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IMPLEMENTATION OF KNOWLEDGE TRANSFER OF FIRE SAFETY AT HOME THROUGH A COMMUNITY PROGRAM

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ABSTRACT

Fire safety is commonly enforced and practised across all industries in Malaysia. However, fire safety practices among individuals are often not applied in residential areas because they feel or perceive homes are safer (i.e., it is where they live and they believe they are familiar with what goes on in their own home) than workplaces. Because of such perception, house fires remain a serious threat, especially in densely populated areas. Faulty wiring, overloaded power sockets, and unattended stoves or candles are common causes of house fires, according to the Malaysian Fire and Rescue Department. This paper presents a community program aimed at raising awareness and providing basic knowledge of home safety, enabling residents to practice preventive measures early to reduce the risk of serious accidents. The program addressed significant gaps in fire safety awareness and preparedness, targeting residents of Taman Sri Pulai in Skudai. Researchers from UTM collaborated with the mosque committee and *Komuniti Rukun Tetangga* (KRT) to implement a comprehensive program involving knowledge transfer from agency and industry experts. The program featured exhibitions, talks, and demonstrations conducted by industry representatives and the Malaysian Fire and Rescue Department. A survey on home fire safety–safety awareness, preparedness, and practices–was conducted during the program and participated in by 116 individuals. The analysis of responses indicated that 84 percent of participants knew the causes of fire, and 72 percent knew how to put out fires at home. The analysis also revealed that many residents lacked a fire extinguisher at home. The program highlights the importance of targeted education in promoting community safety and underscores the value of leveraging industry expertise for public education.

Keywords: Community awareness; emergency response; fire safety; industrial collaboration; knowledge transfer.

1.0 INTRODUCTION

1.1 Cases of Home Fires

The statistics for investigations involving residential fires in 2024 were 5,757 cases as reported by the Malaysian Fire and Rescue Department (JBPM). Fires involving residential properties showed an increasing trend, with 5,267 (in 2023), 4,669 (in 2022), and 4,177 (in 2021) [1]. Resistance heating, gas equipment (i.e. cooking gas), and sparks/short circuits are the top three ignition sources of fires reported by JBPM. In conjunction with these statistics, it can be concluded that

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unsafe conditions or a lack of safety awareness at home are contributing factors to fire incidents among homeowners and occupants.

On March 16, 2024, at 5:13 a.m., the Selangor State Fire and Rescue Operations Center (PGO) of JBPM received an emergency call regarding a two-storey house fire in Damansara Utama. The rescue team successfully rescued one victim, while two other victims were found dead. The fire was completely extinguished at 6.00 am. The narrow operating route and limited visibility due to the dark conditions are the main challenges of the operation. A total of 61 members from JBPM and agencies were involved in this operation. An estimated 70 percent of the house was destroyed, and the fire was found to have originated in the main bedroom on the upper floor of the residence and the kitchen area on the ground floor [2].

On July 9, 2024, eighteen houses of Kampung Kuala Abai, Sabah, were engulfed in fire. The fire covered an area of 3,600 square meters (11,811 square feet). The Malaysian Fire and Rescue Department extinguished the fire using 500 feet of hose, two streams, three water sources from machinery tanks, and nearby open water, i.e., river. Firefighters created a fire break and successfully saved 35 houses. The operation concluded at 8:40 pm, with no casualties reported [3].

The Uniform Building By-laws (UBBL) 1984 mandate fire safety, including the provision of means of escape (i.e., accessible exits in case of fire), the use of fire-resistant materials, and a fire detection and suppression system, specifically detectors and fire extinguishers. Despite these safety requirements, almost every house has security grilles installed on windows and doors to prevent burglary. While these security grilles improve security, they can obstruct emergency exits during a fire. Occupants may be unable to find keys to unlock the grilles, and sometimes, the grilles or locks become rusty and fail to open. This situation creates a conflict between fire safety and security needs, increasing the likelihood that occupants will fail to evacuate in an emergency [4]. On February 13, 2025, five people were killed in a house fire. The victims could not escape because all the doors had iron grilles, which were also locked [5].

Fires at home are usually started from a small, manageable incident. If the fire were not controlled immediately, it would spread rapidly and cause severe damage to property within seconds. Unfortunately, many Malaysian homes lack basic firefighting tools (e.g., fire extinguishers), making it harder to control fires early. Fires can be stopped if occupants understand how to interrupt the fire triangle – removing fuel, cutting off oxygen, or eliminating ignition sources.

