HUMAN PERCEPTION TOWARDS FIRE SAFETY AWARENESS IN MALAYSIA PUBLIC HOSPITAL

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Abstract:

The focus of this research is on human perception toward fire safety awareness in public hospitals. The perception was evaluated by looking at two variables, awareness, and knowledge. With the existence of knowledge and awareness, the perception of fire safety in hospitals is high. Thus, the three objectives are; i) evaluate and identify the relation of consumer perception towards the fire safety awareness in hospitals. ii) evaluate and analyse consumer perception on fire safety awareness with the effective value of designs and exit routes prepared. iii) suggest improvement measures in ensuring the hospital's occupants able to increase the awareness and understanding values in fire safety in hospitals. This study adapted quantitative methodology by using a random survey as an instrument which involved 285 respondents representing 6 selected hospitals in Malaysia. The findings found that there was no significant between the relation of awareness and knowledge with age, education, and occupation in identifying the level of awareness and knowledge in fire safety in hospitals. Yet, there was a significant value in gender which the men have higher awareness and knowledge as compared to women who were not significant in this study. Therefore, several improvement measures need to be done by the hospital administration to add awareness value among the hospital users.

Keywords:

Fire Safety In The Hospital, Human Perception In Fire Safety In Hospital, Human Awareness In Fire Safety In Hospital.

Introduction

Fire incidents in hospitals are a serious threat to the building occupants, especially patients and visitors. During fire emergencies, the evacuation process has a significant effect on the occupants especially on behaviours, attitudes, perceptions, also the victim's interpretation. For example, the victim will switch the availability of their routes to other exit routes, their perception of the surroundings disturbed by the conditions of the surroundings, their movements restricted as their visibility reduced, movement restrictions especially among the patients, and mental pressure or significant panic which caused them difficulty in making an evacuation decision, and this matter is too complicated and unpredictable (Li et al., 2020). Therefore, the methodology in saving the lives of the building occupants during a fire is a complicated and complex issue that needs to be effectively attended to and requires expertise from multiple fields. Various research has been conducted to ensure the evacuation methods in hospitals are well practiced by the premise occupants. One of the usual methods is the amount of time for safe evacuation must be less RSET (Required Safe Egress Time) than ASET (Available Safe Egress Time) (Mu et al., 2013). However, this process is depending on the reaction condition of the hospital occupants by looking at their perception and understanding of the surroundings of the respective hospital. (Ramli et al., 2017a). Most hospitals are built with complex designs, comply with the standards, rules, high fire safety act or code of conduct, and oblige to the standards of the authorities. Thus, hospitals can assist in lowering the hazard risks of fire and provide sufficient and safe exit route designs for the occupants during the evacuations. The success of these safety steps designs decreases the hazardous risk of fire, yet this factor is solely depending on the attitude and behaviour of the occupants. The hospital occupants are diversified in terms of attitudes and perceptions on their interpretation of fire safety. Humans are known for a complex and unpredictable attitude, when a fire emergency occurs, the changes in their attitude and action may lead to the worst fire condition and endangerment to their lives. There is a possibility that some occupants will be able to evacuate without hesitation and fast to act, some may face extreme difficulties and panicking, others may not evacuate themselves, while some individuals may take risks by helping to extinguish the fire and more other attitudes and actions of the occupants during the fire emergencies. All these situations are factors influenced by psychological, physiological, surroundings, and previous involvements of the occupants in fire incidents. Other than that, this condition may be impacted by the severity of threats to occupants who had experienced the situations during the fire and the actions that will be done by them when the fire incidents occur (Ramachandran, 1990).

Perceptions by these occupants will cause more dangerous risks to them in fire situations. The perceptions as well will determine the occupants' awareness values of the fire hazard on them and the surroundings. It is undeniable that most hospitals provide a high standard of fire safety infrastructures and facilities to secure the safety of occupants if fire incidents happen, yet without the awareness and concern on fire safety among them, they will not be able to save themselves during the fire. Each design of a building needs to be equipped with fire safety devices, active or passive. Therefore, it is the occupants' role to acknowledge and understand, as well as use the facilities well during fire emergencies. The provision of fire safety devices is the main requirement in assessing the building fire safety performance and design especially for the provision of hospital fire safety facilities (Danyan Huang, S.M.Lo, Lizhong Yang, Jacqueline TY Lo, 2019). All these facilities are built in hospitals to ensure fire evacuations by the occupants can be executed fast, efficiently, and safely by patients and hospital staff.

Literature Review

As the result of a search of research highlights related to human attitude and calculation of fire evacuation time, several approaches pertaining to occupants' perception have been identified. For (Furness & Muckett, 2007; Gerges et al., 2017; Zeng et al., 2018) the approach related to human's attitude, behaviour, and action in the evacuation process can be divided into several elements, namely, human's perception during the evacuation, panic attitude, pre-evacuation process, evacuation in high population (congestion), barriers of evacuation, and human's actions during smoke situations. Paulsen, (1984) stated that perception has made occupants unfocused in ensuring their evacuation process moves fast and safely.

In a previous study, it was found that there were several in-building fire safety concepts that have been designed to provide occupants' movement surrounding that when the fire happens, they could move fast and evacuate fast and safely. On the other hand, the other factor of failure of a design in a fire safety context is the attitude of the respective occupants themselves. According to (Rita F. Fahy & Aiman, 2009) sometimes the occupants become anxious and panic situations that occur portrayed them as having heightened anxiety, their actions portrayed that they were in a logical and suitable situation, and these situations frequently happen during the fire emergency in buildings. The provision of designs that depend on the occupants' attitude and behaviour could help in the provision of several fire safety facilities in a building such as personal safety kit, prevention equipment, protection, and fire-fighting equipment, and able to assist each occupant to evacuate facts and safely (Bakar, 2006). The requirements and needs in an act and uniformed building bylaw 1984 have emphasis the requirements, needs and justifications of a building design plan by emphasising the fire safety principle in various aspects including the main basic principle, Mean of Escape for all occupants when fire emergency in the building occur. The fire evacuation methods usually being portrayed in the emergency exit signage situated in the lobby and main entrance of a premise. However, the effectiveness of this method is depending on the occupant or an individual oneself to use it during the fire emergency as being instructed. According to (Furness & Muckett, 2007) the individual actions of the building occupants during fire emergency is complex and unpredictable. Psychology research showed that the individual's reactions during fire emergency is perception based and them react according to their own styles without looking at their surroundings and the existed guides.

(Kobes et al., 2010) in their simulation research on the verification of occupants' action in finding the nearest exits during the evacuation using three situations, normal, smoked and exit direction sign position scenario. In this simulation, the fire evacuation process can be categorised in three basic activities, signifies confirmation, decision-making, and evacuation to a safe place. Based on that research as well, it was found that during evacuation, occupants would act to act on their own if the exit direction sign was not found. They have the tendency to decide by searching the nearest exit, yet if the exit signs were placed on ceiling level and with clear visibility thus their potential of to follow the exit routes until to the last emergency door. It was clearly portrayed that if smoked fire had closed the exit signs, the perception of the occupants for evacuation were to find the nearest exit, and if the signs were visible, they would follow the routes until the last emergency door. In the context of occupant's attitudes and behaviours, (Furness & Muckett, 2007) added that when fire emergencies happen in a building, the occupant's actions can be divided into four sections, namely, sensory principle, sensory perception principle, sensory interpretation, and evaluation on fire risks. These four behavioural principles happened in fire emergency on the individual. Predicting the source of

the fire is a tough task, yet if it is done effectively and fast using the sensory to determine the spark source, they would be able to act and decide accordingly with precisions to fight the fire or informing the involved authorities, or evacuate immediately

Sensory Principle of Building Occupant

According to (Furness & Muckett, 2007) sensory principle of the occupants should be aligned with the fire safety designs in the building to create a surrounding in the building that give fast and safe impact for the fire evacuation movement by the occupants during the fire emergencies. Fire evacuation is a temporary or permanent actions in an immediate moving out from the building or the disaster zone or danger for the purpose of saving life. This involvement has been provided for in acts and law by emphasising the safe fire evacuation methods, movements, and routes for the premise occupants. (Paulsen, 1984) argued that the effectiveness of the methods and means, as well as fire safety facilities to be functioning in evacuation process in any buildings, is depending on how it is used by individuals or the premise occupants during the fire emergency apart from the automatic fire safety facilities such as sprinkler system. (Rita F. Fahy & Aiman, 2009) explained the ways and actions of an individual or premise occupants during fire emergency are too complex and complicated depending on their psychology. Th psychological responses of an individual or occupant are depending on their perception on the surroundings. In understanding and interpreting on how they alert and react on the danger of fire, it is depending on their sensory perception principle. When an individual is aware on the fire emergency condition, they feel the heat, breath difficulty due to the smoke, unpleasant smell, and the sound of explosion, they responded (FPA, 2015).

