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Electrical Fire Safety Knowledge and Awareness among Residential Buildings' Occupants in the Sultanate of Oman

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ABSTRACT

Fire incidents have a devastating impact, affecting both lives and property. The severity of these impacts is particularly high in areas with inadequate fire safety precautions. Lack of fire safety awareness remains a significant challenge in fire management across the country, highlighting the need for effective prevention and response strategies. Precaution is a key element in fire risk reduction, encompassing community knowledge and awareness, preparedness for appropriate responses, and the ability to recover quickly. The aim of this study was to assess the current level of knowledge and awareness among residents regarding the causes and risks of electrical fires in residential buildings in Oman. A quantitative research approach with a descriptive design was adopted, involving a sample of 973 residents from the Sultanate of Oman. The study revealed that only 9.4% of respondents acknowledged having knowledge of certain fire safety issues in buildings, while 8% admitted to having no knowledge at all. Overall, the findings indicate inadequate awareness of electrical fire causes and hazards (electrical safety), along with a low-risk perception among Omani residents. This underscores the urgent need for awareness programs to enhance public knowledge and increase awareness, ultimately minimizing fire incidents.

Keywords: Fire knowledge, fire awareness, fire safety & fire risks

1. INTRODUCTION

Fire incidents have a significant impact on both life and property. The severity of these impacts is increasing, particularly in areas with inadequate fire precautions. In urban areas, the risk of fire arises from potential hazards such as electricity usage and gas stoves, combined with high community vulnerability influenced by population and building density. Minimizing fire risk in urban settings is challenging, especially given the essential reliance on electricity and cooking appliances. Similarly, reducing population density to lower vulnerability is nearly impossible. Therefore, precaution plays a crucial role in fire risk reduction, encompassing public awareness, knowledge, and the ability to respond appropriately.

The community plays a crucial role in reducing the risk of fire incidents. Both individuals and society must strengthen and enhance their fire precaution capabilities, particularly in fire-prone areas such as high-rise buildings. They should be supported with warning systems, including warning signs and the dissemination of information in the event of a fire incident (Gowing et al., 2017). Through this precautionary strategy, the community can take appropriate action to minimize the loss of life, property damage, and environmental harm. Residential buildings should be equipped with information sources that provide fire warnings, evacuation routes, and designated gathering points in case of a fire. Gathering points are an essential component of fire incident management, serving as a precautionary measure to reduce fire-related risks.

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In the Sultanate of Oman, more than 30 percent of reported fires occurred in residential areas between 2010 and 2015 (OPWP, 2018). Even more concerning, from 2018 to 2020, home electrical fires resulted in over 30 deaths and 40 reported injuries. Over the past five years, more than 3,000 fires have occurred annually in Oman (OPWP, 2018), and the number of electrical fires continues to rise. A report issued by the Omani Public Authority for Civil Defense and Ambulance revealed that most home fires and fire-related casualties stem from three primary causes: air conditioners, electrical connection arcing, and lighting (The Public Authority for Civil Defense and Ambulance, 2018). Scientifically, fires occur in the presence of three key elements: oxygen, fuel, and an ignition source. Oxygen and fuel are typically abundant in the surrounding environment, while ignition sources—such as lighting, electrical arcs, or faulty wiring—often occur unexpectedly. Among these, the heat source is the most critical factor in the fire triangle.

Figure 1 illustrates the number of fire incidents in Oman from 2014 to 2022. The increasing trend in fire incidents has led to a rise in both fatalities and property losses. Conversely, fire incidents declined between 2018 and 2020 due to the onset of the COVID-19 pandemic. However, the percentage of fire incidents relative to the total number of reported fires remained high during this period. In the past two years, the number of fire incidents has risen again, underscoring the ongoing challenges of fire management in the country and the need for effective prevention and response strategies.

