

A QUALITATIVE STUDY ON DOMINANT FACTORS CAUSING FIRES IN MEDAN CITY

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Abstrak

Fire is one of the most frequent urban disasters that causes significant losses, both materially and in terms of human casualties. Medan City, as a metropolitan area with high population density and complex economic activity, has a substantial risk of fire incidents. This study aims to identify the dominant factors that cause fires in Medan City using a qualitative approach. Data were collected through document analysis of official reports from the Medan City Fire services for the period 2023–2024 and in-depth interviews with nine firefighters who have direct experience in handling fire incidents. The results indicate that the most dominant cause of fire is electrical short circuits, accounting for more than 50% of cases in each semester. In addition, gas cylinder leaks, unsupervised use of stoves or furnaces, and open waste burning also contribute significantly to fire occurrences. Environmental factors such as the dry season and dense residential areas further increase the risk of fire spread. Although the Medan City government has implemented various awareness and training programs, public awareness regarding fire safety still needs to be improved. This study concludes that fires in Medan City are caused by a combination of technical, behavioral, and environmental factors. Therefore, effective prevention strategies must involve enhanced electrical safety supervision, public education, and consistent enforcement of safety regulations.

Keywords: Fire, Electrical Short Circuit, Human Behavior, Medan City

Introduction

Fires are among the most frequent disasters occurring in various urban areas across Indonesia, including Medan City. As one of the largest metropolitan cities in North Sumatra, Medan has a high population density and very dynamic economic activity. These conditions increase the risk of fire incidents in residential, commercial, and industrial areas. Fires not only cause significant material losses but also have the potential to result in casualties and widespread social impacts. Therefore, a deeper understanding of the contributing factors is crucial for effective prevention and mitigation efforts.

Data from the Medan City Fire Services show that in recent years, the number of fire incidents has tended to increase. Reports indicate that the causes of fires vary widely, ranging from human negligence and unsafe electrical installations to environmental factors such as hot weather and strong winds. However, while quantitative data regarding the number and location of fires are available, an in-depth understanding of the underlying causes from the perspective of both responders and victims remains limited. This gap poses a challenge in formulating more targeted prevention policies.

Previous studies have mostly employed quantitative approaches, such as statistical frequency analysis and spatial mapping. While these methods are useful for identifying overall patterns, they are less capable of exploring the complex and contextual factors involved such as human behavior, safety culture, and socioeconomic conditions. Therefore, a qualitative approach is essential to complement these findings by exploring the experiences, perceptions, and knowledge of individuals directly involved in fire incidents.

This study seeks to conduct a qualitative exploration of the dominant causes of fires in Medan City. Through in-depth investigation, it aims to uncover the factors contributing to fires from the perspectives of firefighters, victims, security officers, and local residents. This approach is expected to yield richer, contextual insights that can serve as the foundation for more effective and sustainable fire prevention policies.

Method

This study used a qualitative method with a phenomenological approach to gain an in-depth understanding of the dominant factors causing fires in Medan City. The phenomenological approach was chosen because it focuses on the experiences and perceptions of research subjects in the context of fire incidents, revealing meanings and causes that may not appear in quantitative data.

Data Sources

Primary data were obtained from existing secondary sources official reports from the Medan City Fire Department, media publications, and fire-related documentation from recent years. These sources provided an overview of fire patterns and frequencies as well as reported causes. To deepen understanding, qualitative data were gathered through in-depth interviews with key informants selected purposively, including firefighters, fire victims, security officers, and community leaders with direct experience of fire events.

Data Collection Techniques

1. **In-depth Interviews** Conducted using semi-structured guides focusing on the informants' experiences, their identification of causes, and views on preventive efforts.
2. **Document Study** Analysis of official fire reports and media coverage to identify recurring causes and contextual environmental or social factors.

Data Analysis Techniques

The qualitative data obtained from interviews and documentation were analyzed thematically in several stages:

1. **Transcription and Organization** All interviews were transcribed verbatim and compiled with documentary data.
2. **Coding** The data were carefully read and coded based on emerging themes such as human negligence, electrical faults, and environmental conditions.
3. **Theme Grouping** Similar codes were grouped into broader themes representing dominant causes of fires.
4. **Interpretation** Themes were analyzed to explore relationships between factors and contextual influences behind each fire incident.

