

# Knowledge, Attitude, and Practice of Fire Safety Systems and Preparedness Among Students at Higher Learning Institutions

Nur Aliesa Mohd Zul<sup>1</sup>, Wan Zaiton Wan Sulaiman<sup>1\*</sup>, Khairiah Mohd Mokhtar<sup>1</sup>, Nurud Suria Suhaimi<sup>1</sup>, Nur Syafiqah Fauzan<sup>1</sup>, Siti Ilyani Rani<sup>2</sup>

<sup>1</sup>Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang Al-Sultan Abdullah, 26300 Kuantan, Pahang, Malaysia

<sup>2</sup>Faculty of Engineering Technology, University College TATI, Kampus TATIUC, Teluk Kalong, 24000 Kemaman, Terengganu, Malaysia

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## ABSTRACT

The main objective of this study is to determine the level of knowledge, attitude, and practice (KAP) regarding fire safety systems and preparedness among students at Universiti Islam Pahang Sultan Ahmad Shah (UniPSAS). A cross-sectional survey was conducted to explore the knowledge, attitudes, and practices (KAP) regarding fire safety among students at Universiti Islam Pahang Sultan Ahmad Shah (UniPSAS). The survey collected data from a diverse group of students across different departments at a single point in time. Researchers used a structured questionnaire to evaluate how well students understood fire safety, their attitudes, and how they practiced safety measures. The survey included various campus facilities. A cross-sectional survey, which consists of two main sections, was conducted. The first section focuses on sociodemographic information, and the second delves into the KAP components. The questionnaire aims to gauge students' understanding, thoughts, and actions related to fire safety and preparedness during a fire incident. A total of 157 students participated in the study. Over half of the participants have good knowledge, positive attitudes, and good practices toward fire safety systems and preparedness. However, very few participants know how to use fire control measures in case of a fire accident. The study findings indicate that UniPSAS students exhibit a commendable level of awareness regarding fire safety, coupled with a moderate understanding of fire safety measures.

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\* Corresponding author. E-mail address: [zaiton@ump.edu.my](mailto:zaiton@ump.edu.my)  
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## INTRODUCTION

Fire accidents pose a significant threat to lives and property, occurring unexpectedly in various public spaces such as homes, workplaces, hospitals, theaters, and shopping malls. The catastrophic effects of fires, such as property damage and human casualties, highlight how crucial fire safety knowledge, attitude, and practice (KAP) are to reducing and averting such accidents. The number of fire accidents including home, business, industrial, automobile, and forest fires—has been alarmingly rising globally in recent years. According to data from the World Health Organization (WHO) in 2020, the alarmingly high number of fire deaths in Malaysia reached 336, accounting for 0.20% of all deaths. To find out how knowledgeable and equipped they were about fire safety, a survey was given to 455 flat dwellers in Dublin, Ireland. The results indicate a lack of preparedness and highlight the complexity of motivations behind fire safety readiness. Notably, heightened concern about fire increased the probability of respondents testing their smoke detectors by 27.4 percent, resulting in a 33.3 percent decrease in adherence to the building evacuation policy. For instance, perceived preparedness and the possession of extinguishers or fire blankets positively correlated with personal responsibility for fire safety in the building. However, no significant relationship was observed between individual responsibility and the presence of household fire plans, appropriate fire alarm response behaviour, or testing of smoke detectors (Brown et al., 2022).

Hostels are essential to student life, so additional care must be taken to ensure fire safety. Adeleye et al.'s study examined the level of fire preparedness for public building fire disasters in Nigeria's Ibadan Metropolis (Adeleye et al., 2020). This study describes preparedness for a fire as having access to firefighting equipment, being technically proficient in its use, and being aware of the local fire department. The study involved the convenient selection of 43 public buildings and 108 building tenants. A cross-sectional survey that involved direct observation of the buildings and the distribution of questionnaires was used to collect the data. The questionnaires aimed to gather data regarding the buildings' fire safety features, the building inhabitants' familiarity with operating firefighting apparatus, and their awareness of the local fire department. The overall level of fire disaster readiness in the research area was determined by analysing these parameters collectively. The findings revealed that only banks, recreational centers, and health-related public buildings had adequate fire disaster equipment. On the other hand, structures used for administration, education, and worship lacked the adequate readiness to control fires according to rules. The report also emphasizes how crucial the requirement of public building occupants to complete training courses on first aid, evacuation techniques, and fire and catastrophe safety. Fire events are more likely to occur in older buildings with antiquated electrical systems and flammable materials like wood and paper. This highlights a crucial issue: educational institutions, especially those that house large numbers of students and hostel residents, must possess a comprehensive awareness of fire systems and readiness.

Tragic events like the Malaysian Tahfiz Darul Quran Ittifaqiyah fire underscore the critical need for efficient disaster management systems, notwithstanding efforts by governments and NGOs to increase disaster awareness and preparedness. This study, focusing specifically on dorms and student populations, aims to bridge the knowledge and readiness gaps about fire safety in academic institutions, considering these challenges. The research intends to find areas for improvement and suggest actions to improve the safety of students, academic staff, and other staff in the case of fire by analysing the existing status of fire safety knowledge, attitude, and practice. Another incident happened at Universiti Malaysia Perlis (UniMAP). Prime Minister Datuk Seri Anwar Ibrahim has acknowledged the situation of the students affected by the fire on the lowest floor of Block B, Pauh Putra Residential Complex at UniMAP. The complex's principal, Mohd Syamril Akhmar Chek Kassim, thanked Anwar for his compassion and extended financial support to 36 students whose motorcycles sustained damage in the fire. Muhammad Kamil Abdul Munim, the Minister of Finance, visited the location today and received aid from the political secretary. Since they had returned to their homes, eight pupils received their help immediately, with the remaining children receiving it later (BERNAMA, 2024).

## LITERATURE REVIEW

Most people do not realise the destruction and damage to human life and property a fire can cause. A fire incident poses a significant threat to all people within a building, and it can have serious financial and psychological implications (McKimmie et al., 2009). Fire safety in university settings is crucial, especially considering the alarming statistics of fatal fires in dorms, fraternities, sororities, and off-campus housing between 2000 and 2015. A total of 85 fatal fires resulted in 118 deaths, highlighting the critical need for robust fire prevention and preparedness measures to safeguard the lives of students, faculty, and campus visitors (U. S. Fire Administration, 2000). According to the fire department report of the US Fire Administration, there have been annually 1,300,000 cases of fire from 2008 to 2017, in which 3400 persons were killed and 15,000 persons were injured (U. S. Fire Administration, 2018). School fire has had its background since 1997 and brought about the death of 10 of students and teachers, the most important of which was the fire in Shinabad, a village in Iran that sent two students to death and burned 28 primary school girl students (Seyedin et al., 2020).

