

ORIGINAL ARTICLE

Factors Associated with Knowledge, Attitude and Practices on Fire Safety and Its Prevention Among Hostel Occupants in a Higher Learning Institution

Ahmad Saeed Ahmad AlWaqfi¹, Ng Yee Guan¹, Lim Poh Ying², Shamsul Bahri Md Tamrin¹

¹ Department of Environmental and Occupational Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor Darul Ehsan, Malaysia

² Department of Community Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor Darul Ehsan, Malaysia

ABSTRACT

Introduction: Failure to prepare students on fire safety and prevention in hostels adequately may result in various losses not limited to life and health but also in terms of properties, intellectual properties, and morale. As practices relates closely to knowledge and attitude, the aim of this study was to investigate the level of their knowledge, attitude and practices (KAP) in fire safety and prevention and its associated factors among hostels occupants in a university.

Methods: A cross-sectional study was conducted from March 2020 to October 2020, using online questionnaire with five different sections to obtain respondents' sociodemographic information, past-experiences and KAP related to fire safety and its prevention. **Results:** Out of 283 students, the prevalence of having acceptable level of knowledge, positive attitude and good practice were 62.0%, 87.9% and 49.3% respectively. Multiple logistic regression showed that non-Malay respondents were less likely (OR=0.301) to have acceptable knowledge level but those who had past-experiences in fire drill training particularly hands-on in fire drill training have significantly higher odds (OR=5.694; OR=2.353 respectively) of having acceptable knowledge in fire safety and prevention. Respondents who had hands-on in fire drill training was the predictor for positive attitude (OR = 2.285); whereas respondents with total household monthly income RM4,850-RM10,959 has 3.000 higher odds of good practice in fire safety and prevention. **Conclusion:** It may be worthwhile to explore other approaches in accident prevention besides KAP model (attitude change via knowledge to modify behaviour) in this case, fire safety and its prevention.

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Corresponding Author:

Ng Yee Guan, PhD

Email: shah86zam@upm.edu.my

Tel: +603 9769 2859

the demand for these hostels in the recent decades. Depending on the density of these hostels, the occupants may face a life-threatening incidence such as fire, which can cause casualties and losses in properties.

INTRODUCTION

Hostels are one of the important investments for any academic establishment which serves as short to mid-term accommodation facilities for the students (1). In the higher educational institution, hostels are typically equipped with a broad range of shared use facilities which provide cost-effective solution for students with limited financial capacity and concurrently resolves various logistical issues. These advantages contribute to the high occupancy where supply being outrun by

There has been an overall decreasing trend of residential fires in the developed countries; i.e.: United States National Fire Protection Association reported a continuously downward trend of deaths and injuries resulting from fire by apartment buildings from the year 1980 – 2020 (2). Similarly, Fire and Rescue Services (FRS) of England reported an overall decrease in dwelling fires in the past 2 decades from the year 2000 to 2020 (3). In both cases, statistics in the year 2019/2020 indicated that the major cause of fire was primarily kitchen related activities (i.e.: cooking appliances) (4, 5). This

was followed by other electrical appliances (including heating elements), smoking, etc.

In Malaysia, the total incidents of hostel fires were 63 and 71 cases for years 2017 and 2018 respectively based on a report by the Fire and Rescue Department of Malaysia (BOMBA) (6). Overall, the report cited electricity being the main cause of the fires which contributed to 36 cases in 2017 and 38 in 2018. Being the state with highest incidents, the main cause of residential fires in Selangor was electrical failure and negligence during human activity. BOMBA reported that 158 people died of fire nationwide in 2015 where despite a reduction to 107 deaths in 2016, it increased to 145 in 2017 before it declined in 2018 to 97 deaths. The overall trend in the past 5 years was not consistent with no clear upward-increasing and downward-decreasing pattern.