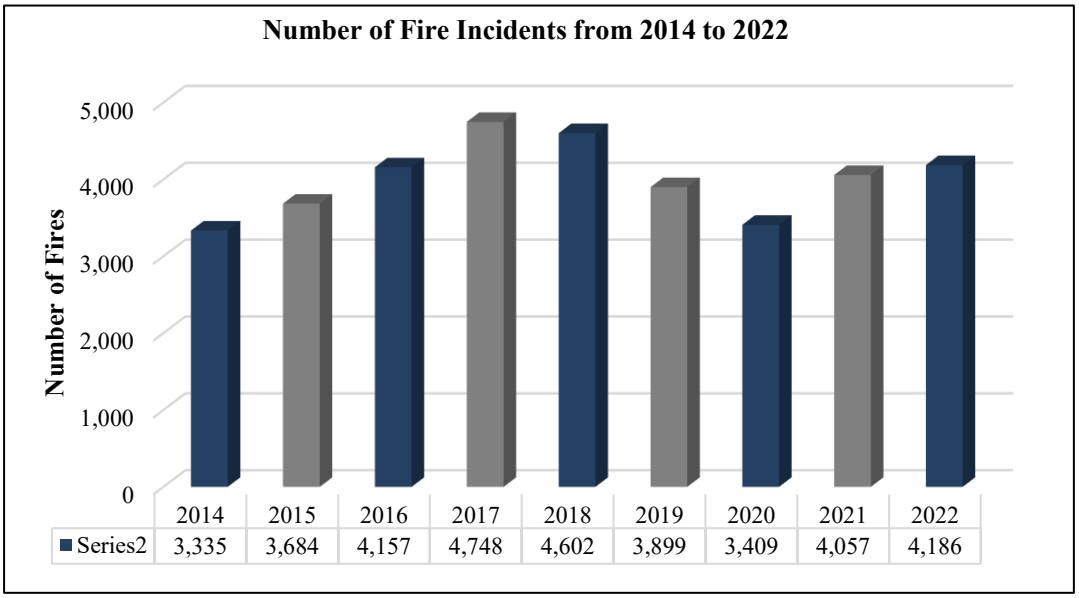

Figure 1. The Number of Fire Incidents from 2014 to 2022 (PACDA, 2022)

The rules and guidelines in Oman are established by the Public Authority for Civil Defense and Ambulance. These regulations are enforced by various organizations across the country. Unfortunately, inadequate fire safety precautions are considered a primary cause of fire incidents, particularly in residential buildings. According to the Group Chief Executive Officer of Muscat Insurance Company and Muscat Life Assurance Company, out of 11 fire incident claims settled in 2015, nine were disputed because the insured parties had failed to follow safety precautions (Wallington, 2016). He also noted that electrical wiring and cables were not routinely tested or inspected, and in some cases, substandard cable materials were used, contributing to fire incidents. Given these deficiencies, improving safety measures is essential for the protection of all stakeholders. Therefore, this study aims to assess the current level of knowledge and awareness among Omani residents regarding the causes and risks of electrical fires in residential buildings.

2. LITERATURE REVIEW

Precaution refers to actions taken to reduce the risk of disasters. Surveys conducted by Shokouhi et al. (2019) revealed that at least 75 percent of fires are preventable. A crucial aspect of fire precaution is the social responsibility of the community in preventing accidental fires, ensuring they do not start in the first place (Akhimien et al., 2017). To safeguard human lives and property, the Public Authority for Civil Defense and Ambulance (PACDA) recommends installing smoke detectors and using only approved gas connections. Additionally, great care must be taken when using electrical appliances, cooking gas, and other household equipment to minimize fire risks. Routine inspections of damaged electrical wiring and appliances can also help prevent electrical fires at home. The National Centre for Statistics and Information (NCSI) of Oman reported that the easy availability of firefighting tools can reduce response times for civil defense authorities (NCSI, 2022). PACDA officials have also urged residents to avoid overloading electrical outlets or charging multiple devices simultaneously, as these practices can increase the risk of fire.