Without suitable and adequate control and suppression equipment, student housing is considered a high-risk facility where a fire could quickly spiral out of control. Therefore, it is imperative to prioritise fire safety in student housing. To guarantee a student housing facility that is fire-safe, the student housing administration department must maintain a steady commitment to meticulous design, execution, and upkeep (Mowrer, 1999). A critical aspect of fire safety in academic buildings involves having effective fire safety systems. Fire safety management plans are commonly created independently from fire safety designs, often after the design is finished, and by a different person than the fire safety design engineer. If this happens and the person who developed the fire safety management plan did not have a solid grasp of the fire safety systems and the design engineer did not have a clear appreciation for how the facility operated, the level of safety that results can be lower than anticipated (Meacham, 1999). Regular inspections and maintenance of these systems are crucial to guarantee their proper functionality. The importance of fire safety is highlighted by tragic events such as the fire in Russia. More than a million historical papers are thought to have been harmed by a fire that tore through one of the biggest university libraries in Russia; some have dubbed the incident a ‘cultural Chernobyl’ (Guardian, 2015). Preventing fire incidents in university settings also involves enforcing strict regulations regarding the use of hazardous items in residential buildings (Shokouhi et al., 2019). Banning items, such as candles, microwaves, hot plates, and holiday decorations is essential to mitigate potential fire hazards. Additionally, smoking is strictly prohibited in all parts of university residential halls, and violations can lead to disciplinary actions, including suspension or expulsion (Manitoba, 2021).

The classification of fires based on the type of fuel burning is crucial for selecting appropriate fire extinguishers. The National Fire Protection Association (NFPA) categorises fires into Class A (ordinary combustibles), Class B (flammable liquids and gases), Class C (electrical equipment), and Class D (combustible metals). Proper training in fire safety and the use of fire extinguishers is essential to address different fire scenarios and prevent injuries and damage (NFPA, 2021). Building controls typically rely on passive fire protection, giving little to no consideration to the usefulness of active fire prevention methods like sprinklers. However, sprinklers lessen the intensity of fires, thereby reducing the chance of significant fire losses. One could argue that in most cases, active protection should take precedence over passive protection. Fire safety systems and preparedness involve various components, such as fire disaster preparedness, portable fire extinguishers, smoke detectors, water sprinklers, exit routes, and fire drills. Adequate disaster preparedness includes the provision of firefighting equipment and knowledge of operating facilities, ensuring general fire safety, and possessing appropriate contacts with municipal firefighting authorities (Hsiao & Hsieh, 2023; Jaafar et al., 2022)

Portable fire extinguishers, often dry chemical multifunctional devices, play a crucial role in fire prevention, and proper training on their use is essential (Sutriningsih et al., 2021). Smoke detectors, while

widespread, can fail during fires, emphasizing the need for regular testing and installation of dual sensor alarms for optimal protection. Higher education institutions have become more adept at installing fire sprinklers to protect their staff and students after tragedies such as the Seton Hall catastrophe (Conlon et al., 2022). Based on research conducted at X university dormitory, less than 60% of the active fire protection system is deemed appropriate, placing it in the bad category. The fire extinguisher has an appropriateness rating of 47.77%, the heat detector scored 35.90%, the hydrant scored 58.75%, and the alarm received a rating of 18.75%. The dorm building does not have sprinklers installed, and senior management has made no commitments to workplace safety and health. The active fire protection system is still under 60% (poor category) and has no maintenance (Rosanti et al., 2021).

When a crisis strikes, public facilities need to be designed with the ability to lessen its negative consequences, which means that the evacuation process needs to be carefully considered. The design of Kanisius Junior High School (SMP), in Kalasan, D.I. Yogyakarta, is assessed in this study as one of the study's reference buildings (Raniasta, 2022). It is possible to implement performance-based fire design by contrasting the outcomes of evacuation and fire simulations. Engineers must have access to multiple types of evacuation data, such as occupant travel speeds, flow rates, and pre-evacuation time, to simulate building evacuations. Pre-evacuation behaviours and timeframes are among the most crucial pieces of information needed for dependable evacuation simulation output, particularly in building types where individuals might take longer to start traveling to the exits (Lovreglio & Kuligowski, 2022). Despite these measures, the frequency of fire incidents in academic buildings is still a concern. Buildings, designed to last for decades, can face potential harm due to the direct or indirect effects of fires. Ensuring the implementation of rigorous safety protocols, conducting regular fire drills, and providing comprehensive training can minimise the risk of fire incidents and enhance the safety of everyone on campus. Another study describes how one's degree of comprehension of a subject is gauged by their knowledge. Practice is the activity people take in a certain situation, whereas attitude is the views and viewpoints on issues that come up (Nasruddin et al., 2023).

Research on university fire safety emphasizes how vital it is to improve staff and student awareness, attitudes, and practices (KAP). Research shows that a lack of preparation results from underestimating the potential damage that flames might do. A concerning trend of fire events in student accommodation, with notable fatalities and injuries, especially in residential settings, is indicated by data from multiple reports. **Knowledge of Fire Hazards:** Many students do not know how dangerous it is for campus buildings to catch fire, especially in dorms and other high-risk locations. A higher frequency of incidents involving fire is a result of this ignorance. **Integration of Safety Systems:** Design and operational plans must be integrated for effective fire safety management. There are gaps in safety measures since many fire safety management plans are created in isolation. **Impact of Demographics on KAP:** Studies indicate that students' demographic backgrounds—such as age, educational attainment, and whether they live on campus—have a substantial impact on their knowledge, attitudes, and fire safety behaviours.

It is expected that the level of KAP of the students from UniPSAS may vary according to their demographic background, level of education, and whether they reside in a hostel. Thus, the study tested three hypotheses regarding their demographic background on KAP of fire safety and fire protection.