When the individuals are aware on the fire emergency, they will immediately react by quickly think on the measures they need to take or start to conduct fire evacuation movement. This decision is based the seriousness of the fire risks and the duration of the fire evacuation movement. However, it can be viewed that the individual's perception may become more critical for them during the fire evacuation process in general if they responded late (Andrew Furness, 2007). In understanding the ways of the occupants to be alert on the risks of fire around them, it is determined by looking at their attitude, skills, training, experiences, personality, memory and ability to process their sensory information in identifying the risks of the fire. It is a process of detect and interpret, which they alert on the information from the surroundings through their senses. The detection process is as process of receiving information from outside or their surroundings involving all of their sensory organs; eyes to collect visual information, ears for sounds such as explosions and noises, nose to receive unusual odour stimuli, chemical odour, burnt odour and sensitive towards any stimuli such as chemicals, skins respond to the pressure, temperature changes and multiple stimuli related to pain and lastly, the sense towards internal structures of joints, tendons and muscles and sensitivity towards body movements and the position of an individual during the fire. All these elements is crucial in ensuring the occupants could react immediately when fire emergency occurs, when their senses start to feel the significant changes around them, thus their sensory system will respond to detect the source of spark or heat they felt. If they are not aware of the changes of temperature, odours and feel around them, they will respond late in evacuating safely and eventually fail to escape from the danger of fire.

Occupant Perception on Fire

Perception is an act of assumption which perception process and reality perception are different views between the individuals (Ramli et al., 2017b). Perception received by individual through secondary information such as telephone calls are differed with reality perception received by individuals in the actual location. Their actions are also differed for example, if the perception received from secondary sources such as telephone calls, the individuals would try to verify the situation before they respond. When compared to the real perception which the individuals will respond fast to fight the fire or to evacuate immediately. (Andrew Furness, 2007) explained there were issues regarding reality perception by looking at the perception value itself; first, there were tendency to view a whole situation for verification and not accepting information with different gaps and will verify the whole incidents by getting the actual incident frame. Secondly, the tendency to view and interpret personally related to objects as constant in size, shapes, colour, and quality. Thirdly, sometime, the constant objects are regarded as variables, for example, at a time, it was seen that there was only one object, and it might be more than one (Wong et al., 2009). It is a bit unusual for an individual to have real fire emergency experience or situation which secure on their ability to evacuate fast and efficiently.

According to Deutsch dan Gerard 1955, the influence of social theory translates that the influence to receive information from secondary sources will be paired with other real sources an evidence of reality perception. In addition, the social influence aspect can be viewed from the public action or the surroundings as the main source of the way or situations were seen and characterised during the fire emergency, and the responses that need to be conducted when receiving information towards the individuals (Kinateder & Kuligowski, 2014). For example, common experience defined the warning alarm they interpreted as faulty or false warning alarm, yet it was regard as a common notion. However, they are not aware that the warning alarm is an actual threat, and the risk of danger will occur if they react late. There are deadly fire incidents when there are individuals that fail to see the risks of a small fire, yet it leads to rapid growth of fire beyond their experiences and they fail to acknowledge magnitude of the fire danger risk and causes their late and limited movements and increases the risks of injuries, catastrophe or death.

Occupants' Interpretation on Fire

Interpretation occurs in the brain fast and will contribute to the action towards the individual. The sensory organs send information to brain by changing the external stimuli into the brain nerves. Brain sends the information to nerves and this information will be interpreted into action by the individual related to the condition and situation surround them. The evaluation and response to subsequent behaviours will depend on the experiences and emotions of the individual involved (G. Proulx & Hadjisophocleous, 1994). The things that affect the response of the individual to act, could be influenced by the external factor and their surroundings, such as movements and actions by other individuals around them towards the emergency (Zhang et al., 2014). Hearing the fire emergency alarm can help the individuals or occupants to respond and evacuate without hesitation whether it is a real emergency or is due to another factor (Jeon & Hong, 2009; Jiang et al., 2014). However, if the source of the sound followed by other sources such as high heat surrounding or existence of smokes will impact the individual or occupants to respond faster. According to (Paulsen, 1984) Individual behaviour can be seen according to their gender which both genders have different interpretation on the fire situations. According to the research, it was found that there were multiple individual's actions related to the smoke and fire detection in a premise which can explain that women tend to warn others or

people around them whereas men would try to fight the fire, and women tend to seek help from neighbours or people around.

Evaluation on Fire Risk Perception

It has been established that at the early stage of fire, the occupants sniffed smoke or heard the alarm but responded late (Meng & Zhang, 2014). At first, the occupants were not aware they are in a danger of fire, they neglected the surroundings or trying to find the explanation behind the phenomena. These responses frequently lead to delayed evacuation or protective measures (Rathnayake et al., 2020). With the psychological and psychosocial approaches, the risks perception study give understanding about human behaviour when facing danger, decision and action taken in that contexts. Risk perception plays role in risk management and control, crisis prediction, and public supports for prevention strategies (Tancogne-Dejean & Laclémence, 2016)

Perception evaluation is a force that can be viewed by individuals through their sensory ability such as hearing, smell and feel, which helps in detecting the danger signals (fire) around them (Ab Aziz et al., 2019). With the evaluation from the individual, it estimates the danger threat by undergo the signal verification process received through their senses. After that, the action to make decision either to conduct the fire evacuation or to wait for other verification signals based on their interpretation as the last measures to start the fire evacuation movement (Haghani & Sarvi, 2016). The occupants were aware on the given signals and defined it as danger alarm (fire) and started to act, proved that signal verification is an important process in fire evacuation in buildings (Zhang et al., 2014). The perception toward danger (fire) determines their actions or responses towards the actions taken by them. If the fire condition is seen as hazardous, they tend to escape or evacuate from the building. However, most occupants have issues in estimating the level of fire danger and the implications caused by it (Zhou et al., 2021).

Their beliefs and assumptions regarding the speed or severity of fire, and the growth of smokes are often inaccurate and incorrect. This indicates that they often putting themselves in a dangerous situation when delaying the fire evacuation process (Cao et al., 2018). Their perception on the surroundings plays important role in evaluating their response performance during the fire situations, where they found that it is not the matters of the actual length of the routes, but how the see and choose the nearest emergency exit to move around in the building (Bukowski, 2007). For example, the corridors with unknown angles and routes are experienced as longer compared to straight corridors and commonly used for exit, in other words, if those corridors are the nearest to them, they need to follow the routes as it has been designed for the evacuation from fire emergency (Kinateder & Kuligowski, 2014). The fire risks evaluation by different occupants can be viewed and influenced bias situations, some might evaluate the risk as low and eventually led to unsuitable changes of actions or making wrong decision for evacuation (Tancogne-Dejean & Laclémence, 2016)

According to (Andrew Furness, 2007) perception on fire risk is an individual psychological variable which involves age, gender experiences, training, personality, and culture in interpreting the risk value of danger level of a fire emergency. The ability to quickly process the information received by the individuals' senses could evaluate their ability to face the fire danger and produce a fast action in making decision for appropriate actions whether to fight or evacuate. The perception that able to interpret an object has dangerous risk value could help

individuals to move with precautions, to see the other weaknesses, and to evaluate self-ability to move fast and safely. However, this perception is being influenced by the sociological factor in the situation involving several matters such as hierarchy positions, involvement in organisations, pressure from the organisation groups, culture, politics, or organisation's specific strategies toward the interpretation of the hazard value, risk level and level of ability and capability of other individuals in making decision and actions during the fire emergency.