With an estimated enrollment of more than 700,000 students enrolled in Malaysia higher educational institution annually (7) with most of the public universities providing in-campus accommodation facilities – hostels, fire safety is a major concern. While there are not much studies looking into the knowledge, attitude, and practices on fire safety and its prevention in Malaysia, the awareness on fire safety of public in Malaysia was considered to be low based on a previous study to determine the course of their actions when facing a fire incident (8).

As the students who resides in hostels may come from a wide variety of socioeconomic background, lifestyle, behavior, knowledge, and experiences, it is expected that these factors may affect their knowledge, attitude, practice (KAP) on fire safety and its prevention. Therefore, this study aim to (i) determine the level of KAP on fire safety and its prevention, its association with demographic characteristics and past-experiences with fire as well as its predictors among students staying in hostels of a university.

MATERIALS AND METHODS

Study Design

A cross-sectional study was conducted during the academic year 2019/2020 among students who has prior experience of at least 3 months living in the residential college but does not include international students, visitors, exchange students or (non-active) students who deferred their studies. The required sample size was 430 students based on the 95% confidence interval (p-value at 0.05) based on a formula for sample size calculation by Yamane (1967) (9) of which 10% of increment were added to anticipate non-response.

Instrument - Questionnaire

The questionnaire used in this study consist of 5 sections; socio-demographic characteristics, past-experiences with fire safety and prevention, knowledge, attitude and

practice on fire safety and prevention. The questions on socio-demographic characteristics and past-experiences with fire safety and prevention were customized to the target population of respondents which includes current academic information.

A total of 12 items on knowledge used in the questionnaire were adapted from two different studies which addresses the knowledge element in fire safety among dental students and healthcare workers respectively (10, 11). Each questions are provided with yes/no/do not know answers option and scored as follow: correct response = 1, incorrect response = 0, do not know = 0, and no response = 0 which was described in a previous study (15). Level of knowledge was divided into 3 categories on a equal proportion; good (9 – 12), fair (5 – 8) and poor (0 – 4).

For attitude section, the items were adapted from 2 different studies; one of which focuses on occupants of residential houses and another on fire prevention among elementary school children (10, 12). There were a total of 22 items where respondents were required to rate each item on a 5-point Likert scale; 5 points for strongly agree, 4 points for agree, 3 points for natural, 2 points for disagree and 1 point for strongly disagree (13).

The point distribution were then re-scored based on a method in previous studies which assign a score of 1 for agreement to each statement (agree or strongly agree) and score of 0 for neutral and disagreement (disagree and strongly disagree) to each statement. The level of attitude was divided into 3 categories; good (15 – 22), fair (8 – 14) and poor (0 – 7) based on methods described by Lee et al. (2018) (14).

The final section of the questionnaire which contain 12 items with yes/no answer options on practice in fire safety and prevention were adapted from a study on electrical safety among senior secondary school students (15). For every good practices, a score of 1 was given while for every poor practices, a score of 0 where the level of practices was divided into 3 categories; good (10 – 12), fair (8 – 9) and poor (0 – 7) based on a method described in previous study (16).

Content validity was carried out by 2 experts in the field of Occupational Safety and Health and had prior experiences in disaster and emergency planning and management. Pre-test carried out for the questionnaire on students from another different university yield acceptable level of reliability – internal consistency. The Cronbach's alpha coefficient for knowledge, attitude and practices attained were 0.711, 0.985 and 0.713 respectively, all of which was considered to achieve acceptable level (≥ 0.7) based on Almqvist, Ashir & Brannstrum (2014) (17).

Study Ethical Approval

This study was approved by Universiti Putra Malaysia Ethical Committee for Research Involving Human Subjects" under approval document reference no.: JKEUPM-2019-381.

Data collection procedure

Approval to collect data from students in hostels was obtained from the top management of the university followed by the hostels management office. The online questionnaire was prepared on Google Form platform and sent via email to hostels management staff and student's council for them to distribute it to students in the hostels. Additional attempt to obtain more respondents were also made by sending messages on social media platform (i.e.: Whatsapp). A follow up email which contains QR code for the questionnaire link were sent to the residential college's staff to collect the required sample size where they were also concurrently printed and posted in conspicuous location (i.e.: advertisement board, main corridors, etc.) to obtain better response rate.