1.2 Studies on Community Preparedness for Fire Hazard

Conducting case studies on fire safety measures in residential areas could offer valuable insights into practical preparedness and procedures. Manan et al. [6] investigated fire risk across different building types in Selangor using Brushlinsky's approach. The information includes the number of fire cases broken down by building types, the number of fire cases reported by Selangor fire stations, the number of fatalities reported by Selangor fire stations, and the causes of fire as reported by Selangor fire stations. Since all of these data were recorded annually, the three approaches were employed to elucidate conclusions from the data structure. The Poisson distribution (i.e., a discrete probability) was used to predict the number of fire events in a given time interval, assuming that fires occur according to a Poisson process. Fire occurrences occur randomly and spontaneously. Applying Brushlinsky's methodology can divide the assessment of fire hazards into three categories: the risk of a person perishing in a fire, the likelihood of a person coming into contact with a fire, and the likelihood of a person perishing in a fire [6]. The study found that most fire cases occur in residential and commercial buildings.

Implementing fire risk management techniques that leverage the comprehensive fire risk models can improve building fire safety ratings, reduce fire risk, and minimize consequential damage. The impact of fire hazards can be minimized through disaster management efforts. Disaster management itself consists of several stages, one of which is preparedness. Preparedness is a series of activities carried out to anticipate disasters through effective and efficient measures. Increasing community preparedness for fire disasters aims to train people not to panic during disasters and to reduce losses. A community's preparedness can decrease over time, particularly with the occurrence of socio-cultural, political, and economic changes in society [7]. It is necessary to share knowledge of fire safety precautions as part of community preparedness and to maintain and increase preparedness continually.

The likelihood of a fire can be reduced through educational strategies, such as training, exhibitions, and campaigns, to raise public awareness and understanding of fire safety and associated hazards. Moreover, residents or the community can benefit from implementing fire training programs, which help them better understand situational skills and knowledge pertinent to a particular context, thereby streamlining emergency response operations and enhancing procedures for handling fires amid outbreaks.

While workplace fire safety is regulated, residential fire preparedness in Malaysia remains poorly studied, particularly regarding knowledge transfer from industry to communities. An all-encompassing strategy is necessary to address fire safety concerns, particularly among residents. This may involve developing educational workshops to increase engagement among the community. Additionally, local authorities and stakeholders can play a crucial role in helping communities become more knowledgeable about fire safety by organizing exhibitions and sharing best practices for safety.

To improve the community's overall preparedness and resilience against fire events, it is recommended that residents be educated about safety practices. For example, a community program that organizes fire drill simulations or

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demonstrates how to use fire extinguishers to put out a fire. Participation in the community program will demonstrate residents' concerns for one another's safety and resilience.

This paper presents a community program and a survey conducted among residents of Taman Sri Pulai, Skudai. The community program was a transfer of fire safety knowledge from industrial best practices to Taman Sri Pulai residents. The objective of the community program is to instill among residents an awareness of and a general understanding of home fire safety. The industry, agency, and university should share knowledge and best practices with the community rather than working individually and not contributing to it. The survey is to obtain prior knowledge of the community as well as their demographic.

2.0 METHODOLOGY

2.1 Planning and Running the Community Program

The Safe Neighbourhood Community Program was held on 8 December 2024 at Taman Sri Pulai Mosque in Skudai, Johor. The program was initiated because agencies and ministries highly emphasize safety in the industry or workplace. However, the emphasis on home safety is not as great as on workplace safety because there are no regulations to protect home safety. Hence, as an initiative, this program collaborated with the Taman Sri Pulai Mosque, members of the Taman Sri Pulai *Komuniti Rukun Tetangga* (KRT), Fire and Rescue Station (BBP) Skudai, and one industry.

Each collaborator supported this program through various opportunities available. The Taman Sri Pulai Mosque committee provided space and facilities for its implementation. Moreover, the Fire and Rescue Station (BBP) Skudai played a crucial role in giving practical exposure to home safety, focusing primarily on electrical and gas safety, to the participants. The industry collaborator gave talks on chemical safety at home and shared their knowledge through an informative exhibition.

Program activities include talks, demonstrations, quizzes, exhibitions, surveys, and lucky draws. The main attraction of this program is the safety demonstration led by PKPgB Tc. Saifulbahri Bin Safar and his team. The demonstration illustrates the initial steps to extinguish a cooking gas fire and the correct procedure for escaping from home during an emergency. Next, the firefighters from BBP Skudai also shared basic knowledge and skills of the *Sedia Urus Risiko Isi Rumah* (ISURI) with the Taman Sri Pulai community, providing helpful guides for housewives on how to respond to a fire.