In addition, the replacement and repair of all electrical wires that are old or frayed must be carried out as soon as possible (Brown et al., 2022). Rahman et al. (2022) emphasized that avoiding the placement of electrical cords in hazardous areas is essential, particularly in spaces with heavy usage that could compromise the wiring system. Residents are also advised to follow the manufacturer's instructions provided with electrical appliances to ensure safe usage. Fire service agencies are encouraged to conduct fire drills and demonstrations to educate residents on proper evacuation procedures and how to manage panic during fire incidents (Tawfik et al., 2019). Additionally, formulating and disseminating the codes of practice in collaboration with the Directorate General of Civil Defense could enhance the knowledge and awareness of Omani residents. Establishing fire safety standards as part of the national health agenda for the Sultanate of Oman would further strengthen preventive measures. A significant cause of residential fires in Oman is the lack of public awareness and knowledge about electrical safety. Many residents are unaware of the risks associated with overloading circuits, using substandard equipment, or neglecting proper electrical maintenance. This gap in understanding increases fire hazards, as highlighted by the Royal Oman Police and safety reports. Therefore, enhanced public education and awareness campaigns are crucial to reducing such incidents (Oman Observer, 2021).

2.1 Knowledge

Knowledge plays a crucial role in community preparedness for fire emergencies, particularly when individuals have limited time to decide on a course of action or are in a state of panic (Ding et al., 2021). Communities with greater awareness of fire risks tend to adopt more effective precautionary measures compared to those with minimal knowledge. Moreover, communities well-informed about fire management as a preventive measure are more likely to implement strong fire prevention efforts (Glauberman, 2020). The level of knowledge within a community can significantly influence individuals' attitudes and families' preparedness in anticipating disasters, especially for those living in fire-prone areas such as high-rise buildings (Arewa et al., 2021). Key indicators of individual and community knowledge include a fundamental understanding of fire incidents, their causes, early warning signs, and appropriate actions to take in the event of a fire. Larsen et al. (2021) emphasized that individuals must not only be aware of fire risks but also understand possible response actions and their consequences. For instance, using water to extinguish a grease fire is dangerous, whereas a fire blanket is a safer alternative.

Karemaker et al. (2021) found that elderly individuals perceived fire safety in their homes as their personal responsibility. When asked whom they trusted to provide reliable information about home fire safety, most respondents indicated that fire service agencies should take on this role. The fire service was regarded as trustworthy because "they know what they are talking about" (Karemaker et al., 2021).

However, Ding et al. (2021) revealed that many residents of high-rise buildings tend to have limited or even incorrect knowledge about fire situations, leaving them inadequately prepared in the event of a fire. Therefore, to encourage individuals to make informed preventive decisions, increasing public awareness and knowledge about fire risks and fire prevention measures is essential (Gerges et al., 2021; Larsen et al., 2021).

2.2 Awareness

Awareness is defined as an individual's perception of elements in their environment within a given space and time, their comprehension of these elements' significance, and their ability to anticipate future developments (Cvetković et al., 2022). Positive awareness is shaped and influenced by knowledge. The primary goal of precautionary knowledge is to instil a proactive attitude toward fire incidents, ensuring that fatal risks are avoided. It is not only important for individuals to understand the concept of fire safety, but also to be prepared to handle fire risks effectively, thereby minimizing the severity of fire incidents. Kim et al. (2021) emphasized that training and educating building occupants is a crucial component of any fire prevention system. While buildings may be equipped with various fire prevention devices, their effectiveness depends on occupants' awareness and familiarity with their functions. If individuals do not know how to use alarms or locate emergency exits, these devices will fail to fulfil their intended role in fire safety measures.

Omar et al. (2023) noted that human behaviour can become habitual, whether individuals are consciously aware of it or not. In some cases, this behavior aligns with fire-safe practices, such as keeping keys in a designated place at home or ensuring that electrical devices are switched off before leaving the house. However, unsafe habits, such as charging electrical devices overnight, have also been reported. Literature suggests a positive relationship between awareness and fire-safe behavior (Brown et al., 2022). It is expected that increased awareness will enhance residents' preparedness to adopt fire safety precautions (Stumpf et al., 2017). The findings of Trifianingsih et al. (2022) indicate that people generally desire to keep their homes safe from fire incidents. To achieve this, communities must develop security plans, actively share the information, and cultivate environmental awareness regarding fire risks. A notable gap in fire safety literature in Oman is the limited focus on public awareness, particularly in educating residents about electrical safety and emergency preparedness. This gap weakens the effectiveness of fire prevention strategies, underscoring the need for further research and community-based campaigns to enhance knowledge and promote fire-safe behaviors.