Statistical analysis

The statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) v25. Frequency and percentage were used to present demographic characteristics and experience with fire safety and prevention among students. Median and IQR was presented for the data as Kolmogorov Smirnov analysis found that the data were not normally distributed. Chi-square and Fisher's Exact Tests were used to investigate the association between demographic characteristics and experience with fire with KAP. To carry out logistic regression, the categories for each knowledge, attitude and practices were respectively re-categorized into binary classes.

Acceptable knowledge combines the range of both good and fair knowledge (score between 5 – 12) leaving poor knowledge to be unacceptable knowledge level (0 – 4). Similarly, positive attitude combines both good and fair attitude (score between 8 – 22) leaving poor attitude (score 0 – 7) to be negative attitude. However, for practices, good practices were recategorized as obtaining a total score of more than 10 (equivalent to 80.0% of total score) whereas poor practices being any score lower than 10 (below 80.0%) based on a previous study (18).

Simple logistic regression was carried out where the pairs of variables with significance level of $p < 0.25$

proceeded with multiple logistic regression analysis. In the multiple logistic regression analysis, variables with $p < 0.05$ were considered as statistically significance in the final model.

RESULT

Content validity

From a total of 299 responses obtained, only 283 sets of data which fulfilled the criteria of this study were analyzed. However, from the 283 data sets, there were some random missing values or incomplete answers which results in lower responses for some questions within the questionnaire.

Sociodemographic characteristic, current academic information and past-experiences in fire safety and prevention

Table 1 summarized the result of socio-demographic characteristics, current academic information and past experiences in fire safety and prevention among the respondents where most of the respondents were single (99.6%), females (68.6%) within the age of 21-22 years old (54.0%) and of Malay ethnicity (95.0%). A majority of the respondents did not possess any work experiences (58.0%), with total household monthly income less than RM4,850 (69.0%).

On the academic information, most of the respondents were undergraduate students (94.0%) where almost half of them (48.5%) belongs to programme in the Science (non-Medical) cluster in their first and second year of their studies (70.0%). Most respondents have stayed in the hostel within for more than 6 months (88.0%) with an equal proportion of the respondents (45.6%) who stayed in 2 colleges while the rest were distributed in other 7 colleges.

In term of experiences in fire safety and prevention, almost all the respondents (96.0%) had attended fire drill training in the past, most of whom (84%) participated in demonstration while only 51% had attended theoretical session and 47.0% had hands-on training in fire drill training. From the 77.0% of the respondents who claimed to had fire safety training, 66.0% of them had only attended demonstration whereas 47.0% of them had been exposed to theories in fire safety while only 33.0% have had hands-on in fire safety. The statistics further showed that of 281 respondents, only 12.0% of the respondents had experienced fire outbreak at least once either as a victim (5.0%) or responder (7.0%).

Table I: Distribution of socio-demographic characteristics and past-experienced with fire safety and prevention among students (CONT.)