2.2 Survey

A survey questionnaire is prepared to collect data on community safety awareness. To design the question, both independent and dependent variables were first identified. Independent variables are the causes, predictors, or conditions being tested. On the other hand, dependent variables are the factors measured to determine the outcome of changes in the independent variable. The list of variables for this study is shown in **Table 1**.

Table 1. Independent and dependent variables of community safety awareness

Independent Variables	Dependent Variables
a. Age and gender group b. Knowledge of common causes of home fires, and emergency numbers c. Awareness of electrical outlet hazards d. Ability to identify fire hazards	Safety Awareness
a. Presence and knowledge of fire extinguisher use b. Accessibility of emergency numbers	Safety Preparedness
a. Practices and regular checks of electrical appliances b. Staying in the kitchen while cooking and keeping flammable objects away from the stove	Safety Practices

The survey questions were then developed based on the independent and dependent variables. The independent variables in the context of the home fire safety questionnaire include demographic factors, awareness, preparedness, and practices. The dependent variables are assessments of family knowledge, preparedness, and practices related to fire safety. The questions are categorized into multiple sections – safety awareness, preparedness, practices, and demographics – as listed in **Table 2**. The survey questions were shared with an expert for review and comment.

Given that the community will respond to the survey, the questions are designed using simple, straightforward language. During the program day, the survey was distributed via a QR code that linked to a Google Form, in hard copy, and through in-person interviews. Participants who had difficulty answering the questions were assisted by the program's committee.

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Table 2. List of sections prepared for the survey.

Section 1: Demographics
1. Name 2. Age 3. Gender
Section 2: Safety Awareness
1. Do you know the causes of a house fire? Provide examples of fire causes: 2. Do you know the emergency number? State the emergency number:
Section 3: Safety Preparedness
1. Do you know the ways to extinguish fire at home? 2. Do you have a fire extinguisher at home?
Section 4: Safety Practices
1. The electrical appliances in your home have the SIRIM seal.

2.3 Analysis of Responses

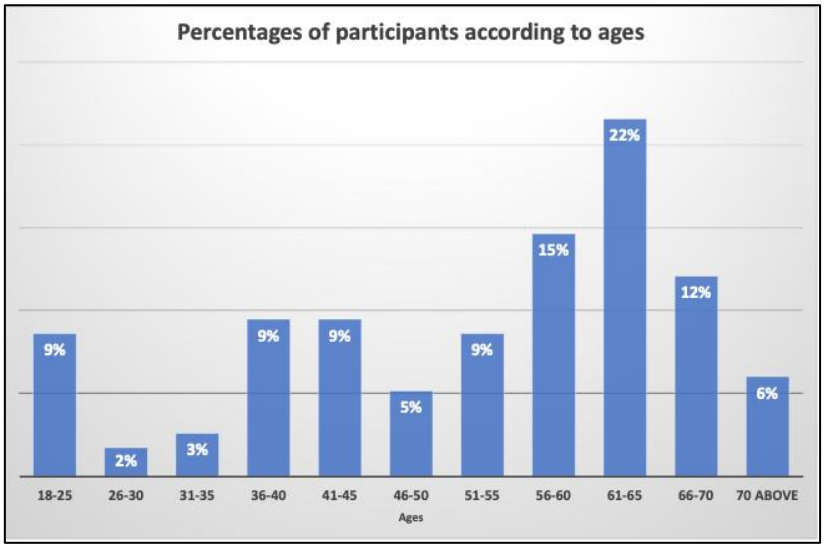
Questions in Sections 2 to 4 provide 'YES' and 'NO' as the options of answer. Hence, a descriptive analysis is used in the study to organize the raw data, identify patterns, and provide a clear overview of responses. All analyses are conducted in Microsoft Excel to produce results as percentages. Additionally, Microsoft Excel is an effective tool for descriptive analysis, particularly for surveys.

3.0 RESULTS AND DISCUSSION

This section presents the analysis of survey responses on fire safety awareness, preparedness and practices. The correlation between age, gender, and fire awareness is also discussed in this section.

3.1 Analysis of Survey Responses

The total number of individuals attending the program is 118. However, voluntary participation in the survey is 116, comprising 55 men and 61 women, residents of Taman Sri Pulai. Another two respondents declined to participate in the survey. **Figure 1** shows the percentages of participants who responded to the survey by age. The program was attended mainly by individuals aged 56-60, 61-65, and 66-70. These age groups are the senior citizens, who would have the time and interest to join a community program in the neighbourhood. Young adults and adult participants, aged less than 55 years old, also attended and participated in the program. **Figure 2** shows that the bulk of responses are from female and older groups, as the program was held on a day when most men were at work. The analysis of the survey among Taman Sri Pulai residents highlights important patterns in fire safety awareness and their relationships with demographic variables, such as gender and age.