3. METHODOLOGY

This study employs a quantitative approach with a cross-sectional research design (Bougie & Sekaran, 2019). A self-administered questionnaire was used to collect information on residents' knowledge and awareness of fire incidents. The study's sample frame consists of occupants (both tenants and owners) of residential buildings in the Sultanate of Oman. Simple random sampling, a technique that selects participants based on their availability, was used to gather data (Bougie & Sekaran, 2019). To determine the sample size, this study follows the recommendation of Krejcie and Morgan (1970), who simplified sample size determination by providing a reference table to support effective decision-making. Given that the population of Oman is approximately 5.259 million, according to the National Center for Statistics and Information (NCSI, 2024), a minimum sample size of 384 is required to ensure representativeness (Cochran, 1977). In total, 973 residents responded to the survey.

3.1 Survey Instruments

The questionnaire was developed based on the final checklist of the electrical fire risk assessment, with appropriate modifications made to align with the context of residential buildings in Oman. The survey results were then used to establish appropriate weightings for different factors in the electrical fire risk assessment. As shown in Table 1, the survey questionnaire consists of three sections. In addition to collecting demographic data, it measures residents' awareness of fire hazards and their knowledge of the root causes of electrical fires. A three-point Likert scale, ranging from 1 (Yes) to 3 (No), was used to assess respondents' level of agreement with the measurement items.

Table 1 Summary of Questionnaire Structure

Part	Constructs	Items
A	Respondents' Profile	6
B	Awareness of the Fires	4
C	Root Causes Knowledge of Electrical Fires	10

To evaluate the level of knowledge, the total number of "Yes" responses in Section C: Root Causes Knowledge of Electrical Fires (Table 1) was recorded and analyzed. The overall score for this section was then categorized into three levels, ranging from "poor knowledge" to "good knowledge," as summarized in Table 2. A poor knowledge score indicates a low level of understanding of fire safety measures, where respondents lack information about fire prevention in their residential buildings and, consequently, may not know how to avoid fire hazards. Conversely, a high knowledge score reflects a strong understanding of fire safety measures, demonstrating that respondents possess extensive information on fire hazard prevention and are likely to apply this knowledge in the future.

Table 2 Level of Knowledge Score Classification

Level of Knowledge	Score Value	Interpretation
Poor Knowledge	0 – 3	Very Low
Moderate Knowledge	4 – 7	Average
Good Knowledge	8 – 10	Very Good

3.2 Data Analysis Method

To assess the community's knowledge and awareness of the causes and risks of electrical fires in residential buildings, this study employs descriptive statistical analysis and the Pearson Chi-Square test using SPSS software. SPSS is chosen for its efficiency in handling large datasets and its ability to generate clear insights into community behavior patterns. The Pearson Chi-Square test is used to analyze relationships between categorical variables, such as awareness levels and risk avoidance behaviors among respondents with different knowledge levels. This test helps determine whether the observed differences are statistically significant or merely due to chance. By combining these methods, the study ensures an accurate and meaningful analysis of the survey data.

4. RESULTS AND DISCUSSIONS

Table 3 presents the demographic profile of the respondents, showing that the majority (81%) fall within the 25- to 45-year-old age group. This group is generally well-educated and perceived to be the most informed about fire risks and causes. As a result, they are likely to learn about fire

safety quickly and respond effectively in emergency situations. Additionally, 77.7% of the respondents are employed, either as employees or employers, across both the private and public sectors. The functional status profile reflects a diverse range of residents in Oman, with the majority holding stable jobs. Therefore, they are more likely to have the financial capability to equip their homes with fire prevention equipment.