Independent Variables	Frequen- cy (n=283)	Percent- age (%)
Gender		
Male	89	31.4
Female	194	68.6
Age group (n=280)	21 (1) ^a	
< 21	68	24.0
21 - 22	150	54.0
> 22	62	22.0
Ethnicity group		
Malay	268	95.0
Non-Malay	15	5.0
Marital status group		
Single	282	99.6
Married/Divorced/Widow	1	0.4
Current educational status group		
Foundation	10	3.5
Undergraduate	266	94.0
Postgraduate	7	2.5
Current academic year group (n=282)		
1st, 2nd years	197	70.0
3rd, 4th, 5th years	68	24.0
Foundation, Master, Phd	17	6.0
Program of study group (n= 282)		
Science cluster	137	48.5
Social science cluster	92	33.0
Medical cluster	43	15.0
Centre of Foundation Studies for Agri-cultural Science	10	3.5
Residential college		
Kolej Tun Dr Ismail	129	45.6
Kolej Canselor	129	45.6
Kolej Sultan Alaeddin Suleiman Shah	35	12.4
Kolej Pendeta Za'ba	10	3.5
Kolej Sepuluh	8	2.8
Kolej Dua Belas	2	0.7
Kolej Tiga Belas	7	2.5
Kolej Empat Belas	43	15.2
Kolej Tujuh Belas	7	2.5
Duration of stay in the hostel in months (n=276)	11 (12) ^a	
3-6	33	12.0
6-18	175	63.0
>18	68	25.0
Have working experiences (n=283)		
Yes	120	42.0
No	163	58.0

CONTINUE

Table I: Distribution of socio-demographic characteristics and past-experienced with fire safety and prevention among students (cont.)

Independent Variables	Frequen- cy (n=283)	Percent- age (%)
Years of experience in month (n=114)	12 (0) ^a	
<12	23	20.0
12	71	62.0
>12	20	18.0
^a Total household monthly income (RM) (n=112)	1500 (4250) ^a	
< RM 4,850	77	69.0
RM 4,850 - RM 10,959	29	26.0
>RM 10,959	6	5.0
Had fire drill training		
Yes	271	96.0
No	12	4.0
Theory		
Yes	143	51.0
No	140	49.0
Demonstration		
Yes	238	84.0
No	45	16.0
Hands-on		
Yes	133	47.0
No	150	53.0
Had fire safety training		
Yes	217	77.0
No	66	34.0
Theory		
Yes	134	47.0
No	149	53.0
Demonstration		
Yes	187	66.0
No	96	34.0
Hands-on		
Yes	93	33.0
No	190	67.0
Experience in a fire outbreak (n=281)		
Yes	33	12.0
No	248	88.0
Role at the time the fire occurs (n=281)		
Victim		
Yes	14	5.0
No	267	95.0
Responder		
Yes	20	7.0
No	261	83.0
Times involved in fire outbreaks (n=281)		
0	248	88.0
1-6	33	12.0

^a Median (IQR)

^b Based on household income & basic amenities survey report 2019, Malaysia

Knowledge, attitude and practices in fire safety and prevention

As shown in Table II, the overall knowledge score indicates that most of the respondents had fair (56.0%) and poor (38.0%) level of knowledge but good level of attitude (77.6%) although only slightly less than half scored good level of practices (49.3%). Appendix 1, 2 and 3 respectively showed the detailed distribution of correct and incorrect answers for each of the 12 questions on knowledge, scale of agreements for each of the 22 questions on attitude and behavior for each of the 12 questions on practices in fire safety and prevention among the respondents.

Table II: Level of knowledge, attitude and practices on fire safety and prevention among respondents

Dependent Variables	Frequency (%)	Median (IQR)
Level of knowledge (n = 283)		5 (2)
Good (Score: 9 – 12)	17 (6.0)	
Fair (Score: 5 – 8)	159 (56.0)	
Poor (Score: 0 – 4)	107 (38.0)	
Level of attitude (n = 281)		19(5)
Good (Score: 15 – 22)	218 (77.6)	
Fair (Score: 8 – 14)	29 (10.3)	
Poor (Score: 0 – 7)	34 (12.1)	
Level of practice (n = 281)		19(5)
Good (Score: 10 – 12)	139 (49.3)	
Fair (Score: 8 – 9)	78 (27.7)	
Poor (Score: 0 – 7)	65 (23.0)	

Association between sociodemographic characteristics and past experiences with knowledge, attitude and practices on fire safety and prevention

In determining the association between the variables, Table III showed that Malay ($p = 0.018$), medical program ($p < 0.001$), had fire drill training ($p = 0.001$), specifically had attended theoretical training on fire drill training ($p = 0.026$), had hands-on training on fire drill ($p = 0.001$), had attended theoretical training of fire safety ($p = 0.009$) and had hands-on training on fire safety ($p = 0.017$) had higher percentage of acceptable knowledge level in fire safety and prevention. There were no significant association for the rest of other pairs with level of knowledge.