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Figure 1. Percentages of participants based on age.

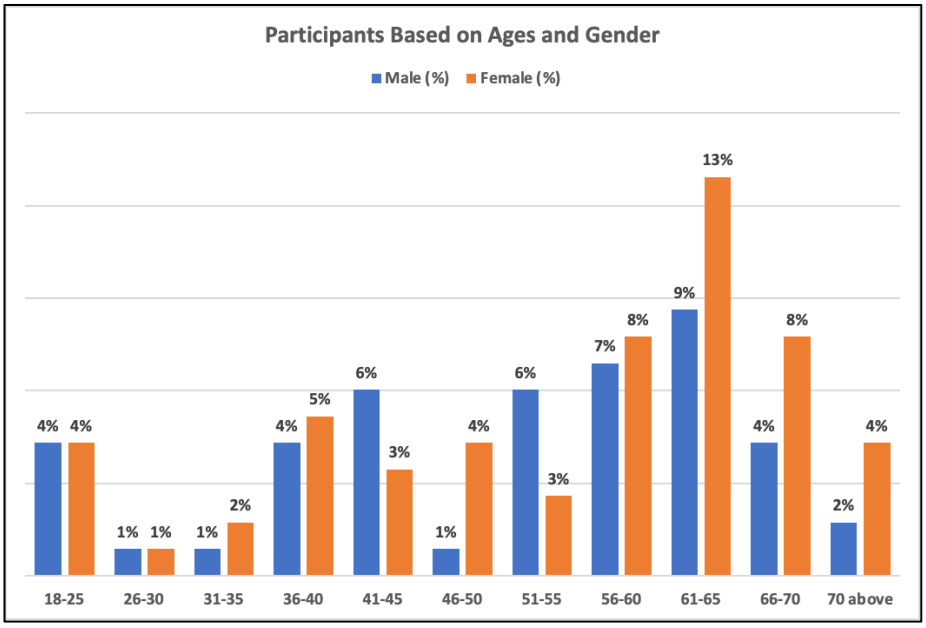
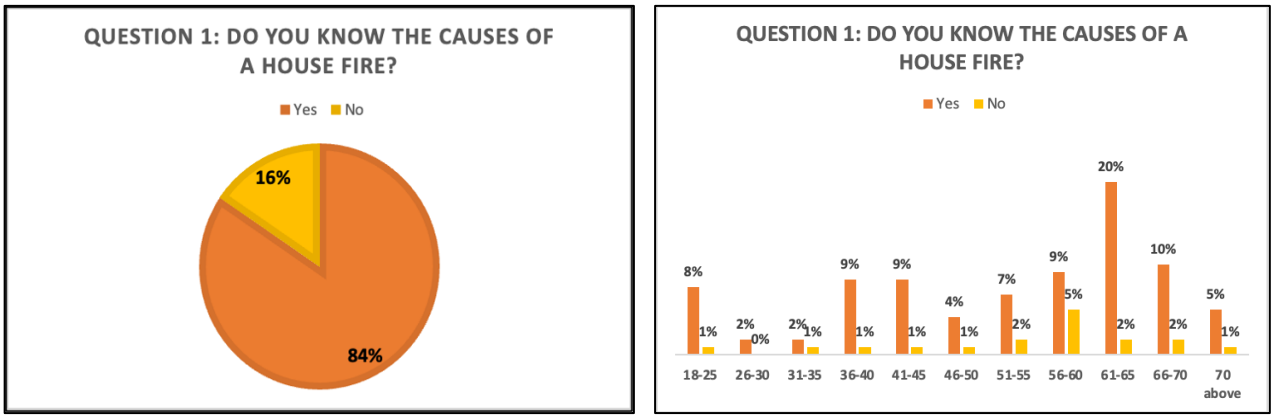


Figure 2. Percentages of participants based on age and gender.

Question 1 of the awareness section shows that 84 percent of participants are aware of and understand the causes of home fires (see **Figure 3a**). Respondents aged 61–65 recorded the highest number. Unfortunately, participants of all ages have individuals who do not know the causes of house fires. There was a significant association between education level and awareness of fire safety measures, indicating that higher levels of education were associated with greater awareness [8]. Attending a fire safety course could improve knowledge levels compared to those who did not attend any course. The study showed that respondents had a good level of awareness of fire safety. Continued improvement in individuals' knowledge and awareness of fire safety is crucial to ensure they can respond to emergencies.