Table 3 Demographic Profile

Profile	Demographic Criteria	Frequency	Percentage (%)
Age Group	Less than 19 years old	10	1.0
	19 - 25 years old	61	6.3
	25 - 45 years old	788	81.0
	More than 45 years old	114	11.7
Functional Status	Job Seekers	53	5.4
	Housewife	75	7.7
	Students	41	4.2
	Workers/Employers	756	77.7
	Retirees	33	3.4
	Others	15	1.5
Education Background	General School	32	3.3
	General Education Diploma	181	18.6
	Diploma	195	20.0
	Bachelor Degree	422	43.4
	Post Graduate	129	13.3
	Others	14	1.4
Residential Type	Flat	147	15.1
	House	814	83.7
	Residential Complex	11	1.1
	Hotel	1	0.1

Next, 43.4% of the respondents hold a bachelor's degree, indicating that a significant portion belongs to the educated group. This group is often responsible for overseeing household and family safety and plays a crucial role in mitigating risks. Additionally, the majority (83.7%) of respondents reside in landed houses. Furthermore, most are homeowners, providing valuable insights based on their personal experiences and perspectives on residential fire safety.

4.1 The Current Level of Fire Safety Knowledge and Awareness

This section presents the findings on the current level of knowledge and awareness among Omani residents regarding the causes and risks of electrical fires in their residential buildings. Respondents were asked whether they had ever experienced a fire in their residential building. Figure 2 shows that the majority of respondents (74.1%) have never experienced an electrical fire in their homes. On the other hand, 20.9% reported having experienced an electrical fire in their residential building, which may have resulted in property damage or loss of life. Additionally, 5% of respondents stated that they had occasionally encountered electrical fires. Table 4 presents a crosstabulation of respondents' awareness of fire hazards based on their level of knowledge. Respondents' knowledge levels are categorized into poor, moderate, and good based on their scores. A comparison of awareness levels across these knowledge categories, using the Pearson Chi-Square test, reveals a statistically significant difference in awareness of fire hazards ($X^2 = 200.966$, $p < .05^*$), significant at the 1% level. This finding indicates that individuals with varying levels of knowledge exhibit different levels of awareness regarding fire safety.

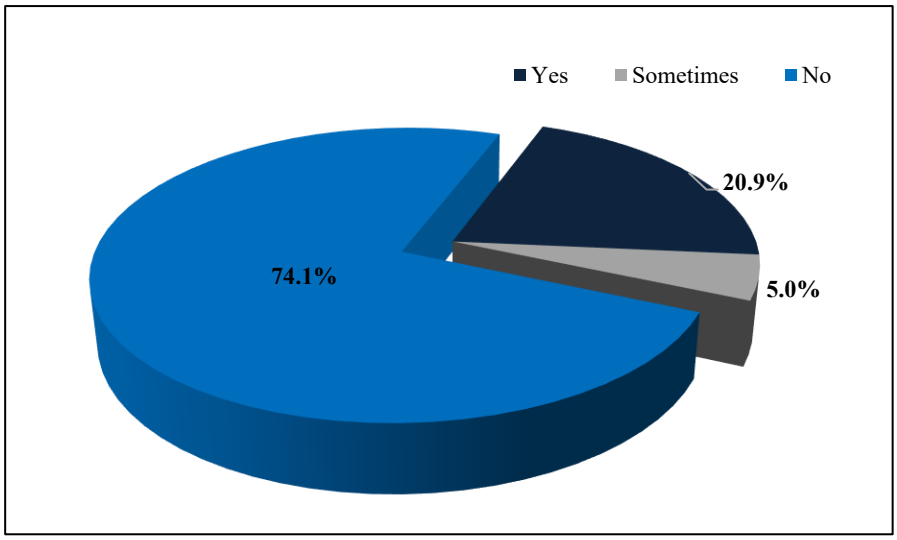

Figure 2. Respondents' Experience with Fire

Table 4 Crosstabulation of Awareness According to Level of Knowledge

Level of Knowledge	Awareness			Total	Pearson Chi-Square
	Yes	Sometime	No		
	n (%)	n (%)	n (%)		
Poor	188 (19.3%)	68 (7.0%)	78 (8.0%)	334	
Moderate	507 (52.1%)	24 (2.5%)	14 (1.4%)	545	200.966***
Good	91 (9.4%)	3 (0.3%)	0 (0.0%)	94	
Total	786	95	92	973	

Note: Pearson Chi-square is significant at *** 1% level, ** 5% level and * 10% level, respectively, using two-tailed tests.