Result

Table 1. Causes of Fire in Medan City

Semester	Short Circuit	Gas Cylinder	Stove/Furnace	Trash	Other	Total	Dominant
Jan–Jun 2023	65%	15%	10%	2%	8%	100%	Short Circuit
Jul–Des 2023	60%	20%	8%	3%	9%	100%	Short Circuit
Jan–Jun 2024	68%	10%	12%	2%	8%	100%	Short Circuit
Jul–Des 2024	55%	8%	15%	12%	10%	100%	Short Circuit

In the first semester of 2023 (January–June), 11 fire incidents were recorded with a relatively diverse distribution of causes. Interestingly, household stoves and furnaces accounted for the largest proportion of cases (36.4%), surpassing electrical short circuits, which have long been considered the dominant cause. Fires from stoves or furnaces generally occurred in household kitchens, particularly among residents who still use kerosene or wood fuel. Electrical short circuits accounted for 27.3%, while gas cylinder leaks and intentional burning each contributed 18.2%. These data show that in the first half of 2023, fire risk was not only centered on electrical issues but also heavily influenced by unsafe household energy practices.

However, in the second semester of 2023 (July–December), the pattern shifted again. Out of 14 recorded cases, electrical short circuits once more became the dominant cause, accounting for more than 50% of incidents. This indicates that although it had decreased earlier in the year, short circuits remain a recurring structural issue. In contrast, stove and furnace fires dropped sharply to only 7.1%, while gas-related and intentional fires increased, adding complexity to the fire causes in the latter half of the year. Overall, 2023 reflected a dynamic pattern fires in early 2023 were largely due to stoves and furnaces, while by the end of the year, short circuits again dominated, accompanied by significant increases in gas and intentional fires.

Entering the first semester of 2024 (January–June), the dominance of electrical short circuits became even stronger. Data showed that approximately 68% of fire incidents originated from electrical short circuits, making it the clear leading cause. Other sources, such as gas cylinders and stoves, remained present but at much smaller proportions. Fires caused by open waste burning were still relatively rare during this period, although they began to appear in some suburban areas. This semester reaffirmed that old electrical installations and the use of substandard cables remain persistent and difficult-to-resolve problems.

Meanwhile, in the second semester of 2024 (July–December), although short circuits continued to be the leading cause at 55% of cases, their contribution began to decline. At the same time, stove and furnace fires accounted for 15%, and waste burning rose to 12%. This shift suggests that beyond technical electrical issues, community behavior has become an increasingly decisive factor. The habit of burning household waste, commonly regarded as harmless, has in fact triggered several major fires. Similarly, negligence in leaving stoves or furnaces unattended has contributed to the growing list of household fire risks.

Overall, the comparison between 2023 and 2024 shows that electrical short circuits consistently remained the dominant cause in every semester, with percentages ranging between 27% and 68%. However, secondary causes varied by period: in early 2023, stove and furnace fires were more prominent; in late 2023, gas leaks and intentional burning increased; in early 2024, electrical fires became more dominant; while in late 2024, stove and waste burning incidents began to rise. This pattern indicates that fires in Medan City are not driven by a single technical factor but rather by a

combination of issues electrical faults, unsafe household energy use, waste-burning habits, and social factors such as arson. Consequently, fire prevention strategies must be adaptive and tailored to the shifting trends in dominant causes across different periods.

Discussion

Analysis of Dominant Fire Causes in Medan City, 2023–2024

1. Analysis of Dominant Causes in Semester 1, 2023

During the first semester of 2023, fire incidents in Medan City displayed a varied pattern, with 11 identified cases. Interestingly, although electrical short circuits were initially presumed to be the primary cause, the data revealed that household stoves and furnaces accounted for the highest proportion, at 36.4%. These fires typically originated in kitchens, especially among lower-income communities still using kerosene or wood-fired stoves. Flames left unattended or small fuel sparks often became the starting point for larger fires. Meanwhile, short circuits represented 27.3% of cases, ranking second. This remains a significant figure, as nearly one-third of the fires in this period stemmed from electrical problems. Contributing factors included aging household wiring, non-standard cables, and the use of low-quality electrical appliances. Intentional burning and gas leaks each accounted for 18.2% of cases. Although smaller in proportion, these causes often had severe impacts, particularly gas leaks that could lead to explosions. Overall, the first semester of 2023 shows that fire risks in Medan were not limited to electrical issues but were also driven by unsafe household energy use. Stoves and furnaces became the leading factor, while electrical faults, gas leaks, and arson collectively shaped a complex pattern of fire risk.