This organisation's sociological perception usually involving groups with criteria such as experiences, training, knowledge on fire evacuation, bravery, physical ability, health conditions, other matters which help in ensuring decisions made are precise, fast, and safe for the others in fire emergency in a building (Fisal et al., 2017). This factor will determine the ability to gives order to the occupants to follow the planned fire evacuation strategies. In this condition, the involved organisations in handling the fire emergency are important so that the occupants are not panicking and able to evacuate in proper, fast and safe motions. With the existence of orders and assistance from the organisations during emergency, the pressure and emotion of the occupants can be reduced in handling the risks of catastrophe and injuries. (Guylene Proulx & Sime, 2006) assumed that the building occupants are corelated with the surroundings and other occupants and stated that the occupants and their attitude and behaviour are depending on their surroundings. Aligning with the traditional psychological approach, humans will view an individual in terms of the personality traits (stability), ability and characteristics of oneself.

However, (Proulx & Sime, 2006) added that nevertheless, the occupants' responses or the individuals themselves are diversified in terms of their ways and actions in similar emergency locations, as per their action at the other places. It is depending on the organisation's sociological at the involved locations. Other than that, other approaches also involved in ensuring the fire evacuation methods can be conducted safely apart from depending on the personal traits of an individual or the usage of fire safety facilities and the building classification where the emergency occurs, yet it also involves the design of the interior of furniture, floor plan and the internal routes plan of the building that might impacted the level of capability of a fast and safe fire evacuation (Jeon & Hong, 2009).

Methodology

This study adapted the quantitative method by using random survey as tools with Likert scale to measure the level of consumer perception on the prepared fire safety in hospital buildings. The scope of study of this research is limited to hospitals with 4 storeys and above and has lift facility, also major specialist hospitals that have more than 800 beds. It involved 6 hospitals in Malaysia: A) Hospial Sultanah Aminah, Johor Bahru, Johor (HSA), B) Hospital Sultan Ismail, Johor Bahru, Johor (HSI), C) Hospital Raja Perempuan Zainab II, Kota Bahru, Kelantan (HRPZII), D) Hospital Nur Zahirah, Kuala Terengganu, Terengganu (HSNZ), E) Hospital Selayang, Selayang, Selangor (HSLG), F) Hospital Serdang, Kajang, Selangor (HSDG). The respondents were from three groups: hospital staffs (doctors, nurses, support staff), patients and visitors. The involvement of respondents is those who occupy the hospitals, and some were those who used to occupy the hospital for treatments, working, or visiting, and the hospital visitors. This study involved 6 sections; demography of respondents, awareness, and interpretation, understanding and knowledge, considerations and actions, limitation and restrictions, and effectiveness of designs and exit routes. While the analysis of this study was conducted using SPSS which involved demographic analysis and inferential using several tests:

reliability, normality, correlation and ANOVA tests. This study used Google Form as research tool in collecting data safely. Due to the MCO restrictions during this Covid-19 pandemic, this study used virtual sampling which was conducted for 3 weeks to get the answers from respondents from each hospital. In terms of sampling, respondents were those with the age more than 12 years old, among men and women, working in private and public sectors. From the information gained, through literature and personal interviews, questionnaire was developed and distributed to the targeted participants. Finally, the data collected from the questionnaire were analysed.

Research Objective

This research established three main objectives; i) evaluate and identify the relation of consumer perception towards the fire safety awareness in hospitals. ii) evaluate and analyse consumer perception on fire safety awareness with the effective value of designs and exit routes prepared. iii) suggest improvement measures in ensuring the hospital's occupants able to increase the awareness and understanding values in fire safety in hospitals.

Research framework structure

Figure 1 below showed the framework chart of this research. Overall, this study involved age more than 12 years old and while the samplings were taken among the hospital staffs, patients, and visitors.

Figure 1: Framework Research Process
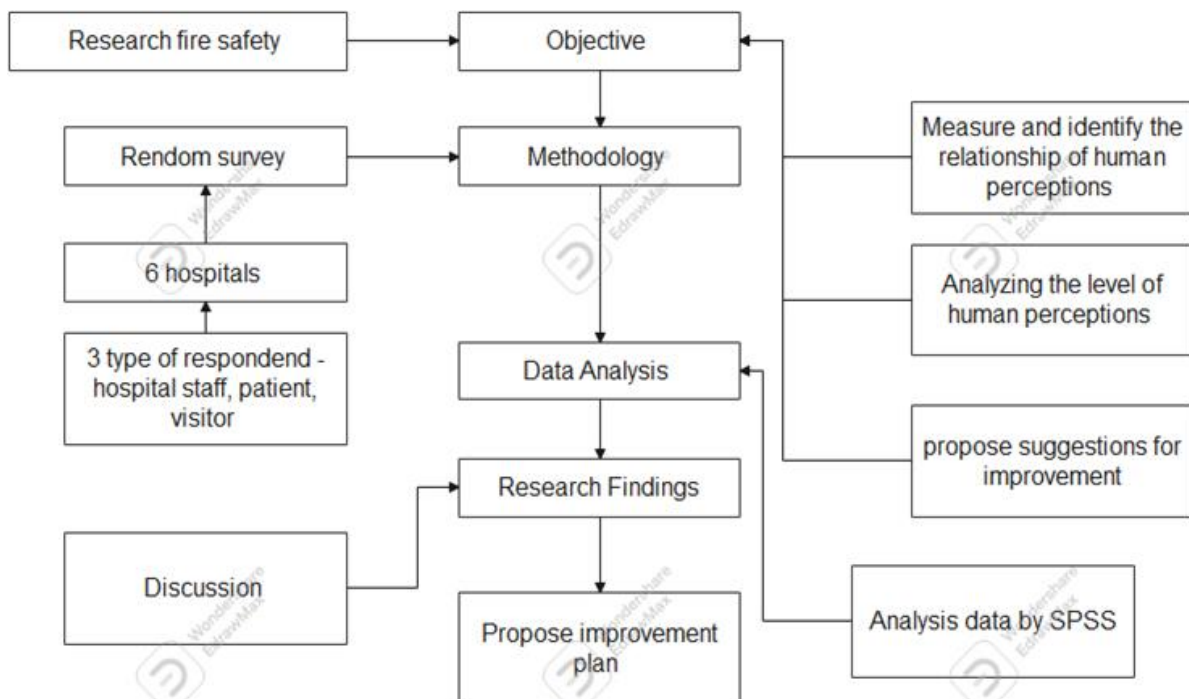
Data Analysis

The findings from this study found that 285 respondents answered all questions including all the 6 selected hospitals. Table 1 showed the number of respondents involved with the highest percentage Hospital A with value of 34.0% and the number of respondents was 97, while the lowest percentages was C with 8.1% represented by 17 respondents.

Table 1: Frequency Respondent in The Survey

MAJOR SPECIALIST HOSPITAL	Frequency	Percent	Valid Percent	Cumulative Percent
HOSPITAL A	97	34.0	34.0	34.0
HOSPITAL B	23	8.1	8.1	42.1
HOSPITAL C	17	6.0	6.0	48.1
HOSPITAL D	58	20.4	20.4	68.4
HOSPITAL E	42	14.7	14.7	83.2
HOSPITAL F	48	16.8	16.8	100.0
Total	285	100.0	100.0	

The number of respondents in Table 2 showed gender responding in the hospital survey that mentioned women was the highest with 51.9% represented by 148 respondents, and men with 48.1% represented by 137 respondents.

Table 2: Gender Responding in The Hospital Survey

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	137	48.1	48.1	48.1
Female	148	51.9	51.9	100.0
Total	285	100.0	100.0	

For the age group, all respondents were categorised according to 7 group age in the conducted survey. As per responded from group of age on Table 3, the highest number age group was age group of 56-60 years old who represented 35.8 % or 102 respondents. While, the lowest number was age group of 46-55 years old which representing 0.4% or 1 respondent only.

Table 3: Responded From Group of Age.

Age	Frequency	Percent	Valid Percent	Cumulative Percent
12-18	8	2.8	2.8	2.8
19-25	17	6.0	6.0	8.8
26-35	49	17.2	17.2	26.0

36-45	96	33.7	33.7	59.6
46-55	1	.4	.4	60.0
56-60	102	35.8	35.8	95.8
61 above	12	4.2	4.2	100.0
Total	285	100.0	100.0	

From the perspective of education level, the respondents were classified into three groups: secondary school and bellow, college, and degree and above. Based on level of education on Table 4, 51.9% or 148 respondents were among degree graduates and above and the lowest percentages was secondary and bellow group with 17.2% equivalent to 49 people. All these three groups will be evaluated on their perceptions towards the fire safety provided in hospitals. Is this relation able to show its significance prepared especially the plan and access route design?

