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Investigation of Fires Occuring in Hospitals Between 2019-2023 in Türkiye: A Content Analysis

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Abstract

Fires are one of the most important dangers for hospital buildings. The aim of the study is to examine the hospital fires occurred between 2019-2023 in Türkiye. In the study, fires in public and private hospitals operating in Türkiye between 2019 and 2023 were examined. In this cross-sectional study, news about fires in hospitals in Türkiye were obtained from the archives of 7 national and 3 local news agencies using the search terms "fire" and "hospital" in Turkish. The content analysis was used to evaluate news texts. Out of a total of 76 hospital fires, 3 resulted in deaths caused by fire, leading to a total of 16 patient fatalities. Additionally, in all fires, a total of 99 individuals, including both patients and employees, required medical treatment due to the fire. In 19 of the fires, patients had to be evacuated due to exposure to either flames or smoke. The highest number of hospital fires occured in İstanbul. While the cause of 28 fires remains unknown, 27 fires were caused by electricity. Hospitals should prioritize fire prevention measures due to the potential losses and difficulties in evacuation. Regular checks of the hospital's electrical installations and devices should be carried out, as well as capacity assessments for new devices and expansions of the building. It is also recommended to keep emergency and disaster plans and teams updated for possible fire situations, increase employee knowledge, and conduct drills.

Keywords: Fires, Hospital, Hospital Management, Patient Safety

1. INTRODUCTION

Hospitals play a crucial role in providing healthcare services under normal and emergency situations (Sahebi et al., 2021a). As one of the most important healthcare organizations, they offer outpatient or inpatient healthcare services to people in need. However, despite being designed to be robust for many years, hospitals are exposed to various natural or man-made hazards over time (Ebekozien et al., 2020). Of these hazards, fire is one of the most significant (Çelik and Yıldız, 2021).

Hospitals are large and complex buildings that differ from other buildings in terms of their characteristics (Mete et al., 2020). Due to the limitations of urban areas, they are usually built with multiple floors and functions to accommodate high human density (Huang et al., 2019). Hospitals use many technological tools and electrical devices, but are also susceptible to hazards, especially fire, due to the presence of risky units such as kitchens, chemical units, gas tanks, medical waste storage areas, laboratories, pharmacies, intensive care units, and high-pressure areas (Tosun and Yılmaz, 2022; Yıldız and Çelik, 2020). As a result, hospitals are classified as "very hazardous workplaces" in the Communiqué on Workplace Hazard Classes Regarding Occupational Health

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and Safety (Yıldız and Çelik, 2020). According to the Regulation on Fire Protection of Buildings, hospitals are considered to be in the "medium hazard usage areas" group (URL 2).

There are various factors that contribute to hospital fires which can lead to serious negative consequences, such as the presence of patients and disabled people, lack of knowledge on how to fight fire, difficulty in evacuating patients, controlling the fire, potential for rapid spread of fire, and excessive smoke formation (Sahebi et al., 2021b). Therefore, it is crucial to take preventive measures and intervene as soon as possible in case of a fire. According to Chowdhury (2014), it is possible to prevent similar fire incidents by identifying the root causes of fires and preparing appropriate corrective actions based on a model created from multiple fire incidents. Studies indicate that hospital fires occur due to several reasons, which can be categorized into four groups (Huang et al., 2019).

a) Presence of many and various flammable materials: Hospitals contain a variety of flammable materials such as bed mattresses, blankets, and chemicals including alcohol and ether found in pharmacies and operating theatres. Large electrical equipment and pressurised containers also pose a fire risk (Huang et al., 2019). Cooking oils and gas used in the hospital kitchen, as well as the storage of flammable liquids in various units of the hospital, are additional factors that increase the risk of fire (Fallah-Aliabadi et al., 2023). The fire triangle comprises the igniter, fuel, and oxidant, which are frequently found in hospitals, and fire occurs when these three elements come in contact (Oyur Çelik and Öztürk, 2018).

b) High demand for electricity and complex electrical circuits: Hospitals have a high demand for electricity due to the continuous operation of medical devices. However, this can lead to complex electrical circuits and potential hazards. Long-term power supply and high electrical load can accelerate the ageing of electrical circuits, leading to line failure, fires, and gas explosions (Huang et al., 2019). The most common causes of fires in hospitals are electrical short circuits and excessive electrical load causing heating (Fallah-Aliabadi et al., 2023).

c) Inadequate or incorrect risk management: Although hospital buildings have the necessary equipment for fire intervention according to certain standards, this equipment may not be regularly checked. In some cases, access to the equipment or emergency exit route may be blocked by items such as patient beds, chairs, and tables (Huang et al., 2019).

d) Human factors: Hospitals are complex environments with a large number of people present for different reasons. This can make managing the safety of everyone within the hospital challenging (Huang et al., 2019). Unfortunately, many hospital fires are the result of human factors. For example, a study conducted in the USA found that 16% of the 150 hospital fires were caused by man-made threats (Sahebi et al., 2021a). It is important to note that individuals with poor mental health may attempt arson, so this should be taken into consideration (Huang et al., 2019). Additionally, smoking in bed and arson are also known causes of fires in hospitals (Fallah-Aliabadi et al., 2023).

Hospitals are at a higher risk of severe fires that can cause harm to patients and staff, as compared to less destructive fires that may only cause damage to property and equipment (Huang et al., 2019; Sharma et al., 2020). Patients, especially those with reduced mobility, along with aged individuals, children, infants, and pregnant women, are vulnerable to fire hazards (Sahebi et al., 2021a; Sharma et al., 2020). Due to their limited mobility, patients are at a higher risk and can be more easily lost in a fire incident. Many studies have focused on reducing the risk of fire and ensuring safe evacuation procedures in hospital buildings (Huang et al., 2019; Sahebi et al., 2021b).