Table III: Association between socio-demographic characteristics and past-experience of fire safety and prevention with knowledge in fire safety and prevention among students (cont.)

Variables	Knowledge		χ^2 (df)	p-value
	Acceptable n (%)	Unacceptable n (%)		
Gender (n =283)			0.929 (1)	0.335
Male	59 (76.0)	30 (24.0)		
Female	117 (60.3)	77 (39.7)		

Table III: Association between socio-demographic characteristics and past-experience of fire safety and prevention with knowledge in fire safety and prevention among students (cont.)

Variables	Knowledge		χ^2 (df)	p-value
	Acceptable n (%)	Unacceptable n (%)		
Age group(n=280)			1.382 (2)	0.501
< 21	45 (66.2)	23 (33.8)		
21 - 22	89 (59.3)	61 (40.7)		
> 22	41 (66.1)	21 (33.9)		
Ethnicity (n = 283)			5.610 (1)	0.018*
Malay	171 (63.8)	97 (36.2)		
Non-Malay	5 (33.3)	10 (66.7)		
Marital status (n = 283)			-	0.378 ^a
Single	176 (62.4)	106 (37.6)		
Married/Divorced/Widow	0 (0.0)	1 (100.0)		
Current educational status (n = 283)			1.700 (2)	0.427
Foundation	6 (60.0)	4 (40.0)		
Undergraduate	164 (61.7)	102 (38.3)		
Postgraduate	6 (58.7)	1 (14.3)		
Current academic year groups (n=282)			3.468 (2)	0.177
1st and 2nd years	116 (58.9)	81 (41.1)		
3rd, 4th, 5th years	48 (70.6)	20 (29.4)		
Foundation, Master, PhD	12 (70.6)	5 (29.4)		
Program of study (n= 282)			30.541 (3)	<0.001*
Science cluster	95 (69.3)	42 (30.7)		
Social science cluster	38 (41.3)	54 (58.7)		
Medical cluster	37 (86.0)	6 (14.0)		
Foundation studies	6 (60.0)	4 (40.0)		
Duration of stay in the hostel in months (n=276)			4.697 (2)	0.096
<6	16 (48.5)	17 (51.5)		
6-18	108 (61.7)	67 (38.3)		

CONTINUE

CONTINUE

Table III: Association between socio-demographic characteristics and past-experience of fire safety and prevention with knowledge in fire safety and prevention among students (cont.)

Variables	Knowledge		χ^2 (df)	p-value
	Acceptable	Unacceptable		
	n (%)	n (%)		
Have working experience (n=283)			1.318 (1)	0.251
Yes	70 (58.3)	50 (41.7)		
No	106 (65.0)	57 (35.0)		
Years of experience in month (n=114)			0.339 (2)	0.844
<12 Month	13 (65.5)	10 (43.5)		
12 Month	42 (59.2)	29 (40.8)		
>12 Month	13 (65.0)	7 (35.0)		
Total household monthly income (RM) (n=112)			0.213 (2)	0.899
< RM 4,850	44 (57.1)	33 (42.9)		
RM 4,850-RM 10,959	17 (58.6)	12 (41.4)		
> RM 10,959	4 (66.7)	2 (33.3)		
Had fire drill training (n = 283)			11.045(1)	0.001*
Yes	174 (64.2)	97 (35.8)		
No	2 (16.7)	10 (83.3)		
Theory			4.942 (1)	0.026*
Yes	98 (68.5)	45 (31.5)		
No	78 (55.7)	62 (44.3)		
Demonstration			1.785 (1)	0.181
Yes	152 (63.9)	86 (36.1)		
No	24 (53.3)	21 (46.7)		
Hands-on			14.097 (1)	0.001*
Yes	98 (73.7)	35 (26.3)		
No	78 (52.0)	72 (48.0)		
Had fire safety training (n = 283)			1.376	0.241
Yes	139 (64.1)	78 (35.9)		
No	37 (56.1)	29 (43.9)		
Theory			6.855	0.009*
Yes	94 (70.1)	40 (29.9)		
No	82 (55.0)	67 (45.0)		