Table 4: Level of Education

Level of education				
	Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Secondary School and bellow (PMR/SPM)	49	17.2	17.2	17.2
College (STPM/STAM/Sijil matriculation /Diploma)	88	30.9	30.9	48.1
High Education (Degree /Master /PhD)	148	51.9	51.9	100.0
Total	285	100.0	100.0	

Kruskal Wallis Test

Kruskal-Wallis H test or also known as one way ANOVA is non-parametric assessment based on position which cab be used to decide whether there are statically significant differences between two or more groups of independent variables with one ordinal dependent variable. Thus, this study was conducted to view the relation of knowledge and understanding variable other variables; age, education, working experiences to view clearly on the statistical value which is significant for each variable in the study. The findings from this Kruskal Wallis Test for age, education on Table 5, working and experience found that there was no significant value on all variables. Each variable was tested, and the highest Sig value was 0.952 from the working experience group and the lowest value was 0.245 from age group.

Table 5: Kruskal Walli's Test for Age, Education, Working and Experience

Kruskal wall test

	Knowledge	N	Mean rank	Chi - Squre	df	Sig.
Age	12-18	8	139.75	7.909	6	0.245
	19-25	17	164.79			
	26-35	49	161.34			
	36-45	96	142.43			
	46-55	1	9			
	55-60	102	134.89			
	61 above	12	124.3			
Education	Secondary School and bellow (PMR/SPM)	49	137.7	1.572	2	0.456
	College (STPM/STAM/ Matriculation /Diploma)	88	152.08			
	High Education (Degree /Master /PhD)	148	139.47			
Working experience	Student	18	138.11	1.125	5	0.952
	Private sector	84	139.7			
	Public sector	119	146.19			
	Own business	31	151.53			
	Retired	12	129.63			
	Not working	21	137.36			

Reliability Test

Instrument reliability means the extent of an instrument in testing the data. In other words, according to Burns dan Groves (1993) stated that the reliability of a question indicated the extent to which the value of the indicator in conducted question score portrayed the questions have clear and precise reliability either low, good, or high depending on the score value received. In ensuring this survey is clear, simple, and precise, a pre-test had been conducted on 285 respondents from 6 selected hospitals. this pre-test involved 5 phases, phase 1 was to test the awareness and second phase was to test on the knowledge. According to Sekaran (2005), before this questionnaire can be used to collect answers and suggestions, researcher should do a pre-test. Findings from this pre-test using the reliability test with *Cronbach Alfa* conducted on several questions related to awareness and knowledge as per Table 6 for reliability test Cronbach Alfa test for the questionnaire survey below. Findings from Cronbach Alfa found that the score for 5 sections of questions had been valued where awareness and interpretation had score of 0.942 with 17 questions, Understanding and knowledge with score of 0.899 with 26 questions. While two groups of design plan & access route dan constraints & obstacles got average score with 0.719 dan 0.788 score. This indicated that all questions in the questionnaire have high and average reliability which closely to 1.0. According to Chua (2011), the interpretation of reliability score with 0.65 – 0.79 is average and 0.80 – 0.95 is high. Based on

the conducted study, in overall, the instrument reliability was at the highest index, in between 0.942, 0.899 and 0.827 as per Cronbach Alfa test for the questionnaire survey on Table 6.

Table 6: Reliability Test: Cronbach Alfa Test for The Questionnaire Survey

REALIBILITY TEST		
Item	**Cronbach Alfa**	**Item**
Awareness and interpretation	0.942	17
understanding and knowledge	0.899	11
Considerations and Actions	0.827	26
Constraints and obstacles	0.788	14
Design plan and access routes	0.719	6

Normality Test

Normality test was conducted to view the sampling tabulation either normal tabulation or abnormal. The purpose of this test being conducted was to view the sample tabulation either normal or abnormal, positive or negative skewness, or positive or negative Krutosis. The findings from this pioneer study, the data after the normality test, statistically showed the form of zero value data distribution for skewness and krutosis while for normality distribution, it showed that the data distribution was 100 percent normal. This method was referring to the significant showed that Shapiro-wilk valued as compared Sig should be greater than value of $P<0.05$. Thus, for the Shapiro-wilk for the awareness value in this study clearly shown the data distribution valued at 0.080 which was greater than value $P>0.05$ portrayed that it was a normal distribution. While for knowledge, showed the sng value 0.001 which is less than $P< 0.05$ which indicated it was an abnormal data. If the data distribution was abnormal, it did not influence the significant value in the study conducted using ANOVA, and it was not a problem to do the analysis as the value in ANOVA could include abnormal and normal data distribution. Table 7 showed the value of the normality test for the research conducted results of the normality test. Based on kurtosis value test, all data consider as normal distribution, and this study will use a parametric test.

Table 7: Indicate the Value of The Normality Test for The Research Conducted.

NORMALITY TEST							
	Skewness		**Kurtosis**		**Shapiro-Wilk**		
					Statistic	**df**	**Sig.**
	Statistic	**Standard Error**	**Statistic**	**Standard Error**			
Awareness and Interpretation	-0.146	0.144	-0.221	0.288	0.991	28	0.080
	-1.014		-0.767			4	
Knowledge and understanding	-0.411	0.144	0.003	0.288	0.982	28	0.001
	2.854		0.010			4	
Considerations and Actions	0.720	0.145	0.883	0.288	0.969	28	0.000
	4.966		3.066			4	

Constraints and obstacles	0.468	0.145	0.863	0.288	0.972	28	0.000
	3.228		2.997			4	
Design plan and Access routes	0.117	0.145	-0.208	0.288	0.988	28	0.020
	0.807		-0.722			4	

********standard skewness (-3 and 3) and kurtosis (-7 and 7)
Source: (Hair et al., 2010) (Byrne, 2001)

Based on Table 7 the value of the normality test for the research conducted, the data shown were the normal data distribution and Figure 2 and 3 showed the graph of the normal distribution for two out of five groups. With these normal distributions, it indicated the respondents consistency in evaluating perception on fire safety awareness in hospitals.

Figure 2: Describe the Normality Test Graft for Awareness and Interpretation
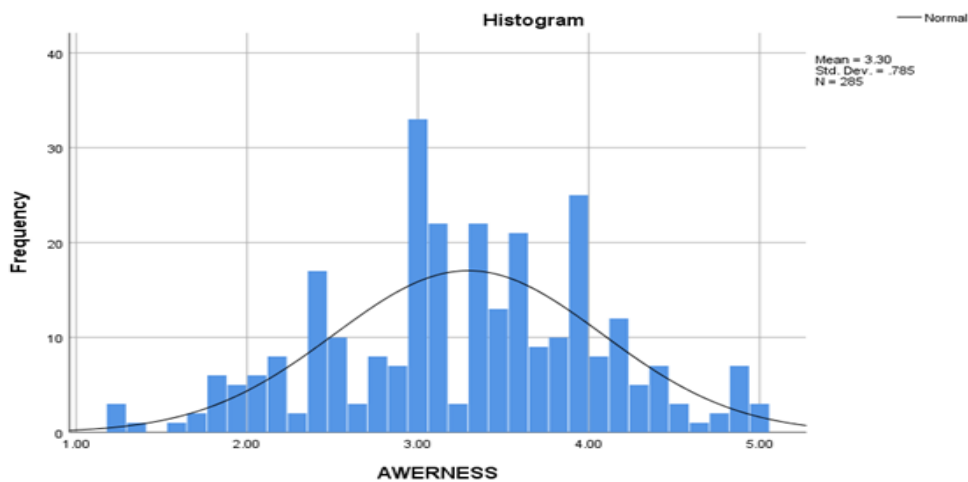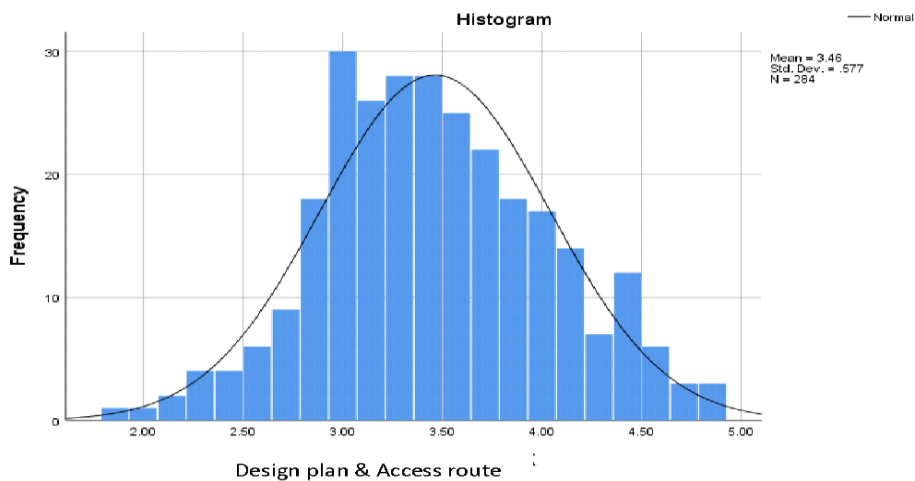