H<sub>1</sub> There is a significant correlation between the students' level of KAP on fire safety systems and preparedness and their education level. The higher the level of education, the greater the level of KAP on fire safety systems and preparedness.

H<sub>2</sub> There is a significant correlation between demographics and the students' level of KAP on fire safety systems and preparedness.

H<sub>3</sub> Staying in a hostel significantly impacts how well-versed students are in the fire safety system and preparedness.

## METHODOLOGY

### Study design, study location, and respondents' selection

A cross-sectional survey was conducted to investigate the KAP of fire safety among UniPSAS students. The survey involved collecting data at a single point in time from a sample of students representing various departments of the institution. The survey utilised a structured questionnaire to assess knowledge, attitudes, and practices related to fire safety. The survey was conducted at Universiti Islam Pahang Sultan Ahmad Shah (UniPSAS), covering various campus facilities, including administrative buildings, academic structures, dormitories, cafeterias, and sports complexes, to ensure a comprehensive understanding of fire safety across different areas.

The study was conducted from August 2023 to November 2023 at the UniPSAS with the consent of the Academic Department. Participants in the study included undergraduate students, aged above 18 years old, and able to read, write, and understand Malay and English. The statistics indicated that most 3000 students were registered with Ministry of Education in Malaysia. The sample size collected was 157 out of 341 students, calculated using a sample size formula from the previous study with a 95% confidence level and a  $p$ -value of less than 0.05 assumed and based on research by Krejcie and Morgan (Krejcie, 1970). A subset of individuals could be selected from a larger population using simple random sampling, which ensures that every member of the population has an equal chance of being selected. Simple random sampling was purposefully and strategically selected in the context of this study on the knowledge, attitude, and practice (KAP) of fire safety among UniPSAS students to guarantee fairness and representativeness in the selecting process. This methodology was used to eliminate biases that could result from using more complex sampling methods.

### Instrumentations

A structured questionnaire was employed as the research tool for the knowledge, attitude, and practice (KAP) study on fire safety systems and preparedness to obtain comprehensive insights from UniPSAS students. The questionnaire comprised two main sections, designed to address a specific aim. Gathering general and personal data about the participants was the goal of the first portion, which was called the socio-demographic section such as age, gender, educational attainment, and whether the students lived in dorms. Demographic data was designed to provide participants with context and possibly identify potential trends that could influence their fire safety knowledge, attitudes, and behaviours. The second section consists of questions to evaluate knowledge, attitudes, and practices regarding fire safety systems and preparedness. Meanwhile, three other sections cover knowledge, attitude, and practice. 10 questions intended to test participants' knowledge of fire safety were given to them in Part A, which focused on knowledge. The topics of the questions included things like what starts fires, how to avoid them, and what to do if one breaks out. Participants were asked to select 'yes' or 'no' as their answer. Section B examined attitude and had four questions with three possible answers: 'yes', 'don't know', and 'no'. The questions aimed to delve into the viewpoints and affective states of the participants concerning fire safety protocols and preparedness. The questions investigated how important people perceived fire safety to be, how risky they perceived fires to be, and how confident they felt they could handle a fire emergency. Eight questions with a 'yes', 'don't know', and 'no' response option was given to participants in Part C, the practice segment. This section evaluated participant behaviours and actions regarding fire safety. Questions focused on obtaining fire safety training and participating in fire drills. This section's replies were gathered to offer useful information about participants' compliance with fire safety procedures.

### Reliability Study

The reliability or pilot study involved testing a condensed version of the survey instrument and data collection methods to identify and address any potential challenges or shortcomings in questionnaires. The

pilot study selected a small sample of about five people to participate. The survey or questionnaires were administered to these selected students, and their responses were meticulously collected and recorded. The data obtained from the reliability study underwent a comprehensive analysis to identify any potential issues, such as unclear questions or ambiguous response options. Subsequently, the findings of the KAP study on fire safety among university students were analysed using Cronbach Alpha in Statistical Program for Social Science (SPSS) Version 22.0. The obtained Cronbach Alpha of 0.825, as presented in Table 1, fell within the acceptable range, considering a threshold of 0.70 or above for Cronbach's Alpha. By conducting a meticulous pilot study and employing appropriate statistical tools for analysis, the researchers secured a reliable, valid, and effective KAP study on fire safety among university students.

Table 1. Reliability Results

| Cronbach's Alpha | N of Items |
|------------------|------------|
| 0.825            | 22         |

### Data Collection

The recruitment strategy for the study on UniPSAS students' knowledge, attitude, and practice (KAP) of fire safety and preparedness was properly planned to ensure full participant engagement and thorough data collection. First, official consent was painstakingly obtained from the university's administrative office, indicating a dedication to moral research procedures and institutional observance. Potential participants were given an information sheet outlining the goals and methods of the research to encourage informed consent and transparency, focusing on how crucial it is to ensure participants are well-educated before participating in the study. With the use of Google Forms, the questionnaire distribution process was made easier and more accessible for all students since the replies were automatically collected and arranged in a structured fashion for additional review, the digital platform made data collection more accessible and more efficient analysis possible. An inventive method of survey approval that used QR codes was implemented, which attracted more responses and encouraged students to feel important and involved. To ensure a comprehensive and rigorous approach to collecting data on fire safety KAP among UniPSAS students, this complex recruitment method highlighted a commitment to inclusivity, transparency, and participant engagement throughout the study.

### Data Analysis

Methodical scoring was used as a methodology in the knowledge, attitude, and practice (KAP) for data analysis. In the knowledge part, a total score ranging from 0 to 20 was obtained by assigning a score of 2 to each 'yes' response and 1 to each 'no' response. After that, this score was divided into three categories: 0-11 for inadequate knowledge ( $\leq 59\%$ ), 12-15 for moderate knowledge (60-79%), and 16-20 for good knowledge (80-100%). Like this, the attitude part used a point system: 'yes' scored three points, 'do not know' scored two, and 'no' scored one. Next, the attitude ratings were divided into three categories: neutral (7-9), negative (0-6) and positive (10-12). The practice section's scoring scheme was three for 'yes', two for 'do not know', and one for 'no'. As a result, the total score might be anywhere from 0 to 24. Further categorisation of these scores into good (19-24), fair (15-18), and poor (0-14) practice levels were analysed by SPSS Version 22.0. Furthermore, based on participants' educational backgrounds and other sociodemographic characteristics, associations between knowledge, attitudes, and practices about fire safety and preparedness were found using chi-square tests in SPSS. The chi-square test was utilised in this study to examine associations between categorical variables, as it is a suitable non-parametric method for testing relationships without assuming a normal data distribution. This thorough research aimed to identify trends and correlations in the data, improving UniPSAS students' knowledge of fire safety awareness and procedures.