(a) (b)

Figure 3. Responses to the question of knowing the causes of a house fire according to (a) percentages by total participants and (b) percentages by ages.

Figure 4 shows that 87 percent of participants know the emergency numbers to contact. The emergency number in Malaysia is 999, which consists of agencies, particularly the Royal Malaysian Police (PDRM), Malaysian Fire and Rescue Department (JBPM), Ministry of Health Malaysia (Ambulance services) (KKM), Malaysian Civil Defence Department (APM), and Malaysian Maritime Enforcement Agency (APMM). The percentage derived from the data gathered indicates that the majority of respondents are aware of the reasons behind home fires and are aware of the emergency number. Table 3 lists participants' responses and feedback regarding the cause of fire and the emergency number.

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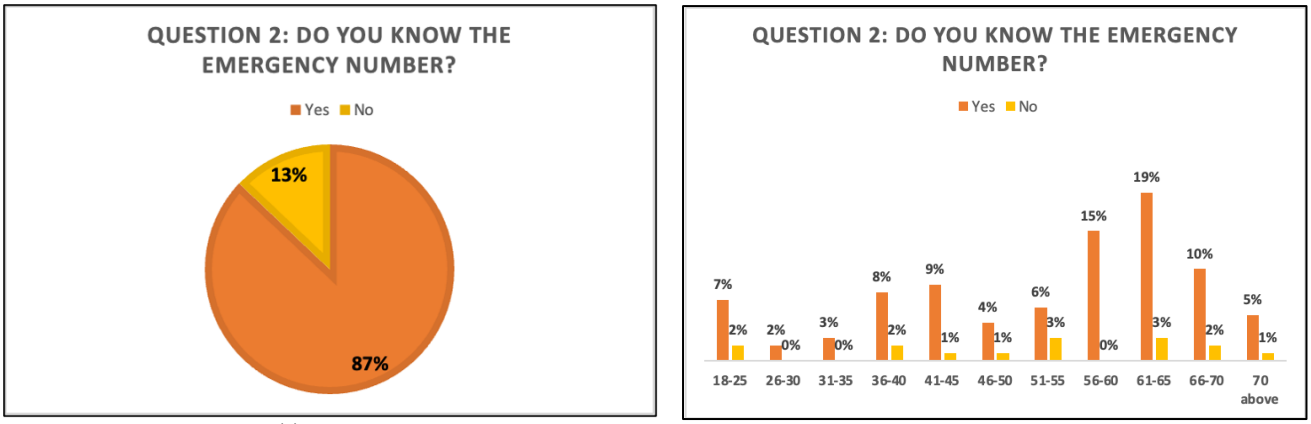


Figure 4. Responses to the question of knowing the emergency number according to (a) percentages by total participants and (b) percentages by ages.

Table 3. Responses from the residents of Taman Sri Pulai, Skudai

Questions	Resident's response
Do you know the causes of a house fire? Provide examples of fire causes:	Short circuit
	Electrical equipment/overload
	Gas leak
	Candles and match
	Leave cooking unattended
Do you know the emergency number? State the emergency number:	999

Question 3 of the survey to evaluate the preparedness of individuals or the community should they face a small fire at home. The responses to the question indicated that 72 percent of participants knew how to put out a small fire at home (see **Figure 5**). The next question asks respondents whether they have a fire extinguisher at home or not.