Neglecting to take proper precautions and measures can lead to fires that result in injuries and fatalities. According to Ong and Suleiman's study, severe consequences from fires are often linked to factors such as the lack of fire safety systems, their inadequacy, implementation issues, and poor management (Ong and Suleiman, 2015). There are regulations and standards developed to protect hospitals against hazards such as fire. The most recent standard developed by the National Fire Protection Association (NFPA) for evaluating whether healthcare facilities have sufficient fire safety measures is NFPA 99: Health Care Facilities Code, 2015 edition. NFPA codes and standards highlight the importance of fire alarm systems, emergency voice/alarm communication systems, and the necessity for fire- or smoke-resistant doors, exit doors, locks, and manual fire alarm boxes. Additionally, they provide guidelines on how to install and implement these safety practices in healthcare facilities (Koffel et al., 2015).

Fire statistics are a useful tool for reducing the number of fires, analyzing the causes of fire, implementing necessary preventive measures, and making it easier to control fires. But studies on hospital fires in Türkiye are limited. Yıldız and Çelik examined hospital fires between 2007 and 2018, but no studies were conducted thereafter (Yıldız and Çelik, 2020). Hospital and patient bed capacity is high in Turkey. As per the statistics provided by the Ministry of Health, Türkiye has a total of 1,555 hospitals in 2022. Out of these hospitals, 915 are owned by the Ministry of Health, while the private sector operates 68 university hospitals and 572 hospitals. The total number of patient beds available in all these hospitals is 262,190. Public hospitals have the highest number of beds, which is 163,207, followed by private hospitals with 55,069 beds and university hospitals with 43,914 beds (URL 1). Due to the high number of people and potential risks present in hospitals, it is crucial to take measures to prevent hazards that could result in personal injury, death, or property damage. In Türkiye, which has many hospitals, it is crucial to increase research on hospital fires and enhance the existing literature. For this purpose, fires, which are a preventable danger, were examined in this study.

The purpose of this study is to analyze the incidents of hospital fires that occurred in Türkiye over the past five years. The objective was to evaluate these fires based on various characteristics such as the time of occurrence, cause, location, and consequences. The study aims to provide valuable insights that can help prevent future hospital fires, develop effective fire intervention and evacuation plans, and improve the safety of patients, their relatives, and employees.

2. MATERIAL AND METHOD

2.1. Type and Design of the Research

Content analysis method was used in this study. Content analysis, which began to be employed in the USA in the 1950s, examines and interprets the content of various types of written texts or verbal expressions that are conveyed in writing. This method is applicable across multiple disciplines and can measure and analyze the presence, meanings, and relationships of specific words, themes, or concepts. It can be applied in both quantitative and qualitative research. Quantitative results are presented through numbers and percentages, while qualitative content analysis offers insights into the dynamics of social interaction and communication by examining direct texts or transcripts (Sallan Gül and Kahya Nizam, 2021).

Secondary data were used in this study. The study analyzed news reports about fires that occurred in all public and private hospitals in Türkiye. Fires that happened inside the hospital building, additional service buildings, gardens, and car park areas were included in the study. However, fires that occurred during the construction of the hospital building before its operation were excluded.

2.2. Data Collection Tool and Method

The search conducted covers a period of five years starting from 01 January 2019 and ending on 31 December 2023. A search was made using the words "hospital" and "fires" in the Google news search engine, and the results were compiled by accessing the archives of the relevant news agencies. The data used in the study were gathered from the official web pages of several national and local news channels. The national news channels that were used include TRT Haber, NTV, CNN Türk, Habertürk, Hürriyet, Milliyet, and Cumhuriyet Newspaper. Additionally, news was collected from local news channels such as Sakarya Newspaper, Aydın Denge, and Medya Ege. The analysis of the news sources included information such as the type of hospital, the province in which the hospital is located, the date of the fire, the location where the fire originated, the time of the fire, the cause of the fire, whether there were people who needed treatment due to the fire, whether there were any casualties, and whether the patients had to be transferred to another hospital due to the fire.

Hospitals are categorized based on their type, such as public, research and training, private, university, and public-private partnership hospitals. Support units in hospital facilities include archives, data processing, laundry, warehouse, security cabins, and transformers. Outpatient units consist of polyclinic rooms, haemodialysis units, ECHO rooms, tomography rooms, mammography rooms, and dental clinics. The hospital also has a garden and a car park in its open areas. Regarding the fires, the starting times were analyzed in two categories: day shift and night shift.

2.3. Statistical Analysis

The news texts obtained were evaluated using content analysis. The data was compiled using the MS Office Excel programme and number and frequency distributions were analysed. The data was presented in the form of tables and graphs.

2.4 Ethical Aspects of the Study

This study was carried out in accordance with the Declaration of Helsinki. As publicly available data was used in the study no ethics committee permission was required.

3. RESULTS

During the research period, a total of 76 hospital fires were reported. The majority of the fires in the last five years were small and caused minor damage. However, some serious fires resulted in patient deaths. In fact, patients died in three of all fires, with a total of 16 patients losing their lives due to fires. Twelve of these deaths occurred in one hospital fire, while the remaining three and one occurred in other fires. In all the fires, a total of 99 people, including patients and staff, required medical treatment due to the fire. In most of the fires, there was no disruption in service provision due to rapid response. However, in 19 fires, patients had to be evacuated due to flames or smoke inhalation.

The study analyzed the distribution of hospitals where fires occurred, according to the provinces where they operate. Figure 1 shows that Istanbul had the highest number of hospital fires (n=18). Additionally, it was observed that fires occurred more frequently in Aydın, İzmir, and Zonguldak provinces, respectively (n=7, n=6, n=6) (Figure 1).