## RESULTS AND DISCUSSION

### Socio-demographic Characteristics of the Respondents

The respondents' age, gender, education level, current academic year, and hostel stay are among the criteria that make up the sociodemographic distribution shown in Table 2. For age, most respondents are under 20 (94 out of 157, 59.9%), followed by 21-25 (58 out of 157, 36.9%), and a smaller percentage in the 26-30 age range (5 out of 157, 3.2%). 67 out of 157 respondents are male (42.7%) and 90 out of 157 are female (57.3%). Regarding education level, 93 out of 157 respondents hold a diploma (59.2%), 60 out of 157 are degree holders (38.2%), and 4 out of 157 are master's degree holders (2.5%). The current year of study is distributed as follows: first year (71 out of 157, 45.2%), second year (52 out of 157, 33.1%), third year (28 out of 157, 17.8%), fourth year (4 out of 157, 2.5%), and fifth year (2 out of 157, 1.3%). Additionally, 126 out of 157 respondents reported staying in the hostel (80.3%), while 31 out of 157 did not stay in the hostel (19.7%). The mean age is 1.43 with a standard deviation of 0.558, indicating a relatively narrow age distribution among the respondents. Similarly, the mean and standard deviation for other parameters provide insights into the distribution and variability within the sample population.

### Knowledge of Fire Safety Systems and Preparedness

Table 3 reveals the knowledge and preparedness of the study population regarding fire safety. Most respondents demonstrate good knowledge, with 94.9% knowing the fire emergency number, 94.3% recognising smoke and suffocation as the main cause of death in fire accidents, and 90.4% stating that escaping is the first action during a fire alarm. Additionally, 87.3% are familiar with different types of fire extinguishers, 81.5% understood that foam extinguishers are not suitable for electrical fires, and 89.2% advocate using staircases in high-rise building fires. Most participants also knew about the use of dry chemical powder extinguishers for various fire classes (84.1%), crawling during heavy smoke evacuation (85.4%), and the importance of fire safety signage (92.4%). These findings highlight a generally positive level of knowledge and awareness regarding fire safety practices among the study population.

### Attitude to Fire Safety Systems and Preparedness

Table 4 presents the attitudes of the study population regarding fire safety and preparedness. In response to the statement about feeling confident in their ability to respond appropriately during a fire emergency, a substantial majority of 67.5% express confidence, while 30.6% admit to being unsure, and only 1.9% feel otherwise. Concerning familiarity with the campus fire safety plan and evacuation procedures, 58.0% affirm their knowledge, 25.5% are uncertain, and 16.6% indicate they are not familiar with these procedures. Regarding belief in the sufficiency of campus fire safety systems to protect students in the event of a fire, 64.3% express confidence, 29.3% are unsure, and 6.4% do not believe in the sufficiency of these systems. Regarding awareness of the fire safety systems in place on campus, a significant majority of 72.6% indicate awareness, 24.2% are uncertain, and only 3.2% are not aware of the existing fire safety system.

Table 2. Socio-demographics Distribution of the Respondents

| Parameter                    | Frequency (n=157) | Percentage | Mean | SD    |
|------------------------------|-------------------|------------|------|-------|
| <b>Age</b>                   |                   |            | 1.43 | 0.558 |
| <20                          | 94                | 59.9       |      |       |
| 21-25                        | 58                | 36.9       |      |       |
| 26-30                        | 5                 | 3.2        |      |       |
| 31+                          | 0                 | 0          |      |       |
| <b>Gender</b>                |                   |            | 1.57 | 0.496 |
| Male                         | 67                | 42.7       |      |       |
| Female                       | 90                | 57.3       |      |       |
| <b>Education Level</b>       |                   |            | 1.43 | 0.546 |
| Diploma                      | 93                | 59.2       |      |       |
| Degree                       | 60                | 38.2       |      |       |
| Master                       | 4                 | 2.5        |      |       |
| Phd                          | 0                 | 0          |      |       |
| <b>Current year of study</b> |                   |            | 1.82 | 0.905 |
| First year                   | 71                | 45.2       |      |       |
| Second years                 | 52                | 33.1       |      |       |
| Third years                  | 28                | 17.8       |      |       |
| Fourth years                 | 4                 | 2.5        |      |       |
| Fifth years                  | 2                 | 1.3        |      |       |
| <b>Reside in a hostel?</b>   |                   |            | 1.80 | 0.399 |
| Yes (Ya)                     | 126               | 80.3       |      |       |
| No (Tidak)                   | 31                | 19.7       |      |       |



Table 3. Knowledge About Fire Safety and Preparedness

| Parameter for knowledge of fire safety and preparedness   | Yes<br><i>n</i><br>(%) | No<br><i>n</i><br>(%) |
|---|------------------------|-----------------------|
| 1. Do you know the fire emergency number(s) to call in case of a fire outbreak?   | 149<br>94.9            | 8<br>5.1              |
| 2. The important cause of death in fire accidents is smoke and suffocation. (yes)   | 148<br>94.3            | 9<br>5.7              |
| 3. The very first thing you do when you hear a fire alarm is to escape.   | 142<br>90.4            | 15<br>9.6             |
| 4. Do you know the location of a fire extinguisher on your campus?  | 125<br>79.6            | 32<br>20.4            |
| 5. There are at least four major types of fire extinguishers used for different classes of fire (yes).                          | 137<br>87.3            | 20<br>12.7            |
| 6. Foam containing fire extinguisher is NOT meant for electric fire (yes).  | 128<br>81.5            | 29<br>18.5            |
| 7. Instead of an elevator (Lift) staircase is the best means of escape if there is a fire accident in high rise building (yes). | 140<br>89.2            | 17<br>10.8            |
| 8. Dry chemical powder fire extinguisher can be used for A, B, C classes of fire (yes).   | 132<br>84.1            | 25<br>15.9            |
| 9. The best way to exit a building when there is heavy smoke is to crawl on your hands and knees (yes).                         | 134<br>85.4            | 23<br>14.6            |
| 10. Signage is a type of fire safety measure (yes).   | 145<br>92.4            | 12<br>7.6             |