Furthermore, the results in Table 4 indicate that 52.1% of respondents possessed moderate knowledge yet demonstrated good awareness of fire hazards. Additionally, 19.3% of respondents with poor knowledge also exhibited good awareness of factors that could start a fire. These findings suggest that individuals should possess at least a moderate level of knowledge to effectively recognize fire hazards and respond appropriately in the event of a fire. However, 8% of respondents with poor knowledge and 1.4% with moderate knowledge were unaware of fire hazards. This indicates that knowledge of fire causes remains inadequate, as some individuals still lack both knowledge and awareness. Therefore, enhancing local knowledge and awareness through fire safety interventions tailored to local building structures is critically important.

Next, Table 5 presents a crosstabulation analyzing the level of awareness regarding whether electricity can be a cause of fire, based on the respondents' knowledge levels. The Pearson Chi-Square test result ($X^2 = 10.419$, $p < .05$*) indicates a statistically significant difference at the 5% level, confirming that respondents with varying levels of knowledge exhibit different awareness levels concerning the role of electricity in fire incidents. Furthermore, the findings reveal that awareness of electricity as a fire hazard among respondents with poor knowledge increased by

approximately 32%, compared to their awareness of general fire causes (19.3%, as shown in Table 4). This suggests that, even among those with limited knowledge, there is a general understanding that electrical faults can contribute to fire outbreaks in residential settings. Unfortunately, the results also indicate that four respondents were unaware that fires can originate from electrical faults, highlighting a critical gap in knowledge that needs to be addressed through targeted fire safety education and awareness campaigns.

Table 5 Crosstabulation of Electricity Causes Awareness According to Level of Knowledge

Level of Knowledge	Electricity Causes Awareness			Total	Pearson Chi-Square
	Yes	Sometime	No		
	n (%)	n (%)	n (%)		
Poor	311 (32.0%)	19 (2.0%)	4 (0.4%)	334	
Moderate	525 (54.0%)	20 (2.1%)	0 (0.0%)	545	10.419**
Good	88 (9.0%)	6 (0.6%)	0 (0.0%)	94	
Total	924	45	4	973	

Note: Pearson Chi-square is significant at *** 1% level, ** 5% level and * 10% level, respectively, using two-tailed tests.

Table 6 presents a crosstabulation analysis to examine respondents' fire risk avoidance behavior based on their level of knowledge. In this context, risk avoidance behavior is assessed by evaluating whether respondents seek assistance from electrical technicians for electrical connections or maintenance. The Pearson Chi-Square test result ($X^2 = 118.583$, $p < .05$*) indicates a statistically significant difference at the 1% level, demonstrating that respondents with varying levels of knowledge exhibit different tendencies in adopting fire risk avoidance behaviors.

Table 6 Crosstabulation of Risk Avoidance Behavior According to Level of Knowledge

Level of Knowledge	Risk Avoidance Behavior			Total	Pearson Chi-Square
	Yes	Sometime	No		
	n (%)	n (%)	n (%)		
Poor	141 (14.5%)	174 (17.9%)	19 (2.0%)	334	
Moderate	408 (41.9%)	118 (12.1%)	19 (2.0%)	545	118.583***
Good	79 (8.1%)	10 (1.0%)	5 (0.5%)	94	
Total	628	302	43	973	

Note: Pearson Chi-square is significant at *** 1% level, ** 5% level and * 10% level, respectively, using two-tailed tests.