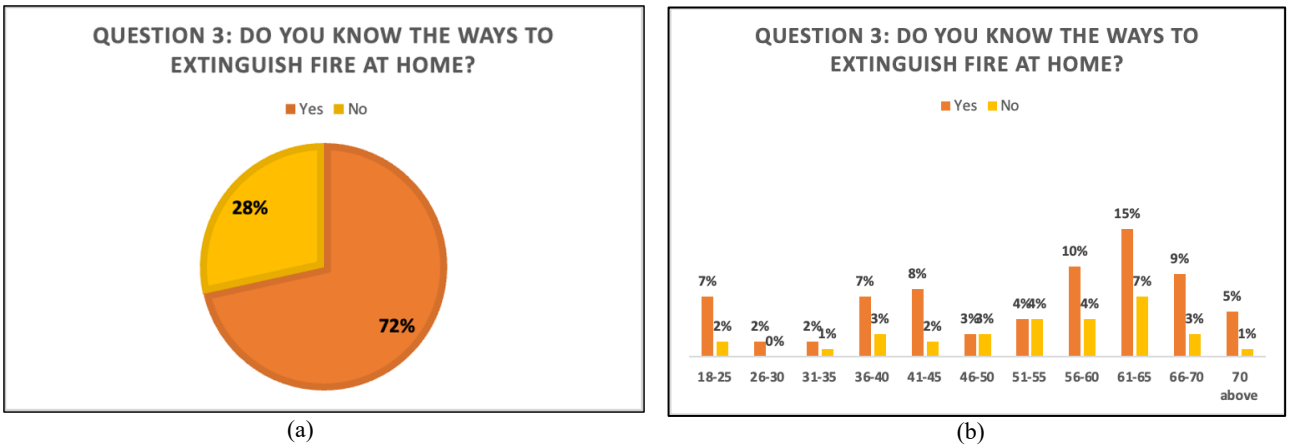


Figure 5: Responses to the question of techniques to extinguish fire at home according to (a) percentages by total participants and (b) percentages by ages.

Figure 6 shows that 67 percent do not have a fire extinguisher at home. Most people of all ages are aware of how to put out a fire if one breaks out at home. The most significant percentage, however, was recorded by responders between the ages of 61 and 65, with 8 of them still unable to put out a fire. Furthermore, the graph shows that most people of all ages do not have a fire extinguisher at home. Among respondents, 21 people reported not having a fire extinguisher at home; those aged 61-65 again reported the highest number.

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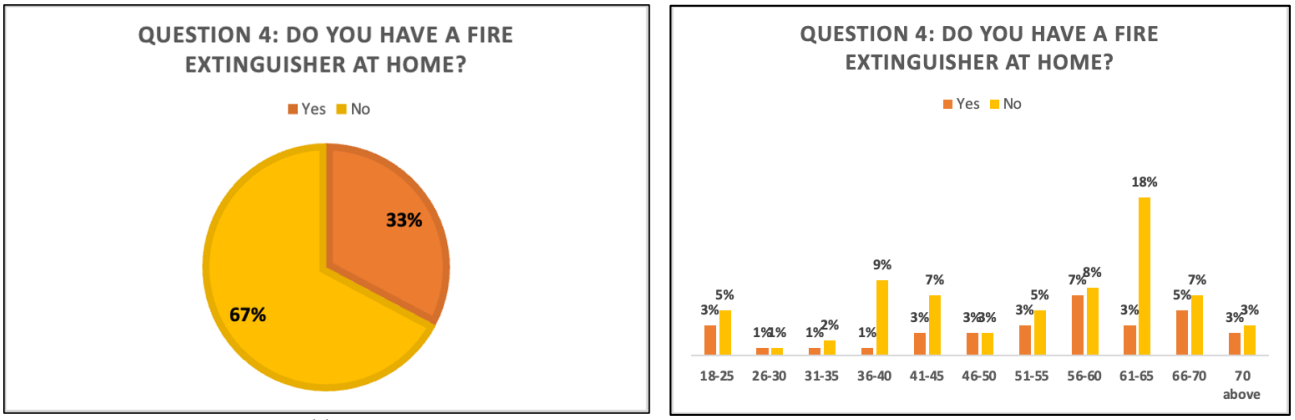


Figure 6. Responses to the question of a fire extinguisher at home according to (a) percentages by total participants and (b) percentages by ages.

Under the Electricity Regulations 1994 [9], a Certificate of Approval (COA) from the Energy Commission is necessary for electrical and electronic goods. The Standard and Industrial Research Institute of Malaysia (SIRIM) tests the safety and efficiency of electrical and electronic equipment to ensure they are safe to use and perform optimally before they enter the marketplace. **Figure 7** indicates that 95 percent of participants ensure their electrical equipment has an SIRIM stamp. Somehow, a few responders aged 36-40, 41-45, 56-60, and 61-66 reported that they still lack SIRIM-stamped electrical appliances.