Table III: Association between socio-demographic characteristics and past-experience of fire safety and prevention with knowledge in fire safety and prevention among students (cont.)

Variables	Knowledge		χ^2 (df)	p-value
	Acceptable	Unacceptable		
	n (%)	n (%)		
Demonstration			0.919 (1)	0.338
Yes	120 (64.2)	67 (35.8)		
No	56 (58.3)	40 (41.7)		
Hands-on			5.718 (1)	0.017*
Yes	67 (72.0)	26 (28.0)		
No	109 (57.4)	81 (42.6)		
Experience in a fire outbreak (n=281)			0.307 (1)	0.580
Yes	22 (66.7)	11 (33.3)		
No	153 (61.7)	95 (38.3)		
Role at the time the fire occurs (n=281)				
Victim			0.945 (1)	0.331
Yes	7 (50.0)	7 (50.0)		
No	168 (62.9)	99 (37.1)		
Responder			1.484 (1)	0.223
Yes	15 (75.0)	5 (25.0)		
No	160 (61.3)	101 (38.7)		
Times involved in fire outbreaks (n=281)			0.307 (1)	0.580
0	153 (61.7)	95 (38.3)		
1-6	22 (66.7)	11 (33.3)		

* p value <0.055
 † Fisher's exact test was used.

However, for attitude, Table IV showed that those who had attended training on fire drill (p = 0.044) and hands-on in fire drill training (p = 0.029) had higher percentage of positive attitude on fire safety and prevention. There were no significant association for the rest of other pairs with level of attitude. Table V on the other hand showed that respondents with total household monthly income between RM4,850 – 10,959 (p = 0.028), had hands-on training in fire drill (p = 0.030) and had past experience as victim during fire outbreak (p = 0.030) had higher percentage of good practice.

CONTINUE

Table IV: Association between demographic characteristics and past-experienced of fire safety and prevention with attitude in fire safety and prevention among students (cont.)

Variables	Attitude		χ^2 (df)	p-value
	Positive n (%)	Negative n (%)		
Gender (n=281)			0.340 (1)	0.560
Male	75 (86.2)	12 (13.8)		
Female	172 (88.7)	22 (11.3)		
Age group (n=279)			1.117 (2)	0.546
< 21	58 (85.3)	10 (14.7)		
21 - 22	135 (90.0)	15 (10.0)		
> 22	53 (86.9)	8 (13.1)		
Ethnicity (n=281)			-	0.404 ^a
Malay	235 (88.3)	31 (11.7)		
Non-Malay	12 (80.0)	3 (20.0)		
Marital status (n=281)			-	-
Single	247 (87.9)	34 (12.1)		
Married/Divorced/Widow	-	-		
Current educational status (n= 281)			-	0.694 ^a
Foundation	10 (100.0)	0 (0.0)		
Undergraduate	231 (87.5)	33 (12.5)		
Postgraduate	6 (85.7)	1 (14.3)		
Current academic year groups (n=280)			2.844 (2)	0.241
1st and 2nd years	168 (85.7)	28 (14.3)		
3rd,4th,5th years	62 (92.5)	5 (7.5)		
Foundation, Master, PhD.	16 (94.1)	1 (5.9)		
Program of study (n=280)			3.436 (3)	0.329
Science Cluster	122 (89.7)	14 (10.3)		
Social Science Cluster	76 (83.5)	15 (16.5)		
Medical Cluster	38 (88.4)	5 (11.6)		
Foundation Studies	10 (100.0)	0 (0.0)		
Duration of stay in the hostel in months (n=274)			1.152 (2)	0.562
<6	27 (81.8)	6 (18.2)		
6-18	153 (88.4)	20 (11.6)		
>18	60 (88.2)	8 (11.8)		
Have working experience (n=281)			2.902 (1)	0.088
Yes	100 (84.0)	19 (16.0)		
No	147 (90.7)	15 (9.3)		