Figure 3: Describe Normality Test for Design Plan and Access Route for This Survey

Independence Test

Independent test is a method to evaluate variable with normal distributions such as in Table 8. This method showed that   independent T test in this study could evaluate a variable was significant or not. Thus, the findings in this test found that the significant value towards men and women which their significant value towards fire safety awareness was high, M=3.49 and SD=0.749 for men, where p>0.05 showed that it was significant for the given variables. While for women, the value was M.=194 and value p=0.019 indicated less value from p,0.05 and this data indicated no significant relation in this case.

Table 8: Analysis SPSS on Awareness (Normal Distribution) By Using Independent Test

INDEPENDENT T TEST

Gender	*M*	*SD*	*df*	*t*	*p*	95% confidence interval of the difference	
						Lower	Upper
Male	3.4088	0.74871	283	2.365	0.019	0.03664	0.40012
Female	3.1904	0.80557					

**** This study found that male respondents (*M*=3.409, *SD*=0.749) had statically significant higher level of awareness on fire safety in hospital compare to female respondents (*M*=3.1904, *SD*=0.8056), *t* (283) =2.365, *p*=0.019.

Descriptive Test

This test was used to view the criteria of the variables towards the mean value, standard deviation, median and mod. The variables data showed in the descriptive analysis was in the form of mean score and standard deviation. Descriptive statistic was used to analyse data of respondent demographic backgrounds, level of awareness and interpretation, understanding and knowledge, consideration and action, Constraints and obstacles, and design plan and access route, hospital occupants. Descriptive statistic also being used to determine the levels of a variable with a score mean. Score mean from 1.00 to 2.33 indicated the score for variable at low level, mean score between 2.34 to 3.66 indicated the average level, and mean score between 3.67 to 5.00 indicated high level (Musa et al., 2014) were the descriptions of the score mean explanation for the studied variables.

Table 9 referred to the overall study on the five variables used in this study. The findings found that the score level for descriptive and variable test for the frequency of hospital visits within 1 year of period was moderate, which between 2.34 to 3.66 where the highest value was 3.61, for understanding & knowledge (≥8) and for the lowest value variable was awareness & interpretation (≤1), 3.15. it was clear that the frequency of visits to the hospitals did not influence the significant of the hospital occupants towards the fire safety awareness in hospitals. though they frequently visited hospitals, they still have moderate level of perception on the fire safety in hospitals.

Table 9: Descriptive & Variable Test for Frequency Respondent Come to The Hospital Per Year.

Descriptive & Variable test for respondent

	Frequency	N	Mean	Standard deviation	Std. error	95% Confidence interval for mean		Min	Max
						Lower bound	Upper bound		
Awareness & interpretation	≤1	46	3.15	0.86	0.13	2.89	3.40	1.24	4.94
	2-5 ≤	134	3.29	0.75	0.06	3.16	3.42	1.24	5.00
	6-7≤	23	3.35	0.80	0.165	3.00	3.70	1.88	4.59
	≥8	81	3.38	0.80	0.09	3.21	3.56	1.24	5.00
Understanding & Knowledge	≤1	46	3.55	0.64	0.10	3.35	3.74	1.55	4.82
	2-5 ≤	134	3.58	0.75	0.07	3.45	3.71	1.73	5.00
	6-7≤	23	3.59	0.72	0.15	3.28	3.90	2.09	5.00
	≥8	81	3.61	0.74	0.935	3.45	3.75	1.55	5.00
Consideration & action	≤1	46	3.46	0.07	0.46	3.32	3.38	2.69	4.69
	2-5 ≤	134	3.44	0.50	0.04	3.36	3.53	2.19	5.00
	6-7≤	23	3.22	0.36	0.07	3.06	3.37	2.73	4.04
	≥8	81	3.34	0.43	0.05	3.24	3.43	2.42	4.88
Constraints & obstacles	≤1	46	3.55	0.50	0.07	3.40	3.70	2.86	4.79
	2-5 ≤	134	3.55	0.55	0.05	3.45	3.64	1.93	5.00
	6-7≤	23	3.39	0.42	0.09	3.21	3.57	2.86	4.43
	≥8	81	3.49	0.42	0.05	3.40	3.59	2.57	5.00
Design plan & Access route	≤1	46	3.42	0.56	0.08	3.25	3.58	2.29	4.86
	2-5 ≤	134	3.53	0.60	0.05	3.43	3.63	2.00	4.86
	6-7≤	23	3.48	0.53	0.111	3.25	3.71	2.43	4.57
	≥8	81	3.38	0.55	0.068	3.25	3.50	1.86	4.71

Meanwhile, the spearman's rank correlation test for frequency of respondents come to the hospital per year showed in Table 9 indicated there were no significant relation towards all the variables stated in the group study. This can be viewed in P=value which in overall exceeded p<0.05, while the r value was below than 1. Highest value of p-value was from Constraints & obstacles group with p = 0.708 and the lowest value was p = 0.077 from Considerations and Actions group.

Correlation Test

However, in the correlation test using Spearman's rho test found the relation between demographic towards the fire safety awareness perception value, which the relation with Variable understanding & knowledge was significant towards the age with sig value of. 0.003 and gender with sig value of. 0.038 where value p<0.05. It can be summarised that the relation of understanding and knowledge is significant with age and gender yet, was not significant with other groups. Table 10 explained the relation between understanding and knowledge with the demographic based on the analysis conducted.

Table 10: Spearman's Rank Correlation Test for Frequency of Responded Come to The Hospital Per Year.

Spearman's Rank Correlation test

Factor	Frequency	r_s	p value	Interpretation
Awareness and Interpretation	≤1	**0.096**	**0.105**	No or negligible relationship
	2-5 ≤			
	6-7≤			
	≥8			
Knowledge and understanding	≤1	**0.053**	**0.370**	No or negligible relationship
	2-5 ≤			
	6-7≤			
	≥8			
Considerations and Actions	≤1	**-0.105**	**0.077**	No or negligible relationship
	2-5 ≤			
	6-7≤			
	≥8			
Constraints & obstacles	≤1	**-0.022**	**0.708**	No or negligible relationship
	2-5 ≤			
	6-7≤			
	≥8			
Design plan & Access route	≤1	**-0.037**	**0.532**	No or negligible relationship
	2-5 ≤			
	6-7≤			
	≥8			

Spearman's Rank Correlation Test

In determining the relations between the variables, correlation test was conducted to view the effectiveness of the relations between two groups. By using the Spearman Rho test interpretation towards the consumers perception on the five factors, it can be evaluated. This can be clearly viewed in Table 11, proving that there was no significant value on the frequency

of respondents with the connected five factors. Thus, the hospital occupants still need a better understanding on the fire safety in hospitals.