The graph in Figure 2 displays the distribution of hospital fires by year. As can be seen in the table, the number of hospital fires increased significantly in 2023. From 2019 to 2022, the number of fires ranged between 10 and 13, but in 2023, a total of 30 fires were reported (Figure 2).

Upon analyzing the fires, it was found that August, March, and July had the highest frequency of occurrence (Figure 3).

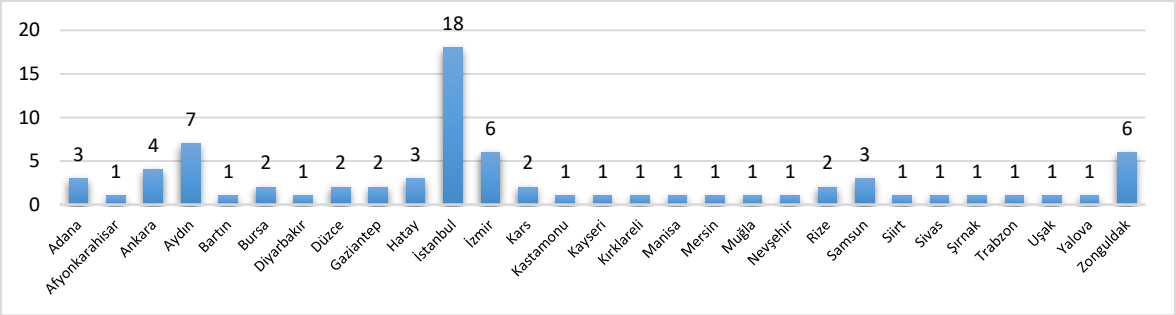

Figure 1. Number of hospital fires by province

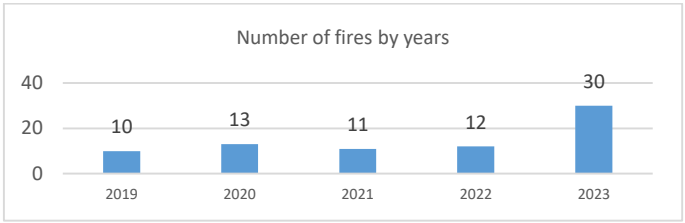

Figure 2. Distribution of fires by years (%)

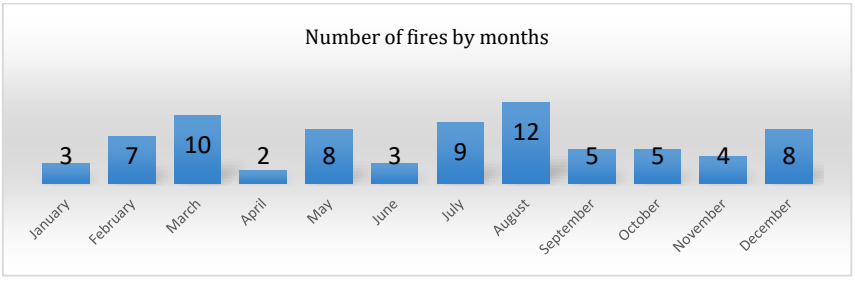

Figure 3. Distribution of fires by month (n)

The data presented in Figure 4 indicates the distribution of fire origin centres in hospitals. It is evident from the graph that the majority of fires occur in the units where support services are provided, followed by inpatient clinics, outpatient service units, and hospital open areas (Figure 4).

The hospitals were categorized as public hospitals, research and training hospitals, private hospitals, university hospitals, and public-private partnership hospitals. Among these categories, state hospitals had the highest number of fire incidents. However, only one fire incident was reported in a public-private partnership hospital, according to Table 1.

After analyzing the starting time of the fires, it was observed that most of the fires occurred during working hours (Figure 5).

Upon analyzing the study's findings, it was concluded that the cause of most fires remained unknown. However, based on the data collected, electrical faults were the most common cause for those fires where the cause was identified (Figure 6).

In addition, ignition of vehicles outside the hospital, cigarette butts, patient-induced causes, renovation of the hospital building, device breakdown, and air conditioning are among the causes of hospital fires in Türkiye. The characteristics of hospital fires that occurred in the last five years in Türkiye are shown in detail in Table 2.

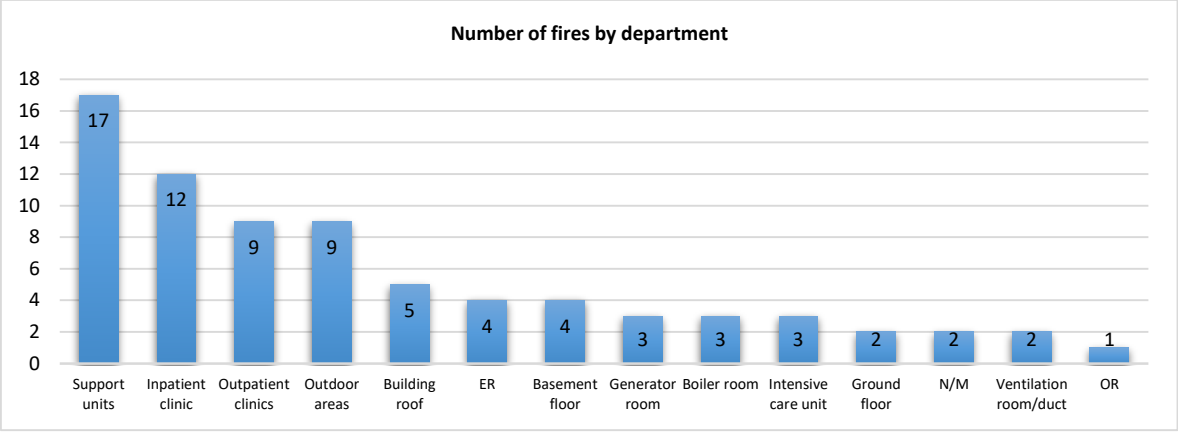

Figure 4. Distribution of units in the hospital where fire broke out

Table 1. Distribution of fires according to hospital type

Hospital Type	Number	Percentage
Public Hospital	31	40,8
Training and Research Hospital	19	25
Private Hospital	8	10,5
University Hospital	17	22,4
Public Private Partnership	1	1,3