The majority of respondents (64.5%) adopted a risk avoidance strategy by seeking assistance from electrical technicians for electrical connections or maintenance, regardless of whether they had poor, moderate, or good knowledge. In contrast, an equal proportion (2%) of respondents with poor and moderate knowledge chose not to avoid risk. This suggests that these individuals attempt to handle electrical connections or maintenance themselves despite lacking sufficient knowledge, potentially exposing themselves to fire hazards. Despite the high risk and repeated fire incidents in the study community, there are still individuals with low awareness of the importance of seeking professional help from electrical technicians.

The results indicate a significant difference in awareness of electricity as a fire hazard based on respondents' level of knowledge. Among those with moderate knowledge, 54% were aware that electricity could cause a fire, compared to only 32% of those with poor knowledge recognizing this risk. However, despite this awareness, there remains a noticeable gap in actual risk avoidance behavior. While 64.5% of respondents sought help from electrical technicians, a substantial 31% only sometimes did, reflecting inconsistent safety practices. Moreover, 4.5% of respondents did not seek professional help at all, exposing themselves to a higher risk of electrical fire incidents. Interestingly, even among respondents with moderate knowledge who had the highest awareness level only 41.9% consistently avoided risks by seeking professional help. This suggests that knowledge alone does not always translate into safe behavior. The contradiction is even more pronounced among those with poor knowledge, where 17.9% only sometimes sought help, and 2% did not avoid risk at all, possibly attempting to handle electrical issues themselves despite their limited understanding. These findings underscore the need for stronger fire safety programs that go beyond raising awareness to actively promote responsible risk avoidance behaviors. Encouraging people to consistently seek professional help when dealing with electrical hazards is crucial for improving practices.

Table 7 Comparison of Fire Safety Knowledge, Awareness, and Risk Avoidance Behaviors

Knowledge Level	Percentage of Respondents	Fire Hazard Awareness (% "Yes")	Awareness of Electricity as Cause (% "Yes")	Risk Avoidance (%)	Behavioral Observations
Poor	34.3% (334/973)	56.3% (188/334)	93.1% (311/334)	42.2% (141/334)	High risk behavior; some respondents unaware of hazards or fail to seek expert help.
Moderate	56.0% (545/973)	93.0% (507/545)	96.3% (525/545)	74.9% (408/545)	Fairly informed; however, 12.1% only sometimes avoid risk.
Good	9.7% (94/973)	96.8% (91/94)	93.6% (88/94)	84.0% (79/94)	Strong awareness and behavior alignment; still, some inconsistency in technician engagement.

Table 7 presents a comparison of different levels of fire hazard awareness and the corresponding risk avoidance behaviors, highlighting a critical gap in the practical application of electrical safety principles among residents. Individuals with higher awareness particularly those who recognized faulty wiring, overloaded circuits, and improper appliance usage as fire hazards were significantly more likely to adopt engineering-recommended safety measures, such as hiring certified electrical technicians for maintenance and system checks. These behaviors align with core electrical engineering standards that emphasize system reliability, proper load distribution, and adherence to safety codes.

Conversely, individuals with lower awareness frequently engaged in non-compliant behaviors, including self-handling electrical faults and neglecting preventive inspections both of which increase the likelihood of system failure and fire incidents. This discrepancy underscores the need to extend engineering education beyond technical domains and integrate it into community-level awareness programs. Furthermore, the findings support the necessity of incorporating human behavior modelling within fire risk assessment frameworks, particularly in the design and operation of residential electrical systems.

Inadequate public understanding and behavioral inconsistencies can undermine even the most robust engineering solutions. Therefore, this study emphasizes that engineering safety must be reinforced not only through technical interventions—such as AFCI installations and system design standards—but also through educational strategies that promote awareness-driven, risk-averse behaviors among building occupants.