Table 4. Attitude About Fire Safety and Preparedness

| Parameter for attitude of fire safety system and preparedness   | Yes<br><i>n</i><br>% | Don't<br>Know<br><i>n</i><br>% | No<br><i>N</i><br>% |
|---|----------------------|--------------------------------|---------------------|
| 1. I feel confident in my ability to respond appropriately during a fire emergency.                         | 106<br>67.5          | 48<br>30.6                     | 3<br>1.9            |
| 2. I am familiar with the campus fire safety plan and evacuation procedures.                                | 91<br>58.0           | 40<br>25.5                     | 26<br>16.6          |
| 3. I believe that the campus fire safety systems are sufficient to protect students in the event of a fire. | 101<br>64.3          | 46<br>29.3                     | 10<br>6.4           |
| 4. I am aware of the fire safety systems in place on this campus.   | 114<br>72.6          | 38<br>24.2                     | 5<br>3.2            |

### Practice Fire Safety Systems and Preparedness

Based on the data presented in Table 5, it is evident that most respondents have a good level of practice regarding fire safety measures on their campuses, with a high percentage acknowledging the presence of evacuation maps (68.8%), fire safety training (49.7%), and practical training on the use of fire extinguishers (59.9%). Furthermore, most claim to know how to use a fire extinguisher in case of a fire outbreak (73.2%), be familiar with the campus fire emergency procedure (63.7%), and have fire alarms (79.6%) and fire or smoke detectors (78.3%) on their premises. The availability of a fire emergency number is also high, with 80.3% reporting such a number being accessible. These findings highlight an overall level of preparedness and awareness regarding fire safety among the study population.

Table 5. Practice Fire Safety and Preparedness

| Parameter for practice of fire safety system and preparedness                    | Yes<br><i>n</i><br>% | Don't<br>Know<br><i>n</i><br>% | No<br><i>n</i><br>% |
|--|----------------------|--------------------------------|---------------------|
| 1. Is the evacuation map displayed on your campus?                               | 108<br>68.8          | 39<br>24.8                     | 10<br>6.4           |
| 2. Have you received fire safety training on your campus?                        | 78<br>49.7           | 20<br>12.7                     | 59<br>37.6          |
| 3. Have you received practical training on the use of portal fire extinguishers? | 94<br>59.9           | 20<br>12.7                     | 43<br>27.4          |
| 4. In case of a fire outbreak, do you know how to use a fire extinguisher?       | 115<br>73.2          | 18<br>11.5                     | 24<br>15.3          |
| 5. Have you known your campus has a fire emergency procedure?                    | 100<br>63.7          | 47<br>29.9                     | 10<br>6.4           |
| 6. Do you have a fire alarm on your campus?                                      | 125<br>79.6          | 24<br>15.3                     | 8<br>5.1            |
| 7. Does your campus have a fire/smoke detector(s)?                               | 123<br>78.3          | 29<br>18.5                     | 5<br>3.2            |
| 8. There is a fire emergency number for you to call in case of a fire accident   | 126<br>80.3          | 22<br>14.0                     | 9<br>5.7            |

### Level of Knowledge, Attitude, and Practice of Fire Safety Systems and Preparedness

As illustrated in Figure 1, a significant majority (96.2%) exhibited a good understanding, while a small percentage (3.8%) demonstrated a moderate level. This suggests a generally well-informed and prepared population, emphasizing the effectiveness of current awareness efforts. However, the presence of individuals with a moderate knowledge level underscores the importance of continuous education.

Moving to attitude (Figure 2) most respondents (67.4%) display a positive outlook toward fire safety systems and preparedness. A notable portion (31.2%) hold a neutral stance, indicating an opportunity for targeted education and engagement to improve their understanding. While a minority (1.3%) express a negative attitude, addressing their concerns and providing resources is crucial for improving overall perception and preparedness.

As illustrated in Figure 3, a significant portion (69.4%) demonstrate good adherence to fire safety measures, reflecting a commendable commitment to protocols and preparedness practices. A fair level of practice is observed in 23.6% of respondents, suggesting room for improvement and reinforcement. A smaller proportion (7.0%) exhibits poor practice, highlighting the need for targeted support and resources to enhance their understanding and implementation of effective fire safety practices. The high percentage of individuals with good knowledge, positive attitudes, and good practices signifies a promising foundation for fostering a culture of fire safety awareness and preparedness within the community. Ongoing education and targeted interventions can further enhance the overall effectiveness of fire safety measures among the study population.

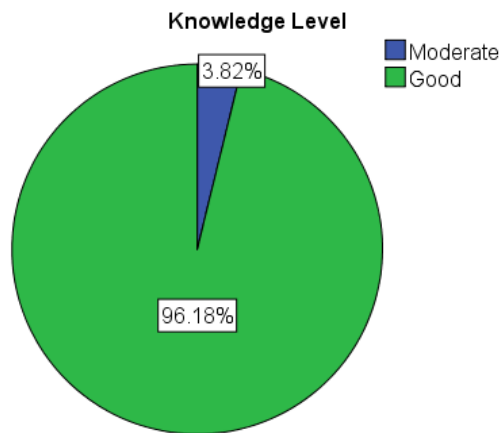


Fig. 1. Level of Knowledge of Fire Safety System and Preparedness among UniPSAS Students

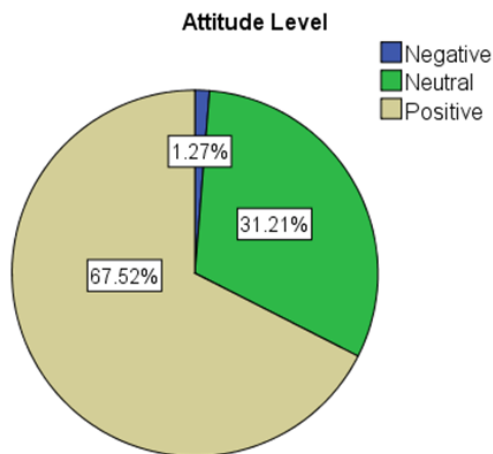


Fig. 2. Level of Attitude of Fire Safety System and Preparedness among UniPSAS Students

