. 2016;3(7):1900-4.
- Chowdhury K. Fires in Indian hospitals: root cause analysis and recommendations for their prevention. J Clin Anesth. 2014;26:414-24.

Cite this article as: Patharla SSR, Pyreddy SR, Panthagani SN. A study on reported fire incidents in major hospitals of India. Int J Community Med Public Health 2020;7:3896-906.