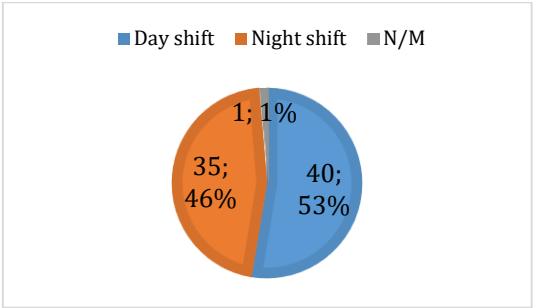

Figure 5. Distribution of fires according to the starting time

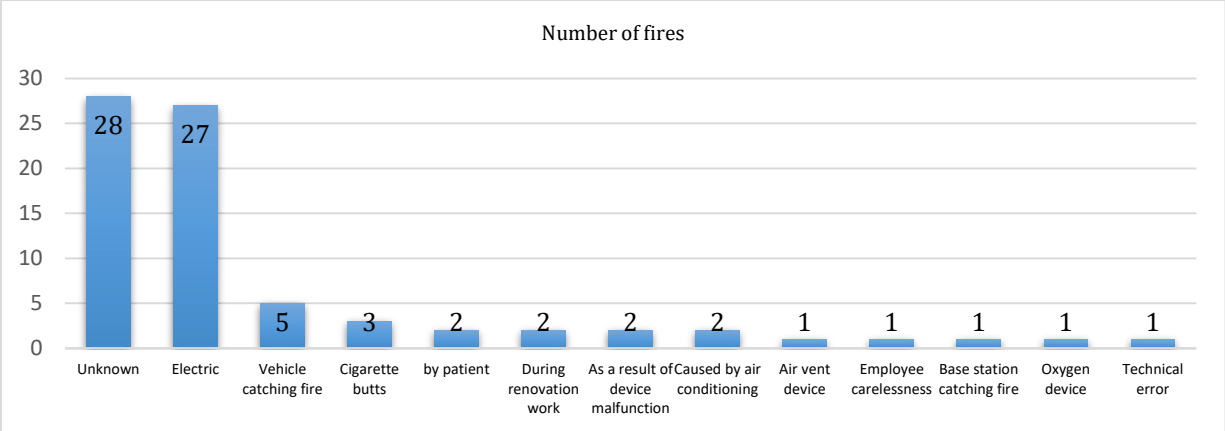

Figure 6. Distribution of fires according to the cause of origin

Table 2. Characteristics of hospital fires that occurred in Türkiye between 2019-2023

No.	Year	Month	Day	City	Hospital Type	Hospital Name	Location of the Fire	Department/ Place	Fire Time (day shift - night shift)	Time of the Fire	Number of People Taken to Treatment	Number of People Died	Evacuation Status	Cause of the Fire
1	2019	March	9	Bursa	Public	Bursa State Hospital	Baby Care and Breastfeeding Room	Support units	Night shift	Evening	0	0	0	Unknown
2	2019	March	20	Adana	University	Çukurova University Faculty of Medicine Balcalı Hospital	Document storage	Support units	NM.	NM.	0	0	0	Unknown
3	2019	March	22	Uşak	Training and research	Uşak Training and Research Hospital	Electric Transformer Room	Support units	Night shift	Midnight	0	0	0	Technical failure
4	2019	May	30	İstanbul	Training and research	Sultan Abdülhamid Han Training and Research Hospital	Dental clinic	Outpatient	Night shift	22:20	0	0	0	Electricity-related
5	2019	August	3	Aydın	Public hospital	Aydın State Hospital	Archive room	Support units	Day shift	Morning	0	0	0	Unknown
6	2019	August	22	İstanbul	Training and research	Kanuni Sultan Süleyman Training and Research Hospital	Medicine warehouse	Support units	Night shift	05:00	0	0	0	Unknown
7	2019	November	5	Siirt	Private	Private Ibni Sina Hospital	5th floor	Inpatient floor	Day shift	12:00	6	0	1	Unknown
8	2019	November	20	İstanbul	Training and research	Bakırköy Dr. Sadi Konuk Training and Research Hospital	Ground floor	Ground floor	Night shift	03:30	0	0	0	From the printer in the gynaecology ward
9	2019	December	13	Ankara	University	Ankara University Ibni Sina Hospital	Archive room	Support units	Night shift	18:00	0	0	0	Electricity-related
10	2019	December	15	Hatay	Public	Iskenderun State Hospital	Generator room	Generator room	Night shift	21:00	0	0	1	From the power supply
11	2020	January	24	İstanbul	Public	Maltepe State Hospital	Emergency department entrance	Emergency department	Night shift	17:30	0	0	0	Electricity-related
12	2020	February	12	Şırnak	Public	Şırnak İdil State Hospital	Roof of the administration floor	Roof	Night shift	07:00	0	0	0	Unknown
13	2020	June	22	İstanbul	Training and research	İstanbul Samatya Training and Research Hospital	Neurology clinic	Inpatient floor	Night shift	21.30	0	0	1	Unknown
14	2020	July	17	İstanbul	Private	Güney Hospital	Intensive Care Unit	Intensive Care Unit	Night shift	20.30	0	0	0	Due to an electrical device
15	2020	July	21	İzmir	Public	Ödemiş State Hospital	Roof	Roof	Day shift	14.00	0	0	0	Short circuit of the electricity of the air conditioner
16	2020	August	24	Aydın	Public	Aydın State Hospital	Polyclinic	Outpatient	Night shift	02:30	0	0	0	Electric fuse panel
17	2020	September	27	Ankara	University	Ankara University Faculty of Medicine Cebeci Hospital	Psychiatry clinic	Inpatient floor	Night shift	04:30	2	1	0	Started by a patient
18	2020	October	8	Adana	Public	Kozan State Hospital	Hospital garden	Outdoor areas	Day shift	Day time	0	0	0	Unknown
19	2020	October	10	Ankara	Training and research	Ankara Dışkapı Yıldırım Beyazıt Training and Research Hospital	Psychiatry clinic	Inpatient floor	Night shift	00.30	1	0	0	Burning of the bed by a patient
20	2020	October	31	Zonguldak	University	Bülent Ecevit University Application and Research Hospital	Intensive Care Unit	Intensive Care Unit	Night shift	19:00	0	0	0	Caused by air conditioning