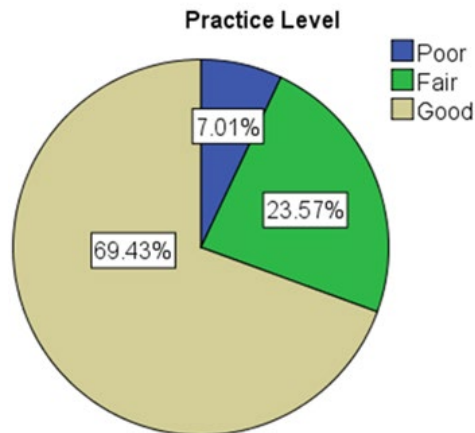


Fig. 3. Level of Attitude to Fire Safety System and Preparedness among UniPSAS Students

Additionally, 12.7% lack information on the types and uses of fire extinguishers. Only 3.8% show moderate knowledge, indicating room for improvement. Ongoing education efforts, possibly through workshops or campaigns, could enhance community fire safety preparedness. (AlWaqfi et al., 2022) found 62.0% acceptable knowledge, and Musigapong and Phanprasit (2013) found that multimedia, teachers, and newspapers as crucial sources of fire safety information.

Fostering a safe atmosphere where students actively participate in preventive measures and efficiently respond to fire emergencies requires maintaining a positive attitude toward fire safety systems and preparation. 67.4% of the participants have a favourable attitude, which suggests that they are inclined to give fire safety a priority. Nonetheless, 1.3% display a negative attitude, reflecting a less optimistic view on fire safety measures, while 31.2% take a neutral position, implying ambiguity or apathy. This highlights the necessity of making focused attempts to raise awareness and understanding among people who have neutral or unfavourable sentiments. The positive attitude trend reported by Yeturu et al. (2016), and other research lends weight to the positive finding that fire safety is the top priority for most participants. However, addressing the smaller proportion of people who have neutral views is crucial for providing thorough fire safety instruction and encouraging a generally optimistic outlook.

Comprehensive fire safety systems and readiness procedures are necessary to protect students in educational institutions. This entails having frequent exercises, well-defined evacuation strategies, and firefighting supplies on hand. The data shows an encouraging trend, with 69.4% of participants exhibiting a high degree of proficiency in following set fire safety procedures. On the other hand, 23.6% of them are classified as having a fair level of practice, indicating that their fire safety procedures could be more consistently and effectively implemented. 7.0% of them are also categorised as practicing poorly, which suggests that they require focused interventions to improve their adherence to safety procedures. Overall, the results demonstrate the beneficial effects of current fire safety measures while highlighting areas in which further focus, and instruction can improve students' overall safety readiness.

### Association between Knowledge and Socio-demographic Data

As illustrated in Table 6, A statistically significant correlation ( $p$ -value of 0.030) has been found between age groups and fire safety knowledge. The greatest proportion of well-informed people (58.2%) are under the age of 20, indicating the efficacy of focused educational programs. The age groups of 21–25 (34.4%) and 26–30 (2.5%), on the other hand, might see a decrease in knowledge, perhaps because of life

transitions and lifestyle changes. Promoting effective fire safety awareness across a range of age demographics requires interventions to be tailored based on generational differences and communication preferences. The  $p$ -value of 0.711 indicates that gender does not exhibit a statistically significant association with knowledge about fire safety. The fact that men and women have different levels of knowledge means that awareness campaigns and educational programs could be equally accessible to and effective for both genders. Gender inclusion in safety education may have risen over time due to social changes, resulting in comparable knowledge levels. The concept that gender does not significantly influence the population under study's comprehension of fire safety is further supported by the similarity in the moderate knowledge percentages for both genders.

The overall relationship between education level and fire safety knowledge is not statistically significant ( $p$ -value = 0.068), even though there is a large variance in excellent knowledge across education levels. The high level of understanding demonstrated by participants with diplomas (58.6%) and master's degrees (2.5%) may be attributed to their practical training and targeted safety education. Consistent with earlier studies, the study highlights the need for customized safety interventions by finding no significant correlation ( $p > 0.05$ ) between teachers' educational levels and their awareness of fire safety in private kindergartens and preschools.

The  $p$ -value of 0.991 indicates that the study year has no discernible effect on students' understanding of fire safety and readiness. Similar levels of knowledge are attained via fire safety instruction that seems to be constant throughout academic years. Though the percentage in the first year is slightly higher (43.3%), indicating introductory programs, the general even distribution across academic levels indicates that awareness of fire safety goes beyond formal schooling, possibly. It is found that residence status and awareness of fire safety are moderately correlated ( $p$ -value = 0.058). Hostel residents (78.3%) demonstrate commendable knowledge, while non-hostel residents (98.1%) show good or moderate knowledge. However, caution is advised in interpretation due to the proximity to significance, possibly influenced by random chance. Further investigation into additional variables like educational background, training exposure, or personal experiences is recommended to understand the nuanced factors influencing fire safety knowledge across different living environments. Comprehensive insights are crucial for tailoring effective educational programs and interventions to enhance fire safety awareness shaped by personal efforts and extracurricular activities.

Table 6. Association between Fire Safety Knowledge and Respondents' Characteristics

| Variable                          | Knowledge of fire safety and preparedness |          |      | p-value |
|-----------------------------------|---|----------|------|---------|
|                                   | Good                                      | Moderate | Poor |         |
| <b>Age</b>                        |   |          |      |         |
| <20                               | 58.2% (93)                                | 0.6% (1) | -    | 0.030   |
| 21-25                             | 34.4% (54)                                | 2.5% (4) |      |         |
| 26-30                             | 2.5% (4)                                  | 0.6% (1) |      |         |
| 31+                               | -   | -        |      |         |
| <b>Gender</b>                     |   |          |      |         |
| Male                              | 40.8% (64)                                | 1.9% (3) | -    | 0.711   |
| Female                            | 55.4% (87)                                | 1.9% (3) |      |         |
| <b>Level of education</b>         |   |          |      |         |
| Diploma                           | 58.6% (92)                                | 0.6% (1) |      | 0.068   |
| Degree                            | 35.0% (55)                                | 3.2% (5) | -    |         |
| Master                            | -   | 2.5% (4) |      |         |
| PhD                               | -   | -        |      |         |
| <b>Current Year of Study</b>      |   |          |      |         |
| First-year                        | 43.3% (68)                                | 1.9% (3) | -    | 0.991   |
| Second year                       | 31.8% (50)                                | 1.3% (2) |      |         |
| Third year                        | 17.2% (27)                                | 0.6% (2) |      |         |
| Fourth-year                       | 2.5% (5)                                  | -        |      |         |
| Other                             | 1.3% (2)                                  | -        |      |         |
| <b>Staying in a hostel or not</b> |   |          |      |         |
| Yes                               | 78.3% (123)                               | 3.8% (6) | -    | 0.058   |
| No                                | 17.8% (28)                                | 1.9% (3) |      |         |