5. CONCLUSIONS AND RECOMMENDATIONS

Fire poses a severe hazard in both developing and developed countries, threatening human life, structures, property, and environmental safety. In Oman, limited knowledge and awareness regarding fire safety measures in residential buildings remain a concern. This study aims to address this issue by assessing the current level of knowledge and awareness among Omani residents regarding the causes and risks of electrical fires in residential buildings. The findings reveal that 9.4% of respondents acknowledged having knowledge of certain fire safety issues, while 8% admitted to a lack of awareness. This result is encouraging, as occupants' knowledge and awareness serve as essential precautionary fire safety measures. Furthermore, respondents emphasized the need to strengthen measures in residential buildings to protect lives and property in the event of a fire. They also expressed that fire safety should be a key priority for both designers and property managers, given the challenges associated with evacuating people and property during a fire outbreak. Notably, most respondents agreed that fire prevention measures should be a critical consideration in the design of high-rise buildings.

Overall, the results indicate that knowledge plays a crucial role in raising awareness about the root causes of fire and the potential risks of electrical fires. A higher level of knowledge enables individuals to react promptly before a fire escalates and poses a serious threat to lives and property. In the Sultanate of Oman, there remains a segment of the population with limited knowledge about the causes of electrical fires and a lack of awareness regarding fire risks. This underscores the urgent need for intervention programs to enhance public knowledge and increase awareness, ultimately helping to reduce fire incidents. Consistent with previous studies (Guo & Wu, 2015; Wei, 2013), the findings reveal inadequate understanding of fire hazards (particularly electrical safety) and a low perception of fire risks among Omanis. These insights highlight the necessity of comprehensive fire safety education initiatives to improve public preparedness and risk mitigation strategies.

Building occupants play a crucial role in ensuring that fire safety measures are maintained at the highest possible standard. Therefore, it is recommended that architects and builders integrate fire safety measures into residential building designs by strictly adhering to building codes and standards. Additionally, proper installation of fire-sensitive systems and fire suppression components should be prioritized. Compliance with these codes and standards plays a vital role in containing and extinguishing fires, minimizing smoke spread, and ultimately protecting lives and property. Furthermore, residents should be well-educated on fire safety practices, as increased awareness can help prevent fire incidents and mitigate the unnecessary spread of fires in case of an outbreak.

To enhance fire safety awareness in Oman, a comprehensive framework should be developed, focusing on public education, regulatory enforcement, and collaborative implementation. Educational campaigns should inform the public about electrical fire risks and safety practices, with an emphasis on community-based training covering fire risks, safe appliance usage, and evacuation procedures. Architects and builders must integrate fire safety measures into building designs by strictly adhering to fire safety codes and ensuring the installation of detection and suppression systems. A strong regulatory framework should enforce strict compliance with safety standards, complemented by collaborations between government authorities, property managers, and community organizations to ensure effective implementation. Additionally, ongoing research and data-driven insights should guide the continuous improvement of this framework. Addressing the root causes of electrical fires and enhancing preparedness strategies will be essential to safeguarding lives and properties.

5.1 Recommendations for Fire Risk Mitigation

A structured fire safety framework should be developed to enhance fire prevention and risk management in Oman. This framework should integrate risk assessment, regulatory enforcement, technological advancements, and public awareness to establish a comprehensive approach to fire safety.

Enhancing fire safety education and awareness is essential. Public campaigns should educate residents about electrical fire risks, safe appliance usage, and emergency responses. fire prevention should be incorporated into schools, workplaces, and community programs, while fire safety guidelines should be included in rental agreements to promote responsibility among tenants.

Strengthening fire safety regulations and compliance is necessary to enforce preventive measures. The mandatory installation of AFCIs, smoke detectors, and fire suppression systems should be required in all residential buildings. Regular inspections and penalties for non-compliance must be strictly enforced. Additionally, a centralized fire incident database should be established to facilitate data-driven safety strategies.

Improving building design and fire protection systems should also be a key component of this framework. Architects and builders must adhere to fire safety standards by incorporating fire-resistant materials, especially in high-rise buildings. Mandatory electrical wiring inspections should be implemented, and modern fire detection and suppression systems should be installed in all residential structures to minimize fire hazards.

Encouraging research and technological innovations will further advance fire prevention strategies. Research should focus on fire risks, climate impact, and prevention methods, while smart fire detection systems using IoT and AI should be adopted. Additionally, government incentives should promote the integration of modern prevention technologies in both new and existing buildings.

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