Table 2 devam ediyor

No.	Year	Month	Day	City	Hospital Type	Hospital Name	Location of the Fire	Department/ Place	Fire Time (day shift - night shift)	Time of the Fire	Number of People Taken to Treatment	Number of People Died	Evacuation Status	Cause of the Fire
21	2020	November	8	Düzce	Public	Düzce Atatürk State Hospital	Indoor car park	Outdoor areas	Day shift	09:00	0	0	0	Electric fuse panel
22	2020	December	19	Gaziantep	University	SANKO University Hospital	Covid-19 service	Inpatient floor	Night shift	04:45	51	12	1	Oxygen device
23	2020	December	22	İstanbul	Private	Delta Hospital	Data processing room	Support units	Day shift	15.30	0	0	1	Unknown
24	2021	January	13	Rize	University	Recep Tayyip Erdoğan University Training and Research Hospital	Pharmaceutical warehouse	Support units	Day shift	Day time	0	0	0	Electricity-related
25	2021	February	25	Adana	Public	Kozan State Hospital	Covid-19 intensive care	Intensive Care Unit	Night shift	17:55	0	0	1	Electricity-related
26	2021	March	5	Zonguldak	University	Bülent Ecevit University Application and Research Hospital	Generator	Generator room	Day shift	15:30	0	0	0	Due to ventilation evacuation machine
27	2021	March	8	İstanbul	Training and research	Zeynep Kamil Women's and Children's Diseases Training and Research Hospital	Basement floor	Basement floor	Night shift	06:00	0	0	1	Electricity cable
28	2021	March	27	İzmir	Public	Kiraz State Hospital	NM.	NM.	Night shift	Morning	0	0	1	NM.
29	2021	April	26	İstanbul	Private	Hospital name not specified	Generator room	Generator room	Night shift	00:30	0	0	0	Unknown
30	2021	May	23	Kayseri	University	Erciyes University Mehmet Kemal Dedeman Hematology and Oncology Hospital	Ground floor	Ground floor	Day shift	11:00	24	0	1	Due to the welding process
31	2021	June	29	Bartın	Public	Bartın State Hospital	Surgical ward	Inpatient floor	Night shift	21.30	0	0	0	Bulk socket
32	2021	July	1	Gaziantep	Private	Hospital name not specified	MR technical room	Roof	Night shift	05:15	0	0	1	Electricity-related
33	2021	December	10	Zonguldak	University	Bülent Ecevit University Application and Research Hospital	Emergency department	Emergency department	Day shift	13:30	2	0	0	By an employee (as a joke)
34	2021	December	21	Aydın	Public	Nazilli State Hospital	Haemodialysis unit	Outpatient	Day shift	13:00	0	0	0	Electricity cable
35	2022	February	8	Sivas	Public	Sivas Numune Hospital	Ventilation gap	Support units	Night shift	22.30	0	0	0	Unknown
36	2022	February	12	İzmir	Public	Ödemiş State Hospital	Dental clinic	Outpatient	Night shift	Evening	0	0	0	Unknown
37	2022	February	15	İzmir	University	Ege University Hospital	Patient Room	Inpatient floor	Night shift	07:50	5	0	0	Unknown
38	2022	March	3	Zonguldak	Public	Zonguldak Atatürk State Hospital	Boiler room	Boiler room	Day shift	14:15	0	0	0	Sparks from the welding machine during installation work in the boiler room of the hospital
39	2022	March	5	Afyonkarahisar	University	Afyonkarahisar Health Sciences University Hospital	3rd floor lecturer's room	Inpatient floor	Night shift	Evening	0	0	0	Unknown
40	2022	May	25	İzmir	University	Ege University Faculty of Medicine Hospital	Mammography Department	Outpatient	Night shift	18:15	0	0	0	Unknown
41	2022	August	4	İstanbul	Foundation	Balıklı Rum Hospital	Roof	Roof	Day shift	12:50	0	0	1	Unknown
42	2022	August	17	Rize	University	Recep Tayyip Erdoğan University Training and Research Hospital	Basement floor	Basement floor	Night shift	05.00	0	0	1	Electricity contact
43	2022	August	31	İstanbul	Public	Sait Çiftçi State Hospital	Basement floor	Basement floor	Day shift	12:10	0	0	0	Unknown