### Association between Attitude and Socio-demographic Data

As shown in Table 7, the study finds no significant relationship between age and attitudes towards fire safety ( $p=0.622$ ). While individuals aged 20 and below exhibit higher positive attitudes (40.1%), a decline is observed in the 21-25 (24.2%) and 26-30 age groups (3.2%). The prevalence of neutral attitudes, especially among those under 20 (19.1%), suggests a need for more targeted educational approaches. In summary, low percentages for poor attitudes indicate a generally positive trend across age groups.

No significant association is found between gender and attitudes towards fire safety ( $p=0.470$ ). While slightly more females display positive attitudes (38.2%), the overall low percentage of negative attitudes (1.3% for females) suggests a positive trend. The absence of a gender-based difference emphasizes the importance of holistic approaches in fire safety education to enhance positive attitudes across genders. The study observes a decline in positive attitudes with higher education levels, but the overall association is not statistically significant ( $p=0.501$ ). Despite trends suggesting higher education correlates with more positive attitudes, the findings challenge this belief, highlighting the need for further research into non-educational factors shaping attitudes.

The current study does not significantly impact attitudes towards fire safety ( $p=0.920$ ). Uniform percentages across academic years suggest consistent fire safety education delivery, with individual experiences and campus-wide initiatives potentially influencing attitudes. Residency status (hostel or non-hostel) does not significantly influence attitudes toward fire safety ( $p=0.545$ ). While variations exist, the lack of statistical significance implies that observed differences could be due to chance. The findings underscore the complexity of factors influencing fire safety attitudes, calling for a broader exploration of variables beyond residency status.

Table 7. Association between Fire Safety Attitude and Respondents' Characteristics

| Variable                          | Attitude of fire safety and preparedness |            |          | p-value |
|-----------------------------------|--|------------|----------|---------|
|                                   | Positive                                 | Neutral    | Negative |         |
| <b>Age</b>                        |  |            |          |         |
| <20                               | 40.1% (63)                               | 19.1% (30) | 0.6% (1) | 0.622   |
| 21-25                             | 24.2% (38)                               | 12.1% (19) | 0.6% (1) |         |
| 26-30                             | 3.2% (5)                                 | -          | -        |         |
| 31+                               | -  | -          | -        |         |
| <b>Gender</b>                     |  |            |          |         |
| Male                              | 29.3% (46)                               | 13.4% (21) | -        | 0.470   |
| Female                            | 38.2% (60)                               | 17.8% (28) | 1.3% (2) |         |
| <b>Level of education</b>         |  |            |          |         |
| Diploma                           | 37.6% (59)                               | 21.0% (3)  | 0.6% (1) | 0.501   |
| Degree                            | 27.4% (43)                               | 10.2% (16) | 0.6% (1) |         |
| Master                            | 2.5% (4)                                 | -          | -        |         |
| PhD                               | -  | -          | -        |         |
| <b>Current Year of Study</b>      |  |            |          |         |
| First-year                        | 30.6% (48)                               | 14.0% (22) | 0.6% (1) | 0.920   |
| Second year                       | 21.7% (34)                               | 11.5% (18) | -        |         |
| Third year                        | 12.1% (19)                               | 5.1% (8)   | 0.6% (1) |         |
| Fourth-year                       | 1.9% (3)                                 | 0.6% (1)   | -        |         |
| Other                             | 1.3% (2)                                 | -          | -        |         |
| <b>Staying in a hostel or not</b> |  |            |          |         |
| Yes                               | 54.1% (85)                               | 25.2% (40) | 0.6% (1) | 0.545   |
| No                                | 13.4% (21)                               | 5.7% (9)   | 0.6% (1) |         |

### Association between Practice and Socio-demographic Data

The data analysis shown in Table 8 indicates that although there is a notable trend showing a drop in excellent practices as people get older, age is not statistically substantially connected with fire safety behaviours. The absence of poor practices among those 31 and older suggests a cautious approach or heightened awareness, possibly influenced by accumulated life experiences or societal awareness. Conversely, the higher percentage of good practices among those under 20 suggests the impact of targeted educational programs.

While there is a marginally large percentage of good and fair behaviours among females, there is no statistically significant correlation between gender and fire safety practices. This lack of relevance raises the possibility that variables other than gender—like education, working conditions, and social expectations—may have a greater impact on how closely people follow fire safety procedures. A computed *p*-value of 0.527 suggests that there is no significant correlation between education level and fire safety behaviours.

Table 8. Association between Fire Safety Practice and Respondents' Characteristics

| Variable                          | Practice fire safety and preparedness |            |          | p-value |
|-----------------------------------|---------------------------------------|------------|----------|---------|
|                                   | Good                                  | Fair       | Poor     |         |
| <b>Age</b>                        |                                       |            |          |         |
| <20                               | 41.4% (65)                            | 16.6% (26) | 1.9% (3) | 0.056   |
| 21-25                             | 24.8% (39)                            | 7.0% (11)  | 5.1% (8) |         |
| 26-30                             | 3.2% (5)                              | -          | -        |         |
| 31+                               | -                                     | -          | -        |         |
| <b>Gender</b>                     |                                       |            |          |         |
| Male                              | 30.6% (48)                            | 9.6% (15)  | 2.5% (4) | 0.848   |
| Female                            | 38.9% (61)                            | 14.0% (22) | 4.5% (7) |         |
| <b>Level of education</b>         |                                       |            |          |         |
| Diploma                           | 40.8% (64)                            | 15.3% (24) | 3.2% (5) | 0.527   |
| Degree                            | 26.1% (41)                            | 8.3% (13)  | 3.8% (6) |         |
| Master                            | 2.5% (4)                              | -          | -        |         |
| PhD                               | -                                     | -          | -        |         |
| <b>Current Year of Study</b>      |                                       |            |          |         |
| First-year                        | 32.5% (51)                            | 9.6% (15)  | 3.2% (5) | 0.700   |
| Second year                       | 21.0% (33)                            | 10.2% (16) | 1.9% (3) |         |
| Third year                        | 12.7% (20)                            | 3.8% (6)   | 1.3% (2) |         |
| Fourth-year                       | 1.9% (3)                              | -          | 0.6% (1) |         |
| Other                             | 1.3% (2)                              | -          | -        |         |
| <b>Staying in a hostel or not</b> |                                       |            |          |         |
| Yes                               | 56.7% (89)                            | 18.5% (29) | 5.1% (8) | 0.737   |
| No                                | 12.7% (20)                            | 5.1% (8)   | 1.9% (3) |         |