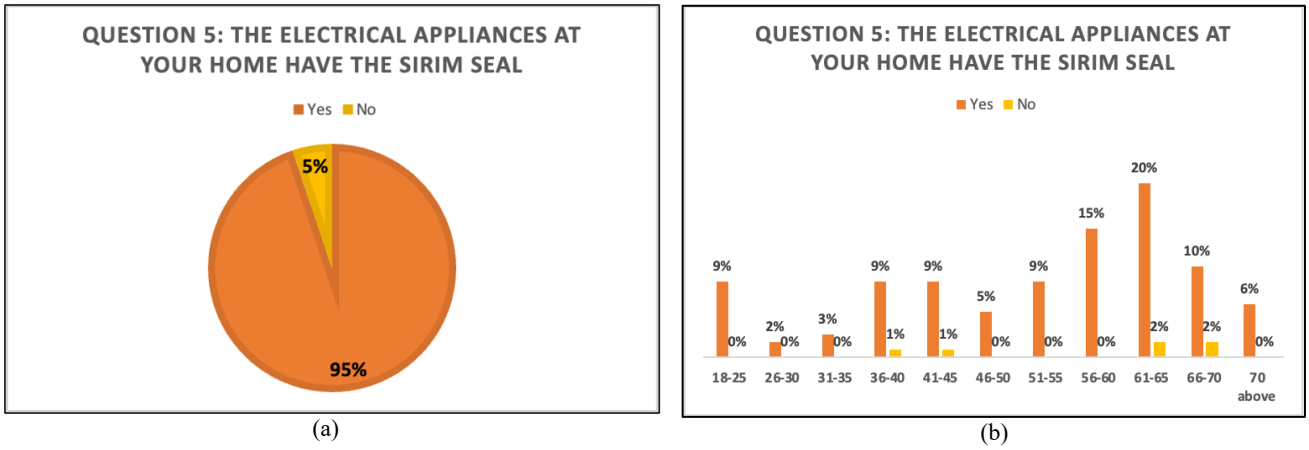


Figure 7. Responses to the question of electrical appliances have the SIRIM seal according to (a) percentages by total participants and (b) percentages by ages.

3.2 Correlation Between Age, Gender, and Fire Awareness

Understanding the relationship between demographic characteristics, such as age and gender, and the severity of fire incidents is essential for proposing targeted fire safety measures. By examining questionnaire responses, incident reports by age and gender, and patterns of fire incidence, we can highlight the hazards and training requirements of different groups. This section discusses the data's findings, highlighting its implications for fire safety knowledge, preparedness, and response tactics.

The awareness, preparedness, and practices of different age groups influence the results of fire situations. Individuals between the ages of 18 and 35 tend to have greater physical mobility and respond more quickly to emergencies [10]. During an emergency, an individual selects an exit depending on their physical condition (e.g., age and physique) and immediately moves toward it as quickly as possible [11].

Specific educational or training initiatives that emphasize safe appliance use and rapid evacuation techniques could significantly lower the risk. Many participants reported that they did not have basic firefighting supplies at home, such as extinguishers. Many houses in Malaysia prioritize security over the safety of occupants; they often feature door and window grills instead of smoke detectors, fire extinguishers, and escape windows. The information suggests that

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complacency or a misguided faith in their ability to manage situations may be contributing factors to vulnerability to fire-related incidents. However, their lack of fire extinguishers and inadequate knowledge about fire safety precautions make them more susceptible to fire mishaps.

Workplace fire safety training and incentives for installing home safety devices are two ways they could improve their fire safety procedures. Despite fewer fire incidents, the elderly remain the most vulnerable due to decreased mobility, slower reaction times, and reliance on outdated safety equipment [11], [12]. Targeted interventions, such as installing automatic fire suppression systems and providing individuals with fire safety training, are crucial for this population. Additionally, making evacuation plans easier to follow and installing fire alarms that are easily accessible can significantly reduce risks.

3.3 Community-based Engagement Initiatives for Improving Fire Safety

Participants working in the industry are usually trained in fire safety. The knowledge of occupational fire safety procedures can be applied to both their home and workplace. Males showed more confidence in their capacity to handle fire situations, which frequently resulted in an overestimation of their preparation levels. Their vulnerabilities are further increased by behavioural characteristics, including risk-taking tendencies and an unwillingness to ask for help—male victims of disasters are viewed as less likely to be fatal and to result in larger financial losses. Compared to female fire victims, the level of dread was far lower [13]. In addition, females experienced fewer overall fire occurrences but were at a higher risk of home fires.

A substantial number of women were unfamiliar with fire prevention methods, particularly those related to electrical safety and cooking. Additionally, high-risk behaviours, such as using electrical appliances without proper inspection or cooking unattended, could lead to fires. In terms of awareness, preparedness, and practices, females tend to have fewer resources in the home and are more likely to feel at risk of losing them. The physical susceptibility to disasters and the diminished capacity to respond appropriately to them heighten sensitivity and anxiety. Consequently, females were more concerned with the threat to life posed by fire than males were, as evidenced by their initial focus on evacuating family members, while males sought to locate the fire's source [14].

Fire safety practices indicated that knowledge alone did not translate into effective behavioural change [15]. Effective programs such as practical training sessions, fire drills, and community-based engagement initiatives should be prioritized to strengthen fire safety and reinforce behavioural change. The interaction of age, gender, and fire severity highlights the need for targeted interventions tailored to specific demographics (see **Figure 8**). Age-appropriate awareness campaigns can significantly enhance the effectiveness of fire prevention initiatives and emergency preparedness in the community [16]. Campaigns that incorporate technology, such as virtual fire drills and smartphone applications offering fire safety advice, are particularly beneficial to younger audiences. In addition to engaging the younger, tech-savvy generation, these technologies ensure they have instant access to vital information in an emergency.