CONTINUE

Table IV: Association between demographic characteristics and past-experienced of fire safety and prevention with attitude in fire safety and prevention among students (cont.)

Variables	Attitude		χ^2 (df)	p-value
	Positive n (%)	Negative n (%)		
Years of experience in Month (n=114)			1.568 (2)	0.457
<12 Month	21 (91.3)	2 (8.7)		
12 Month	57 (80.3)	14 (19.7)		
>12 Month	17 (85.0)	3 (15.0)		
Total household monthly income (RM) (n=111)			-	0.735 ^a
< RM 4,850	65 (84.4)	12 (15.6)		
RM 4,850-RM 10,959	23 (79.3)	6 (20.7)		
> RM 10,959	4 (80.0)	1 (20.0)		
Had fire drill training (n=281)			-	0.044 ^{a*}
Yes	239 (88.8)	30 (11.2)		
No	8 (66.7)	4 (33.3)		
Theory			0.118 (1)	0.855
Yes	123 (87.2)	18 (12.8)		
No	124 (88.6)	16 (11.4)		
Demonstration			1.624 (1)	0.214
Yes	210 (89.0)	26 (11.0)		
No	37 (82.2)	8 (17.8)		
Hands-on			4.790 (1)	0.029*
Yes	122 (92.4)	10 (7.6)		
No	125 (83.9)	24 (16.1)		
Had fire safety training (n=281)			0.192 (1)	0.668
Yes	190 (88.4)	25 (11.6)		
No	57 (86.4)	9 (13.6)		
Theory			0.522 (1)	0.583
Yes	118 (89.4)	14 (10.6)		
No	129 (86.6)	20 (13.4)		
Demonstration			1.704 (1)	0.192
Yes	166 (89.7)	19 (10.3)		
No	81 (84.4)	15 (15.6)		
Hands-on			0.010 (1)	0.922
Yes	82 (88.2)	11 (11.8)		
No	165 (87.8)	23 (12.2)		

CONTINUE

Table IV: Association between demographic characteristics and past-experienced of fire safety and prevention with attitude in fire safety and prevention among students (cont.)

Variables	Attitude		χ^2 (df)	p-value
	Positive n (%)	Negative n (%)		
Experience in a fire outbreak (n=279)			-	0.564 ^a
Yes	27 (84.4)	5 (15.6)		
No	218 (88.3)	29 (11.7)		
Role at the time the fire occurs (n=279)				
Victim			-	0.201 ^a
Yes	10 (76.9)	3 (23.1)		
No	235 (88.3)	31 (11.7)		
Responder			-	0.750 ^a
Yes	18 (90.0)	2 (10.0)		
No	227 (87.6)	32 (12.4)		
Times involved in fire outbreaks (n=279)			-	0.564 ^a
0	218 (88.3)	29 (11.7)		
1-6	27 (84.4)	5 (15.6)		
Knowledge in fire safety and prevention (n=281)			1.435 (1)	0.231
Unacceptable	90 (84.9)	16 (15.1)		
Acceptable	157 (89.7)	18 (10.3)		

* p value <0.05
^a Fisher's exact test was used.

Table V: Association between demographic characteristics and past-experienced of fire safety and prevention with practices in fire safety and prevention among students (cont.)