Although the percentages change depending on educational background, the absence of statistical significance implies that variables other than educational attainment may be involved in the observed disparities in fire safety procedures. To ensure that students maintain consistent and safe practices throughout all academic years, a comprehensive and ongoing approach to fire safety education is required. The analysis of academic years shows that fire safety practices do not significantly vary across different academic levels.

A *p*-value of 0.737 indicates that residency status has no discernible impact on fire safety procedures, regardless of whether one stays in hostels. The association between residence status and fire safety practices is probably coincidental rather than significant, despite variations in percentages. This emphasizes the significance of examining a range of factors other than resident status to comprehend impacts on people's fire safety behaviours. All things considered, minimizing risks, and guaranteeing the safety of people and communities in a variety of contexts continue to depend on an understanding of and promotion of appropriate fire safety procedures.



## DISCUSSION

The study's goal was to evaluate the public's knowledge, attitudes, and fire safety behaviours. It produced some important results. In contrast to earlier research by (AlWaqfi et al., 2022), which found just 62.0% with acceptable knowledge, a noteworthy 96.2% of respondents showed an excellent degree of understanding of fire prevention procedures. This disparity could be the result of different educational programs or demographic variables that affect awareness. The modest number (3.8%) demonstrating moderate understanding suggests a continuous need for focused educational interventions, while the high level of knowledge suggests that present fire safety teaching efforts are beneficial. According to the study, 67.4% of participants had favourable opinions of fire safety systems. The results of Yeturu et al. (2016), who also noted positive views in comparable populations, are consistent with this. Nonetheless, the existence of 1.3% negative and 31.2% neutral opinions highlights the need for targeted engagement tactics to change perceptions. It is imperative to address these groups; community outreach programs and educational workshops could increase awareness and encourage a more proactive approach to fire prevention.

With 69.4% of participants exhibiting good compliance with safety measures, the commitment to fire safety practices was praiseworthy. There is room for improvement, though, as evidenced by the 23.6% who were categorised as having fair procedures and the 7.0% who had poor practices. Maintaining high compliance levels requires ongoing instruction and reinforcing of fire safety precautions. Furthermore, the results showed a relationship between awareness of fire safety and resident status, indicating that customized treatments may be required for various living situations. Age, gender, and educational attainment were among the demographic variables that seemed to affect people's attitudes and understanding about fire safety. Perhaps because of focused educational initiatives, younger people demonstrated a greater degree of understanding. It's interesting to note that knowledge did not significantly differ by gender, suggesting that fire safety instruction is useful and accessible to both sexes. Nevertheless, there was no statistically significant correlation between education level and fire safety knowledge overall, indicating that other factors—like hands-on training—might be more important in influencing awareness.

It is important to recognise the limits of the study, especially the possibility of sample bias and the requirement for a more thorough investigation of individual fire safety experiences. Future studies can examine the effects of community-led initiatives on awareness levels or the efficacy of practical fire safety training. The study's conclusions highlight the value of continuing fire safety education and the necessity of specialised interventions to raise community knowledge and readiness. Fire safety will be a primary concern in educational institutions and beyond if we fill the knowledge gaps and promote good attitudes. This will make the environment safer for everyone.

## CONCLUSION

Overall, students at UniPSAS typically have good knowledge, attitudes, and practices regarding fire safety. Age-related differences in knowledge were found to be significant, with younger people demonstrating superior comprehension. Education level and residency status were important factors, while gender had little bearing on attitudes or behaviours. Personalised education initiatives are crucial for raising students' understanding of fire safety and encouraging good behaviour. In comparison to earlier studies, this one effectively evaluated public knowledge, attitudes, and behaviours around fire safety, showing a notable rise in awareness. The results show that existing instructional activities are effective, as 96.2% of respondents demonstrated a strong understanding of fire safety practices. Nonetheless, the existence of 3.8% with moderate comprehension and significant proportions of neutral and unfavourable views underscores the necessity of continuous educational initiatives and focused engagement tactics. Although 69.4% compliance with fire safety procedures is praiseworthy, there is still an opportunity for improvement,

especially among those who use fair or subpar procedures. Age, gender, and residency status are examples of demographic characteristics that have a major impact on awareness and attitudes, indicating the need for specialised treatments.

Implementing focused seminars that cater to the requirements of various demographic groups—particularly those with moderate or neutral views on fire safety—is essential to improving fire safety education. To ensure that participants apply their information practically, interactive training sessions should be created that let them practice fire safety techniques. Using social media campaigns to spread fire safety information and enlisting local leaders to lead awareness-raising conversations are two ways to improve community outreach programs. The curriculum for fire safety should be incorporated into educational institutions, and frequent exercises and tests should be set up to encourage compliance and knowledge. Continuous monitoring and assessment are also crucial; feedback mechanisms can promote a responsive learning environment, and follow-up studies will assist gauge the success of efforts.

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## CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial, or financial conflicts and declare the absence of conflicting interests with the funders.

## AUTHORS' CONTRIBUTIONS

Nur Aliesa Mohd Zul carried out the research, provided the theoretical framework, and wrote the article. Wan Zaiton Wan Sulaiman conceptualised the central research idea and reviewed and supervised the research progress. Khairiah Mohd Mokhtar reviewed the manuscript. Nurud Suria Suhaimi, Nur Syafiqah Fauzan, and Siti Ilyani Rani helped with the revisions and approved the article submission.

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