Table 2 devam ediyor

No.	Year	Month	Day	City	Hospital Type	Hospital Name	Location of the Fire	Department/ Place	Fire Time (day shift - night shift)	Time of the Fire	Number of People Taken to Treatment	Number of People Died	Evacuation Status	Cause of the Fire
44	2022	September	14	İstanbul	Training and research	Taksim Training and Research Hospital	Polyclinic	Outpatient	Day shift	11:00	0	0	0	Electrical wiring to which the tea set is connected
45	2022	December	5	Kastamonu	Training and research	Kastamonu Training and Research Hospital	Patient room	Inpatient floor	Night shift	04:00	8	0	0	Smoking by the patient
46	2022	December	25	Samsun	Training and research	Samsun Training and Research Hospital	Basement floor	Basement floor	Day shift	Day time	0	0	0	Electricity cable
47	2023	January	10	Aydın	Public	Kuşadası State Hospital	Security room	Support units	Day shift	Day time	0	0	0	Electrical socket
48	2023	February	23	Bursa	Public	Çekirge State Hospital	Boiler room	Boiler room	Day shift	13.00	0	0	1	Electricity-related
49	2023	February	27	Kars	Public	Harakani State Hospital	Ground floor toilet ventilation shaft	Ventilation system	Night shift	Midnight	0	0	0	Unknown
50	2023	March	2	Samsun	University	Samsun OMU Faculty of Medicine Hospital	In the staff dressing room in the General Surgery Service	Inpatient floor	Day shift	12:00	0	0	0	Electricity contact
51	2023	March	24	İstanbul	Training and research	Sultan Abdülhamid Han Training and Research Hospital	Operating room	Operating room	Night shift	02:30	0	3	1	Unknown
52	2023	April	19	İstanbul	Training and research	Ümraniye Training and Research Hospital	Boiler room	Boiler room	Day shift	16:00	0	0	0	Unknown
53	2023	May	13	Hatay	Public	İskenderun State Hospital	Warehouse	Support units	Night shift	Evening	0	0	0	Unknown
54	2023	May	15	Mersin	Public	Tarsus State Hospital	Dining Hall	Support units	Day shift	Day time	0	0	0	Electricity-related
55	2023	May	17	Aydın	Public	Aydın State Hospital	Cigarette butt thrown near the air conditioner motor	NM.	Day shift	Day time	0	0	0	Cigarette butt
56	2023	May	21	Ankara	Private	Private Bilgi Hospital	Roof	Roof	Day shift	11:00	0	0	1	Unknown
57	2023	May	23	Samsun	Training and research	Samsun Training and Research Hospital	Laundry	Support units	Day shift	Day time	0	0	0	Electricity contact
58	2023	June	29	Kars	Public	Harakani State Hospital	Vehicle fire in the garden	Outdoor areas	Day shift	Day time	0	0	0	Due to the vehicle catching fire
59	2023	July	6	Aydın	University	Aydın Adnan Menderes University Hospital	ECHO room	Outpatient	Night shift	Midnight	0	0	0	Unknown
60	2023	July	6	Aydın	University	Aydın Adnan Menderes University Hospital	Polyclinic	Outpatient	Night shift	Midnight	0	0	0	Unknown
61	2023	July	7	Nevşehir	Public	Nevşehir State Hospital	Vehicle fire in the garden	Outdoor areas	Day shift	11:15	0	0	0	Due to the vehicle catching fire
62	2023	July	9	Hatay	Public	İskenderun State Hospital	tomography department	Outpatient	Day shift	Day time	0	0	0	Unknown
63	2023	July	18	İstanbul	Training and research	Bakırköy Dr. Sadi Konuk Training and Research Hospital	4th floor electrical panel	Inpatient floor	Day shift	10:30	0	0	1	Electricity-related

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No.	Year	Month	Day	City	Hospital Type	Hospital Name	Location of the Fire	Department/ Place	Fire Time (day shift - night shift)	Time of the Fire	Number of People Taken to Treatment	Number of People Died	Evacuation Status	Cause of the Fire
64	2023	July	20	Diyarbakır	Public	Selahaddin Eyyubi State Hospital	Cigarette butt thrown on the 3rd floor	Inpatient floor	Night shift	Evening	0	0	0	Cigarette butt
65	2023	August	6	Zonguldak	Public	Zonguldak Atatürk State Hospital	Electricity transformer	Support units	Night shift	Evening	0	0	0	Electricity-related
66	2023	August	9	Yalova	Private	Private Yalova Hastanesi	Emergency department	Emergency department	Night shift	02:00	0	0	1	Electricity panel
67	2023	August	11	Kırklareli	Training and research	Kırklareli Training and Research Hospital	Garden	Outdoor areas	Day shift	14:00	0	0	0	Unknown
68	2023	August	15	İzmir	Training and research	Tepecik Training and Research Hospital	Ground Floor union room	Support units	Day shift	16:00	0	0	1	Due to air conditioning
69	2023	August	17	Düzce	Public	Düzce Atatürk State Hospital	Indoor car park	Outdoor areas	Day shift	Day time	0	0	0	Due to the vehicle catching fire
70	2023	August	28	Muğla	Public	Menteşe State Hospital	Emergency department	Emergency department	Night shift	02:00	0	0	NM.	Electricity-related
71	2023	September	18	İstanbul	Training and research	Ümraniye Training and Research Hospital	Sterilisation Unit	Support units	Night shift	19:00	0	0	0	Unknown
72	2023	September	19	İstanbul	PPP	Kartal Dr. Lütfi Kırdar City Hospital	Vehicle fire in the garden	Outdoor areas	Night shift	22:00	0	0	1	Due to the vehicle catching fire
73	2023	September	28	Zonguldak	University	Bülent Ecevit University Application and Research Hospital	Vehicle fire in the garden	Outdoor areas	Day shift	10:00	0	0	0	Due to the vehicle catching fire
74	2023	October	9	İstanbul	Training and research	Bakırköy Dr. Sadi Konuk Training and Research Hospital	Base station in the building garden	Outdoor areas	Day shift	10:00	0	0	0	Due to the base station catching fire
75	2023	October	12	Trabzon	Training and research	Trabzon Kanuni Training and Research Hospital	Laundry	Support units	Day shift	Day time	0	0	0	Due to the dryer catching fire
76	2023	November	6	Manisa	Public	Soma State Hospital	Morgue	Support units	Day shift	11:00	0	0	0	Electricity-related