Table 11: Description of Spearman's Rho Test

Correlation test Spearman's rho test for Knowledge & Understanding

			Gender	Age	Education	Career	Understanding & Knowledge
Spearman's rho	Gender	Correlation Coefficient	1.000	-.091	-.026	.064	-.175**
		Sig. (2-tailed)	.	.125	.663	.282	.003
		N	285	285	285	285	285
	Age	Correlation Coefficient	-.091	1.000	-.068	.393**	-.123*
		Sig. (2-tailed)	.125	.	.250	.000	.038
		N	285	285	285	285	285
	Education	Correlation Coefficient	-.026	-.068	1.000	-.164**	-.024
		Sig. (2-tailed)	.663	.250	.	.006	.681
		N	285	285	285	285	285
	Working experience	Correlation Coefficient	.064	.393**	-.164**	1.000	.018
		Sig. (2-tailed)	.282	.000	.006	.	.765
		N	285	285	285	285	285
	Knowledge & Understanding	Correlation Coefficient	-.175**	-.123*	-.024	.018	1.000
		Sig. (2-tailed)	.003	.038	.681	.765	.
		N	285	285	285	285	285

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
******The were significant correlations between gender and age the level of understanding & knowledge on this analysis

Meanwhile, for the relation between length of stay (LOS) in hospital indicated that the relation between the five factors were not significant where the value P>0.05. thus, all these matters did not give any impacts on the value of consumers' perception on the fire safety though they had longer length of stay in hospitals. This situation indicated that the length of stay in the hospitals did not ensure the precise and effective perception on the fire safety in hospitals. Thus, the factor of staying longer or the length of stay in hospitals could not ensure they do understand the fire safety in the respective hospitals. Table 11 showed the highest P value where the highest value was design plan & access route group with p value= 0.669 while the lowest value was Knowledge & understanding group with p value = 0.133.

Spearman's Rho Correlation test for age Factor as per Table 11 indicated the p-value which had significant value on awareness & interpretation factor with p-value = 0.05 and 0.038 p-value, yet that value was like 0.05 where the P-value need to be less than 0.05, thus for the value for awareness & interpretation was above par not below 0.05. Only the value of knowledge & understanding variable indicated p-value below 0.05. due to both variables were weak, the other tests should be examined in which in this test as well, it was found that there was r_s value. It was clear that all variables were not significant. Thus, both variables can be excluded. In overall, through all tests, the significant value was not detected in rs test due to all values of the variables were negative; awareness & interpretation variable r_s= -0.116, knowledge & understanding r_s= -0.123, and the smallest was r_s= -0.480 by looking at the overall rs value were below the negative level. This indicated that those variables were not significant toward the perception of consumers on fire safety in hospitals yet there was little significant value under P-value less than 0.05.

In the other tests, based on the education level variable, tested as per Table 11, it was found that all variables were not significant towards the issue of perception of fire safety in hospitals. By referring to the p-value and r_s in Table 11 where p-value exceeded p<0.05 in which the highest p-value was 0.857 from constraints & obstacle. While the lowest was from design plan & access route with value of 0.65 p-value. As for the Rs value, it was found that the highest value was 0.011 and the lowest was -0.24.

Table 12: Spearman's Rho Correlation Interpretation Between Respondent in The Five Hospital Survey.

Spearman's Rank Correlation of survey

Factor	Frequency visiting		Length of Stay		Age		Education level	
	r_s	p value	r_s	p value	r_s	p value	r_s	p value
Awareness and Interpretation	0.096	0.105	0.089	0.135	-0.116*	0.050**	0.013	0.827
Knowledge and understanding	0.053	0.370	0.089	0.133	-0.123*	0.038**	-0.24	0.681
Considerations and Actions	-0.105	0.077	0.047	0.432	-0.480	0.420	0.025	0.676
Constraints and obstacles	-0.022	0.708	-0.033	0.579	-0.078	0.189	0.011	0.857
Design plan and Access routes	-0.037	0.532	0.025	0.669	-0.104	0.080	0.027	0.650

*** No or negligible relationship

Chi Square Test

The next text was Chi-Square test, frequently used for independent (Chi-Square test for independent / test of homogeneity). This test is used to identify the comparison of two variables or more which scaled as nominal. For this research, the comparison was conducted on three groups: gender, occupation, and purpose of hospital visits. The findings were shown in Table 13, where the gender factor did not influence the significant value towards the perception of consumers on the fire safety awareness in hospitals, where the p-value was more than $p<0.05$ except for design plan & access route with p-value was $p=0.008$, smaller than $p<0.05$. While referred to the working experiences which translated similar value, no significant relation in the analysis of this test, which p-value exceeded $p<0.05$ except for consideration & action that indicated there was significant value towards the highlighted variable, $\chi (295) =345.130$, $p = 0.024$ where $P<0.05$.

Table 13: Chi-Square Test for Respondent Hospital.

Factor	Gender		Working experience	
	χ^2	*p* value	χ^2	*p* value
Awareness and Interpretation	65.057	0.191	306.665	0.131
Knowledge and understanding	49.267	0.069	148.598	0.958
Considerations and Actions	71.520	0.127	345.130	0.024*
Constraints and obstacles	45.097	0.118	176.833	0.447
Design plan and Access routes	39.886	0.008	109.699	0.357

ANOVA Test

The final test was using ANOVA test to identify the significant effects between dependent and independent variables used in this research. For this test, the variables towards the value of consumers' perception on the fire safety in hospitals five sections of the questionnaire were analysed: Awareness and Interpretation, Knowledge and understanding, Considerations and Actions, Constraints and obstacles, and Design plan and Access routes. Results from 5 analysis of one-way ANOVA that had been conducted, Table 14 indicated that there were no significant values towards all variables except for destination location, there were two significant sections; Constraints and obstacles with $p = 0.042$ and design plan & access with p value was 0.016. Both groups had value of $P<0.05$. t section for Awareness & Interpretation in the building hospital, there was no significant value on the four variables: age, education, working experience and destination location.

Table 14: ANOVA Test for Awareness & Interpretation in The Building Hospital

One-way ANOVA test for the survey

Source		df	P*	P**	P***	P****	P*****
Age	Between groups	6	0.322	0.350	0.459	0.321	0.369
	Within Groups	278					
	Total	284					
Education	Between groups	2	0.310	0.942	0.232	0.823	0.912
	Within Groups	282					
	Total	284					
Working experience	Between groups	5	0.699	0.855	0.822	0.864	0.261
	Within Groups	279					
	Total	284					
Destination location	Between groups	8	0.312	0.065	0.061	0.042*	0.016*
	Within Groups	276					
	Total	284					

* Awareness & Interpretation in the building hospital, ** Knowledge & Understanding
*** Considerations and Actions, **** Constraints and obstacles, ***** Design plan & access

Result
Based on the gathered data of the research, the evaluation score for each variable can be viewed by referring to the mean score of a variable. For the data analysis, mean score collected will be interpreted based on the likert scale from five points. Based on the respondents' answers, these will be evaluated and the results from the findings will be referred to the previous studies, and for that, this study has adapted method from (Hamzah, Rosdiah, Ahmad, Kamarul Mohsin, Abdullah, 2021) as per Table 15 related to score scale in determining a variable either it is too weak, weak, moderate, good, or excellent. The results of the adapted concept will be used to evaluate the score for the findings of this study.

Table 15: Mean Interpretation Score

Mean interpretation survey

Mean score	Mean interpretation
1.00-1.80	Very low
1.81-2.60	Low
2.61-3.40	Moderate
3.41-4.20	High
4.21-5.00	Very high

Sourse : (Hamzah, Rosdiah, Ahmad, Kamarul Mohsin, Abdullah, 2021)

This study identified that Table 16 defined the results of this study from respondents of 6 selected hospitals, where the score for the perception value of the consumers on the fire safety in hospitals were as per: Hospital A (M=3.2769), Hospital B (M=3.4632), Hospital C (M=3.4345), Hospital D (M=3.3561), Hospital E (M=3.3371) and Hospital F (M=3.2936). This indicated that the level of perception of the consumers on the fire safety in hospitals were good in overall where the highest perception levels were for Hospital B with value of 3.4632 and Hospital C with mean value of 3.4345. and others were at the moderate level. However, both hospitals were almost to the moderate level. l.