Regular reminders about applying safety knowledge and procedures, both at work and at home, are crucial for middle-aged individuals. Such a group frequently juggles numerous obligations; therefore, it's critical to emphasize preparedness and adherence to safety procedures. The impact of fire disasters can be significantly reduced by requiring households to install fire safety equipment. Providing low-income families with subsidized safety equipment, such as smoke detectors and fire extinguishers, can help close the preparedness gap between different socioeconomic groups and ensure fair safety precautions for everyone.

Several specific recommendations have been put forth to reduce home fire accidents. Effective training initiatives are essential to increase knowledge and preparedness among diverse demographic groups. Workshops on fire safety tailored to a person's age and gender can provide them with the information and abilities they need to react appropriately in an emergency. Organizing training and working together with local authorities can further enhance involvement and foster a sense of collective accountability for fire safety [17]. For instance, working with the Malaysia Fire and Rescue Department to present an educational session and demonstrate how to use a fire extinguisher, prevent home fires, and more.

Another essential step in enhancing fire safety is infrastructure modifications. To ensure preparedness in the event of an emergency, residential areas should be equipped with readily accessible firefighting equipment, including smoke detectors and fire extinguishers (see **Figure 9**). Additionally, practical fire safety management still relies heavily on community involvement. Creating volunteer or local fire safety committees can promote proactive actions and a sense of shared responsibility. Conducting regular fire drills can help community members become more confident and respond more quickly, making them better equipped to handle crises. Stakeholders can reduce the incidence and severity of fire accidents across all demographics and promote safer environments by implementing these recommendations.

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Figure 8. The talk session on fire safety to community.



Figure 9. Demonstrations on techniques to use fire extinguishers.

Not everyone is familiar with emergency response protocols and fire extinguishing techniques, which makes it difficult for them to react appropriately in an emergency. Even people who own safety equipment may not know how to use it properly without proper training or knowledge, which would increase the risk of fire emergencies. Improving fire safety results requires closing these gaps through community-driven preparedness initiatives, inexpensive access to safety gear, and practices [18].

Structural and socioeconomic constraints significantly impact preparation for fire safety. Due to budgetary constraints, low-income households often struggle to afford essential fire safety equipment, such as fire extinguishers. Aging homes are also more susceptible to fire threats, as they often have outdated wiring and inadequate fireproofing, increasing the risk of fire accidents. Hence, authorities need to provide supportive policies that promote safety at home and involve the community. Authorities should also foster a sense of shared responsibility and raise awareness of fire safety, both of which require active community involvement. Closing the preparedness gap and ensuring equitable safety measures require subsidized initiatives that provide safety equipment to vulnerable groups, such as low-income families. By using technology and proactive planning, effective interventions can save lives. By facilitating early detection and effective response, devices such as smoke detectors, smartphone apps, and automatic fire suppression systems enhance fire safety [19]. Frequent fire drills, held in towns and in neighbourhoods, could increase people's confidence and emergency reaction times. Community preparation is further strengthened by cooperation with local fire departments for training sessions and awareness programs, ensuring that people have the necessary information and skills to manage fire crises effectively. When combined, these initiatives provide a comprehensive fire-safety strategy that addresses weaknesses and enhances resilience [20].

4.0 CONCLUSION

The study emphasizes the urgent need for focused fire safety education and awareness initiatives to close the knowledge and preparedness gaps among residents of Taman Sri Pulai, Skudai. The survey revealed significant shortcomings in practical preparedness, including a shortage of fire extinguishers and a lack of understanding of fire extinguishing techniques, despite a high level of awareness regarding fundamental fire safety principles, such as emergency numbers and fire causes. Survey's responses analysis showed that although awareness levels were good, a concerted effort by authorities is required to make fire safety equipment more accessible and to emphasize the value of regular preparation. The community program underscored the importance of community engagement, policy support, and targeted education in fostering a culture of safety.

The program was conducted in a single community, and the number of participants does not reflect the community. Thus, as a recommendation, the community program can include training or education on fire safety, combined with practical use of fire extinguishers and guidance on how to act during a fire. Agencies and industries should also be involved in the community program to ensure the objective of fire safety education and practicality is delivered to the community.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

ETHICS DECLARATION

This study did not involve human participants, animal subjects, or sensitive data. Consequently, formal ethical approval was not required.

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