4. DISCUSSION

In this study, which examined the hospital fires that occurred in the last five years (between 2019 and 2023) in Türkiye, a total of 76 hospital fires were reported. Hospitals should be safe places for all users, including patients, relatives, and employees (Agus Salim et al., 2023). However, hospitals are constantly open to fire risk due to their characteristics and high-risk sections, such as electrical installations, kitchens, chemical units, and gas tanks (Tosun and Yılmaz, 2022). Therefore, investigating the causes of hospital fires and developing prevention practices is crucial.

In the past, there have been hospital fires that resulted in the loss of many patients' lives (Huang et al., 2019; Şimşek and Akıncıtürk, 2016; Yıldız and Çelik, 2020). As a result of numerous fire tragedies in healthcare facilities, fire safety has become a critical concern for many governments (Agus Salim et al., 2023).

Hospital fires can occur due to various reasons, such as electrical short circuits, heating caused by electrical overload, cooking oil or gas in the kitchen, storing flammable liquids, arson, or smoking in bed (Chowdhury, 2014). In Türkiye, the cause of most hospital fires in the last five years is unknown, but of those whose causes are known, it was determined that most were caused by electrical malfunctions. A study conducted in Türkiye found that 105 hospital fires occurred between 2007 and 2018 and the leading cause of hospital fires (40-44%) was electrical-related (Yıldız and Çelik, 2020). Similar studies have also found that electrical installation-related problems were the cause of the majority of fires (Fallah-Aliabadi et al., 2023; Şimşek and Akıncıtürk, 2016). In India, a study showed that air conditioning was responsible for 17% of hospital fire sources and electrical equipment for 25% (Paul et al., 2022). In the USA, hospital fires between 2003 and 2006 were most commonly caused by cooking processes, electrical installations and appliances, heating appliances, and smoking (Yıldız and Çelik, 2020). Although the majority of fires are caused by electricity, other causes such as patient or employee negligence, cigarette butts, and devices used in the hospital should not be ignored. In this study, it was found that five fires were caused by vehicles located in the external area of the hospital. This finding highlights the importance of including external areas of the hospital in fire prevention, intervention, and evacuation plans. Precautions must be taken, and follow-up measures should be conducted for fire safety in both the interior and exterior areas of hospitals.

According to this study, the highest number of hospital fires has occured in İstanbul. The Ministry of Health reports 234 hospitals in Istanbul, which is 15% of all hospitals in Türkiye (URL 1). This result is not surprising considering the number of hospitals in the city. The data shows hospital fires occur most frequently in August, March, and July. There may be several factors contributing to this trend. For instance, the heavy use of split air conditioners in summer may overload the electrical systems. The high number of fires caused by electrical installations supports this possibility. It is believed that additional factors, such as the number of patients, the number of employees, and the presence of new staff, may contribute to the occurrence of fires. To better understand these influences, studies could be conducted to examine the frequency of fires during months.

The occurrence of fires was analyzed based on the time of day they started, and it was found that most fires happen during working hours. This is likely due to the high number of people present in the building during this time, as well as the increased use of devices and demand for energy.

Public hospitals have been found to have the highest number of fires. An article on fire safety management in public health facilities revealed that fires are associated with the absence or faulty implementation of fire safety plans, insufficient water pressure, lack of maintenance in buildings, and communication system deficiencies (Agus Salim et al., 2023). Differences in the inspection processes for public and private hospitals regarding building safety and fire precautions may

contribute to these outcomes. Additionally, the budget that hospitals can allocate for building safety could also impact these results. Further studies are necessary to examine the effects of these factors.

The study found that most fires occurred in the units where support services were provided. Then, fires frequently occur in inpatient clinics, units where outpatient services are provided, and hospital open areas. Different studies have stated that fire scenes are mainly in the units providing medical services (Fallah-Aliabadi et al., 2023; Paul et al., 2022). In their study, Paul et al. revealed that most fires occur primarily in intensive care units in medical areas (Paul et al., 2022). A study conducted in India stated that hospital fires occur primarily in units with high O2 utilization, such as intensive care units and operating theatres (Chowdhury, 2014). It is recommended to take additional measures in units where fires are frequently experienced and to provide more frequent training to employees working in these units.

In the last five years, most hospital fires in our country have been rapidly intervened without disrupting service provision. However, in 19 fires, patients had to be evacuated due to flames or smoke inhalation. Although it was found that the majority of the fires were small and caused minor damage, a total of 99 people (patients and employees) required medical treatment due to fires. Furthermore, severe fires resulting in the death of 16 patients also occurred. In another study analyzing hospital fires in Türkiye from 2007 to 2012, it was reported that the only hospital fire causing loss of life happened in Bursa Şevket Yılmaz State Hospital in 2009, where nine people lost their lives. The fire started in the tomography department of the hospital, but the loss of life occurred in the intensive care center two floors above. The study also stated that the fires that broke out in Uludağ University Faculty of Medicine Hospital in 2010 and 2012 were widely distributed to different units of the hospital. The main reason for this situation was the lack of measures taken against the spread of smoke in the connecting shafts (Şimşek and Akıncıtürk, 2016). The causes and consequences of past hospital fires will contribute significantly to developing interventions to prevent fires. In particular, fire cases resulting in death should be examined in detail and discussed by the relevant authorities.