VARIABLE	MEAN	SD	Median	Interpretation on mean
Hospital B	3.4632	0.41542	3.4667	High
Hospital C	3.4345	0.48530	3.440	High
Hospital A	3.2769	0.42718	3.2667	Moderate
Hospital D	3.3561	0.32885	3.3800	Moderate
Hospital E	3.3371	0.50814	3.3267	Moderate
Hospital F	3.2936	0.48572	3.2133	Moderate

The results from the study, it was found that the overall score was moderate due to most respondents were highly educated and had high positions. Therefore, their perception towards the fire safety in hospitals were high. Nevertheless, most answers were found to be more towards moderate and not significant towards the variables used. Yet, from Table 16 the total of responded survey in frequency of responded to hospital, it was indicated that respondents other than the hospital staffs were few which only 4.9% or 14 respondents and rest of them were among the public which 100 respondents or 35.1%, received treatment/patients represented by 94 respondents or 33.0%, looking after patients with 71 respondents or 25.3% and contractors were 5 respondents or 1.8%. Therefore, significant changes were indicated which most variables were not significant towards the consumer's perception such as, design plan & access route and knowledge & understanding. With this data, it was clear that most questionnaire responses were not significant towards the variables when evaluated as a group yet in overall score were evaluated based on mean which indicated the moderate result.

Table 16: Total of Responded Survey

Frequency responded to hospital

	Frequency	Percent	Valid Percent	Cumulative Percent
Working /Staff hospital	14	4.9	4.9	4.9
Looking after patient	72	25.3	25.3	30.2
Under treatment	94	33.0	33.0	63.2
Visiting patient	100	35.1	35.1	98.2
Contractor/ Vendors/ maintenance	5	1.8	1.8	100.0
Total	285	100.0	100.0	

The results of this study had clearly indicated the relation between hospital occupants with the perception on fire safety in hospitals were closely related to the level of awareness & interpretation, knowledge & understanding, Considerations and Actions, Constraints and obstacles, and Design plan and Access routes. These five groups have become the core of this study by looking at the demographic of the hospital occupants such as age, education, occupation, length of stay, purpose of hospital visits, and all these influence their perception on the fire safety in hospitals. The level of perception on the awareness of fire safety in hospital can be nurtured and improved by looking at the responses given by them. Thus, the improvement measures should be taken into consideration by the hospital administration and designer in ensuring the occupants of the hospitals are safe and protected from fire catastrophe in hospitals. This means if the level of perception and awareness is high, the effectiveness of the floor plan designs, and access route should be elevated.

Discussion

Based on the finding, most respondents from four hospitals show a moderate level of perception of fire safety awareness. Only two respondents show the high level of fire safety awareness. This finding provides the answer to the first objective, to identify the level of perception of fire safety awareness in hospital. It clearly shows that majority of hospital users still do not have a high level of fire safety awareness in the hospital area. Even though it was found that most respondents are aware of the dangers of a fire in a hospital, they have a limited understanding of fire evacuation procedures, layout design configurations, and hospital signage design information.

A One-Way ANOVA analysis clearly shows that socio-demographic characteristics do not influence the level of perception of fire safety awareness among hospital users in some cases. This finding answer was to determine the major differences in perception on fire safety awareness among hospital users based on socio-demographic factors. The findings of this study however contradict with previous research that suggested socio-demographic factors influenced fire safety awareness (Huseyin & Satyen, 2006; Kulkarni et al., 2016). Only the mean score for the education level in this study indicated that respondents with higher educational levels, such as Degree level, or Diploma level tend to have a high fire safety awareness compared to respondents who have low education levels (SPM level and below). This may imply that education level is still an important factor in educating fire safety awareness among hospital users. This could be because respondents with a higher education level are more aware of the fire safety procedures than those with a lower education level.

Furthermore, respondents who spent a longer period in the hospital demonstrated a high level of fire safety awareness. This could imply that respondents are taking precautions to increase their perception on fire safety awareness in case a fire breaks out. The frequency with which respondents visit the hospital yields the same result as the duration with which respondents stay in the hospital. The result clearly shows that the more often the respondents visit the hospital, the higher their level of perception on fire safety awareness. It also clearly suggests that respondents are increasing their awareness to prepare themselves during emergency situation such as fire.

Several ideas have been provided to increase the level of fire safety awareness among hospital users to address the third objective of this study which was to propose improvement strategies to increase the level of awareness of hospital users on fire.

1.   Hospital management should conduct more fire safety awareness campaigns throughout the hospital, rather than focusing on a single group of people. In many organizations, an awareness campaign is limited to the organization's employees. It's great to provide employees with training and programs, but if the training and other programs also include visitors and patients, they'll be even more helpful in raising the level of awareness among hospital users. Since a hospital is a public building, it is important to intensify the awareness campaign among all hospital residents.

2.   Hospital management needs to improve the hospital's fire evacuation process information by refining the configuration of layout design, and signage design information. An understanding of hospital users' attitudes and actions must also be refined to ensure that the design is truly effective for hospital users. As previously stated, in the event of fire, a lack of fire safety awareness can cause panic and anxiety in a person. As a result, their reaction time to the evacuation process will be delayed. Individuals with limited knowledge and experience will face difficulties during the fire evacuation process. They will get confused, less confident, and less trusting when deciding whether to make a safe evacuation. A situation as such will further delay their evacuation and put their lives in jeopardy. In this emergency, they will also be hampered in their movement due to either obstruction from medical equipment or the occurrence of bottlenecks in the access route, which causes congestion and will further delay their evacuation. Therefore, it is crucial to have the configuration of layout design as well as signage design information that is clear and understandable to hospital users to assist in making evacuation process easy in the event of a fire, as well as to ensure that residents know, are aware of, and understand the design.

3.   Hospital management should consider adding more information signage about fire hazard warning signs and emergency exit signs, as well as direction signage on the walls and floor of the walkway, to help occupants evacuate more effectively and efficiently. Lights indicating the direction of the exit should also be used. Furthermore, the route design should be wide and appropriate to the capacity of occupants in the space and level.

4.   The hospital administration should also impose additional requirements to ensure that patient aid equipment is available at all levels and that every exit in the hospital building is always safe and free of obstacles such as flowerpots and other hospital equipment. In the event of an emergency, this will obstruct the movement of hospital users. Additional exit signage, both on the wall and on the floor of the exit, must be provided at each exit. This is done to ensure that the occupants understand the quickest and safest way out.

In general, there are several examples of awareness programs that can be considered such as advocating for a mini campaign on fire safety practices and procedure at the hospital level through public outreach campaigns such as public talks and fire safety awareness booths, improving fire safety awareness poster designs, conducting fire drill stimulation, and creating a video case about the importance of fire safety procedures. In other parts, managing the educational fire safety procedure via brochure, effective fire safety advertisement, increased safety awareness via signboard, and much more must be considered as part of one's effort to raise the level of awareness among hospital users, particularly those who do not visit on a regular basis.

With increased awareness of fire safety in hospital buildings, hospital users can help reduce the risk of death and injury due to a fire. Furthermore, an increase in fire safety awareness among hospital users can assist management to easily handle fire emergencies, and hospital users can assist in the process of fire evacuation more efficiently, quickly, and safely, and will not experience panic and fear when faced with fire emergencies. The situation can be managed, and the evacuation can be completed quickly and orderly, as well as within the time frame expected.

Conclusion

The results of hospital users' perceptions of fire safety awareness from six Malaysian hospitals are presented in this research. This finding has been considered for six specific healthcare facilities. In addition, the human aspects of fire safety interpretation, actions, and awareness in a hospital building were investigated. According to the findings, respondents have a moderate level of awareness of fire safety in hospitals. Even though respondents understand the consequences of a fire breaking out, they only have a moderate understanding of fire safety procedures.

The review also shows that the study's findings support the notion that people's attitudes, behaviours, and fears should be considered when designing a hospital because most of them are unfamiliar with the hospital layout. This suggested that people who are familiar with the building layout can help the hospital user make decisions more easily than someone who is unfamiliar with the building layout. People who visited the hospital more frequently and spent more time there had a higher level of fire safety awareness.

From this study, it is hoped that the method of fire safety awareness in Malaysia Hospitals can be broaden to other scopes such as the evacuation process, team of emergency response and the quality of fire safety facilities. With all fire safety perspectives, it will create more effective awareness to hospital employees, patients, and visitors. Aside from that, there are many topics not covered in this article that should be covered in future studies, such as fire evacuation methods in hospital buildings, fire auditing for fire certificates, ERT management and planning evacuation process, and others.

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Reference

Ab Aziz, N. F., Akashah, F. W., & Abdul Aziz, A. (2019). Conceptual framework for risk communication between emergency response team and management team at healthcare facilities: A Malaysian perspective. *International Journal of Disaster Risk Reduction*, *41*(August), 101282. https://doi.org/10.1016/j.ijdrr.2019.101282

Bukowski, R. W. (2007). Emergency Egress Strategies For Buildings. *International Interflam Conference*.