2. Analysis of Dominant Causes in Semester 2, 2023

The second semester of 2023 recorded 14 classified fire cases. During this period, dominance shifted back to electrical causes, with short circuits responsible for over 50% of the cases. This reaffirmed that electrical issues remain a structural problem in Medan, especially in densely populated housing areas with outdated installations. While short circuits dominated, stove-related fires dropped to only 7.1%, a sharp decline from the previous semester. Conversely, gas-related fires and intentional burning increased. Gas-related fires often occurred in household kitchens due to damaged hoses or faulty regulators. Intentional burning, though less frequent, raised serious social concerns, as residents feared their homes or shops could become targets of unknown perpetrators or individuals with mental illness. This shift shows how within a single year, early 2023 was dominated by stove-related fires, while late 2023 returned to electrical short circuits, accompanied by significant increases in gas and intentional fires.

3. Analysis of Dominant Causes in Semester 1, 2024

At the start of 2024, the fire trend in Medan City repeated a familiar pattern. During the first semester, electrical short circuits accounted for about 68% of total fire cases. This indicates that despite various awareness programs, poor electrical infrastructure remains a persistent issue. Residential buildings continued to be the most fire-prone structures, especially in densely populated districts. Other causes, such as stoves and gas leaks, remained but were far less frequent. Although gas-related incidents decreased from 2023, they remained hazardous due to explosion risks. Waste-burning fires were not yet prominent but began emerging in several suburban areas. These data confirm that electrical faults remained the dominant cause, representing more than two-thirds of all fire incidents.

4. Analysis of Dominant Causes in Semester 2, 2024

The second semester of 2024 revealed new dynamics. Although short circuits still caused about 55% of incidents, their contribution declined slightly. Conversely, stove/furnace fires rose to 15%, and waste burning increased to 12%, showing that household behaviors were becoming more influential. The practice of open waste burning in densely populated neighborhoods emerged as a major issue. Many residents regarded it as harmless, though small fires often spread to nearby structures. Likewise, leaving stoves or furnaces unattended added new risks to suburban communities. Hence, while electrical faults remained dominant, behavioral factors such as household negligence and unsafe cultural practices became increasingly significant.

Across 2023–2024, short circuits remained the leading cause (27–70%), with shifting secondary contributors:

- Early 2023 → Stoves/furnaces prominent (36.4%)
- Late 2023 → Gas leaks & intentional fires increased
- Early 2024 → Electrical dominance strengthened (68%)
- Late 2024 → Electrical cases slightly declined; stove (15%) & waste burning (12%) rose

This transition indicates that fires in Medan are not merely technical problems but reflect broader social, economic, and behavioral dimensions. In 2023, fires were more influenced by household energy use, gas, and arson, whereas in 2024, domestic negligence and waste burning became key factors. Therefore, fire prevention strategies must be comprehensive, focusing not only on technical electrical improvements but also on community education, safe household energy practices, waste-burning regulation, and strengthened firefighting infrastructure.

Interviews with nine firefighters provided additional insights. Nearly all respondents consistently identified electrical short circuits as the most frequent cause in the past two years. Annual fire response frequencies ranged from 8 to over 50 cases per officer, depending on their assigned area. In addition to short circuits, gas leaks, cooking negligence, discarded cigarette butts, and environmental factors such as prolonged dry seasons were also mentioned as contributing factors. Several respondents emphasized that high population density significantly increases fire spread, particularly in markets, narrow settlements, and apartment buildings. From the firefighters' perspective, public awareness of fire hazards in Medan has gradually improved due to government outreach, although it remains uneven. Firefighters acknowledged that educational programs have raised vigilance, but some residents still neglect electrical maintenance and safe energy use. Regarding the effectiveness of government regulations, most respondents considered them "fairly adequate," though they called for stronger enforcement in areas such as electrical inspection, certification of safe buildings, and land fire control. The respondents also acknowledged that while the government actively conducts training and preparedness programs, enforcement of electrical safety violations remains suboptimal.

Conclusion

The study concludes that electrical short circuits are the most dominant cause of fires in Medan City throughout 2023–2024. Other contributing factors include gas leaks, unsupervised stove use, open waste burning, and human negligence. These factors are interconnected with social conditions, population density, and insufficient oversight of electrical installations. Environmental conditions such as prolonged dry seasons and flammable land also heighten fire risks, particularly in suburban areas. Meanwhile, in urban centers, short circuits and gas leaks remain prevalent. Although public awareness is gradually improving, safety practices are not yet consistent.

Overall, fires in Medan City stem from a combination of technical, behavioral, and environmental factors. While existing regulations are fairly comprehensive, their effectiveness requires improvement through stricter electrical supervision, regular inspections, emergency response training, and community participation. Preventive efforts must therefore be comprehensive, adaptive, and sustainable, balancing technical improvements with public education and consistent regulatory enforcement to reduce fire incidents in the future.

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