Hospital fires tend to occur more frequently in developing countries (Liu et al., 2022). In contrast, developed countries have lower numbers of deaths resulting from fires (URL 3). The primary reason for this difference is the varying levels of fire safety regulations and adherence to them across countries. Monitoring compliance with rules and standards is also a crucial factor. Developed countries like the USA and Canada have implemented specific regulations to measure the effectiveness of compliance with fire safety (Kodur et al., 2020). In our country, it has been observed that legislative efforts have increased in recent years in order to increase hospital safety. In 2015, the Hospital Disaster and Emergency Plans (HDEP) Implementation Regulation numbered 29301 was implemented in Türkiye (Şen and Ersoy, 2017). This regulation requires hospitals to make systematic preparations for emergency and disaster events. The Emergency and Disaster Management Section of the Ministry of Health Quality Standards in Health Hospital Set also mandates that fire-related items be included as mandatory criteria to be met (URL 4). Additionally, the "Regulation on Fire Protection of Buildings" (Regulation dated 2007 and numbered 26735) is another regulation that hospitals must comply with (URL 2). However, some studies have found that the list of the disaster team in the HDEP is not up-to-date, some employees have left their jobs or changed duty units, the hospital disaster team is not ready for disaster, and hospital employees do not have sufficient knowledge about HDEP (Dinçer ve Kumru, 2021; Pamuk Cebeci ve Arberk, 2021; Şen ve Ersoy, 2017). To ensure the safety of patients and staff, hospitals must prepare an evacuation plan, announce it to all staff, and conduct regular evacuation drills (Goniewicz et al, 2020). Simply having legal regulations is insufficient; all individuals using hospital facilities, including patients, their families, and healthcare professionals, must understand the risks and adhere strictly to the safety measures and training.

A study has investigated fires across the globe, focusing on those that caused numerous injuries and casualties. The study identified several reasons that led to these disastrous fires, including the absence of automatic fire extinguishing systems, issues with law implementation, inadequate planning, maintenance, and management of fire safety protocols, poor performance of hospital staff, use of flammable construction materials, insufficient management following a fire accident, and conflicts arising from authority and safety issues (Ong and Suleiman, 2015). As the mentioned study reveals, the existence, updating, compliance with and inspection of standards related to building safety are effective tools in preventing serious negative consequences.

It is crucial to identify potential risks that may arise during the evacuation of hospitals in case of a fire and to develop appropriate evacuation methods (Altındaş, 2021). Emergency evacuation of hospitals during a fire is a complex process that requires comprehensive and high-level preparation (Sahebi et al, 2021b). High-rise buildings and heavy traffic around hospitals are two of the most significant challenges in managing hospital fires (Liu et al, 2022).

It is important to note that people who are hospitalized may require life-saving measures, be unconscious or immobile, have limited movement or mental instability, and require continuous assistance from trained third parties (Goniewicz et al., 2020). Due to the presence of such patients, the measures taken against fire in hospital buildings should be organized differently compared to other buildings (Şimşek and Akıncıtürk, 2016). Factors such as the presence of potentially hazardous substances in hospital buildings (e.g., chemical and radiological) and the need for emergency response of evacuees further complicate the issue (Bongiovanni et al., 2017). Medical transport of evacuated patients also becomes challenging due to the limited number of ambulances and the limited capacity of health facilities to take in evacuees (Goniewicz et al., 2020). Therefore, preventing hospital fires should be a top priority. In case of unforeseen fires, it is essential to quickly determine intervention methods and carry out necessary controls and inspections to ensure patient and employee safety and minimize damage.

This study has certain limitations. Firstly, the data used were gathered from news websites, which means some fires may not have been reported. It is possible that there were some fires that were not reported due to their small scale during the study period. Secondly, the detailed information about the fires mentioned in the news may be lacking. To validate the findings of this study, it is necessary to access data sources from the Ministry of Health or Fire Departments.

5. CONCLUSION

Hospital fires can be more dangerous compared to fires in other buildings. As hospitals often have many people with physical limitations, it can be challenging to evacuate them in case of a fire. To effectively prevent fires, it is essential to address various tasks and responsibilities at multiple stages, from the initial preparation of architectural plans for hospital buildings to construction, commissioning, and operational phases. Fire safety measures in hospitals can be categorized into two main groups: those related to the building and those concerning the people within it, including staff and patients.

- The primary focus of fire prevention efforts should be on avoiding the occurrence of fires altogether. Key actions related to the building include ensuring structural fire safety, proper architectural planning, and eliminating potential fire hazards. Research clearly indicates that electrical issues are the leading cause of fires. Therefore, it is crucial to regularly inspect and enhance the safety of the hospital's electrical installations. Additionally, periodic maintenance of all devices used in the building is necessary, and the use of inappropriate electrical devices should be restricted. When planning for increased

energy demand, such as with newly acquired hospital equipment or expansions, it is important to ensure that these changes are compatible with the building's capacity.

- Human factors also play a significant role and should encompass both employees and patients. This includes providing fire safety training for staff, teaching them the appropriate actions to take before and during a fire, and ensuring there are effective evacuation plans for patients. Employees need to enhance their knowledge and skills regarding the use of devices that carry a high risk of fire. It is vital to enhance hospital staff's knowledge about emergencies and disasters, to keep emergency response teams and evacuation plans updated, and to conduct regular evacuation drills. It would be advantageous to incorporate training on this topic into both undergraduate and graduate health management programs.

- Additionally, procedures should be put in place to ensure that emergency clinical processes remain uninterrupted during fire incidents. Also, policies could be developed to require or encourage decision-makers to adhere to fire regulations within healthcare institutions.

There is an ongoing need for additional research on hospital fires. Specifically, it is recommended that studies focus on understanding the causes of these fires and analyze factors such as the hospital unit, the time of occurrence, and the type of hospital involved.

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