Byrne, B. M. (2001). Multivariate applications book series. Structural equation modeling with AMOS: Basic concepts, applications, and programming. In *Structural equation modeling with AMOS: Basic concepts, applications, and programming*.

Cao, S., Fu, L., & Song, W. (2018). Exit selection and pedestrian movement in a room with two exits under fire emergency. *Applied Mathematics and Computation*, *332*. https://doi.org/10.1016/j.amc.2018.03.048

Danyan Huang, S.M.Lo, Lizhong Yang, Jacqueline TY Lo, L. G. (2019). Hospital Evacuation under Fire: Risk Identification and Future Prospect. In H. D, L. S, Y. L, G. L, T. Lo J, & S. Fewer (Eds.), *2019 9th International Conference on Fire Science and Fire Protection Engineering, ICFSFPE 2019*. Institute of Electrical and Electronics Engineers Inc. https://doi.org/10.1109/ICFSFPE48751.2019.9055882

Fisal, N. S. M., Lintangah, W., & Ismenyah, M. (2017). Community Awareness & Challenges in Forest Fire Prevention: a Case Study At Peat Swamp Forest, Klias Forest Reserve, Beaufort, Sabah, Malaysia. *International Journal of Agriculture, Forestry and Plantation*, *5*.

Furness, A., & Muckett, M. (2007). Introduction to Fire Safety Management. *Introduction to Fire Safety Management*. https://doi.org/10.1016/B978-0-7506-8068-4.50015-4

Gerges, M., Mayouf, M., Rumley, P., & Moore, D. (2017). Human behaviour under fire situations in high-rise residential building. *International Journal of Building Pathology and Adaptation*. https://doi.org/10.1108/IJBPA-09-2016-0022

Haghani, M., & Sarvi, M. (2016). Human exit choice in crowded built environments: Investigating underlying behavioural differences between normal egress and emergency evacuations. *Fire Safety Journal*, *85*. https://doi.org/10.1016/j.firesaf.2016.07.003

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis, 7th ed. Prentice Hall, New Jersey. *Technometrics*, *15(3)*.

Hamzah, Rosdiah, Ahmad, Kamarul Mohsin, Abdullah, M. F. (2021). Kajian Terhadap Cabaran Implementasi Elemen IR4.0 Dalam Proses Pengajaran dan Pembelajaran Pensyarah Kejuruteraan Elektrik Politeknik Malaysia. *ANP Journal Of Social Sciences And Humanities*, *2*(1), 17–25. https://doi.org/10.53797/anpjssh.v2i1.3.2021

Jeon, G., & Hong, W. (2009). Characteristic features of the behavior and perception of evacuees from the Daegu subway fire and safety measures in an underground fire. *Journal of Asian Architecture and Building Engineering*, *8*(2). https://doi.org/10.3130/jaabe.8.415

Jiang, Z. M., Zhang, P. H., Shang, R. X., & Tian, X. L. (2014). Investigation and simulation on human evacuation behaviour in large hospital building in Shenyang. *Procedia Engineering*. https://doi.org/10.1016/j.proeng.2014.04.014

Kinateder, M., & Kuligowski, E. (2014). A Review of Risk Perception in Building Fire Evacuation. *NIST Technical Note 1840*. https://doi.org/10.6028/NIST.TN.1840

Kobes, M., Helsloot, I., De Vries, B., & Post, J. (2010). Exit choice, (pre-)movement time and (pre-)evacuation behaviour in hotel fire evacuation - Behavioural analysis and

validation of the use of serious gaming in experimental research. *Procedia Engineering*. https://doi.org/10.1016/j.proeng.2010.07.006

Li, Z., Huang, H., Li, N., Chu(Zan), M. L., & Law, K. (2020). An agent-based simulator for indoor crowd evacuation considering fire impacts. *Automation in Construction*, *120*. https://doi.org/10.1016/j.autcon.2020.103395

Meng, F., & Zhang, W. (2014). Way-finding during a fire emergency: An experimental study in a virtual environment. *Ergonomics*. https://doi.org/10.1080/00140139.2014.904006

Mu, H. L., Wang, J. H., Mao, Z. L., Sun, J. H., Lo, S. M., & Wang, Q. S. (2013). Pre-evacuation human reactions in fires: An attribution analysis considering psychological process. *Procedia Engineering*, *52*, 290–296. https://doi.org/10.1016/j.proeng.2013.02.142

Musa, K., Yusof, H., Yunus, J., Hamid, S. A., & Kunci, K. (2014). Kepimpinan Transformasional Pengetua: Perbandingan Antara Sekolah Menengah Awam Dan Swasta Cemerlang Principals' Transformational Leadership:Comparison Between Excellence Public and Private Schools. *Management Research Journal 120–139 Management Research Journal*, *33*.

Paulsen, R. L. (1984). Human behavior and fires: An introduction. *Fire Technology*, *20*(2), 15–27. https://doi.org/10.1007/BF02384147

Proulx, G., & Hadjisophocleous, G. (1994). Occupant Response Model: A Sub-model For The Nrcc Risk-cost Assessment Model. *Fire Safety Science*. https://doi.org/10.3801/iafss.fss.4-841

Proulx, Guylene, & Sime, J. D. (2006). To prevent "panic" in an underground emergency: Why not tell people the truth? *Fire Safety Science: Proceedings of the Third International Symposium*, 843–852. https://doi.org/10.4324/9780203973493

Ramachandran, G. (1990). Human behavior in fires-a review of research in the United Kingdom. *Fire Technology*, *26*(2), 149–155. https://doi.org/10.1007/BF01040179

Ramli, N., Ghani, N. A., Ahmad, N., Ibrahim, I., Md, S., & Rahim, A. (2017a). FIRE ESCAPE: APPS FOR SURVIVAL DURING FIRE. *SIC*, *2*, 1–4. www.perlis.uitm.edu.my/imitsic

Ramli, N., Ghani, N. A., Ahmad, N., Ibrahim, I., Md, S., & Rahim, A. (2017b). FIRE ESCAPE: APPS FOR SURVIVAL DURING FIRE. *SIC*, *2*.

Rathnayake, R. M. D. I. M., Sridarran, P., & Abeynayake, M. D. T. E. (2020). Factors contributing to building fire incidents: A review. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, *0*(March).

Rita F. Fahy, G. P., & Aiman. (2009). ' Panic ' and human behaviour in fire. In G. P. Rita F. Fahy & Aiman (Eds.), *Proceedings of the 4th International Symposium on Human Behaviour in Fire (Robinson College, Cambridge, UK, July 13, 2009),: Vol. NRCC-51384* (Issue July 13, 2009, pp. 387–398). National Research Council Canada, Canadian laws, policies, regulations and international agreements. http://www.nrc-cnrc.gc.ca/irc%0A'Panic'The seven story building fitted with three lifts lies partially on a lake. It houses offices for the Dean, Deputy Deans and eight engineering departments as well as rooms for professors (JUSA A, B and C) and associat

Tancogne-Dejean, M., & Laclémence, P. (2016). Fire risk perception and building evacuation by vulnerable persons: Points of view of laypersons, fire victims and experts. *Fire Safety Journal*, *80*. https://doi.org/10.1016/j.firesaf.2015.11.009

Wong, L. T., Fong, N. K., & Sui, W. H. (2009). A survey of occupant response towards an audible fire alarm. *International Journal for Housing Science and Its Applications*, *33*(4), 249–258.

Zeng, Y., Song, W., Huo, F., & Vizzari, G. (2018). Modeling evacuation dynamics on stairs by an extended optimal steps model. *Simulation Modelling Practice and Theory*. https://doi.org/10.1016/j.simpat.2018.02.001

Zhang, X., Li, X., & Hadjisophocleous, G. (2014). A probabilistic occupant response model for fire emergencies. *Fire Safety Journal*, *68*. https://doi.org/10.1016/j.firesaf.2014.05.017

Zhou, Z. X., Nakanishi, W., & Asakura, Y. (2021). Route choice in the pedestrian evacuation: Microscopic formulation based on visual information. *Physica A: Statistical Mechanics and Its Applications*. https://doi.org/10.1016/j.physa.2020.125313