Variables	Practice (n = 283)		χ^2 (df)	p-value
	Good n (%)	Poor n (%)		
Gender (n=282)			3.099(1)	0.078
Male	37 (41.6)	52 (58.4)		
Female	102 (52.8)	91 (47.2)		
Age group (n=279)			3.421 (2)	0.188
< 21	40 (58.8)	28 (41.2)		
21 - 22	68 (45.6)	81 (54.4)		
> 22	29 (46.8)	33 (53.2)		
Ethnicity (n=282)			0.547 (1)	0.459
Malay	133 (49.8)	134 (50.2)		
Non-Malay	6 (40.0)	9 (60.0)		

CONTINUE

Table V: Association between demographic characteristics and past-experienced of fire safety and prevention with practices in fire safety and prevention among students (cont.)

Variables	Practice (n = 283)		χ^2 (df)	p-value
	Good n (%)	Poor n (%)		
Marital status (n=282)			-	1.000 ^a
Single	139 (49.5)	142 (50.5)		
Married/Divorced/Widow	0 (0.0)	1 (100.0)		
Current educational status (n= 282)			-	0.862 ^a
Foundation	4 (40.0)	6 (60.0)		
Undergraduate	132 (49.8)	133 (50.2)		
Postgraduate	3 (42.9)	4 (57.1)		
Current academic year groups (n=281)			0.577 (2)	0.750
1st and 2nd years	97 (49.5)	99 (50.5)		
3rd,4th,5th years	35 (51.5)	33 (48.5)		
Foundation, Master, PhD	7 (25.2)	10 (58.8)		
Program of study (n=281)			3.020 (3)	0.389
Science Cluster	66 (48.2)	71 (51.8)		
Social Science Cluster	51 (56.0)	40 (44.0)		
Medical Cluster	18 (41.9)	25 (58.1)		
Foundation Studies	4 (40.0)	6 (60.0)		
Duration of stay in the hostel in months (n=275)			2.557 (2)	0.279
<6	13 (39.4)	20 (60.6)		
6-18	92 (52.9)	82 (47.1)		
>18	31 (45.6)	37 (54.4)		
Have working experience (n=282)			0.042 (1)	0.838
Yes	60 (50.0)	60 (50.0)		
No	79 (48.8)	83 (51.2)		
Years of experience in Month (n=114)			1.743 (2)	0.418
<12 Month	9 (39.1)	14 (60.9)		
12 Month	39 (54.9)	32 (45.1)		
>12 Month	10 (50.0)	10 (50.0)		

CONTINUE

Table V: Association between demographic characteristics and past-experienced of fire safety and prevention with practices in fire safety and prevention among students (cont.)

Variables	Practice (n = 283)		χ^2 (df)	p-value
	Good n (%)	Poor n (%)		
Total household monthly income (RM) (n=112)			-	0.028 ^{a†}
< RM 4,850	35 (45.5)	42 (54.5)		
RM 4,850- RM 10,959	21 (72.4)	8 (27.6)		
> RM 10,959	2 (33.3)	4 (66.7)		
Had fire drill training (n=282)			3.314 (1)	0.069
Yes	130 (48.1)	140 (51.9)		
No	9 (75.0)	3 (25.0)		
Theory			2.038 (1)	0.153
Yes	64 (45.1)	78 (54.9)		
No	75 (53.6)	65 (46.4)		
Demonstration			1.543(1)	0.214
Yes	113 (47.7)	124 (52.3)		
No	26 (57.8)	19 (42.2)		
Hands-on			4.681 (1)	0.030*
Yes	56 (42.4)	76 (57.6)		
No	83 (55.3)	67 (44.7)		
Had fire safety training (n=282)			0.482 (1)	0.487
Yes	104 (48.1)	112 (51.9)		
No	35 (53.0)	31 (47.1)		
Theory			2.448 (1)	0.118
Yes	59 (44.4)	74 (55.6)		
No	80 (53.7)	69 (46.3)		
Demonstration			1.384 (1)	0.239
Yes	87 (46.8)	99 (53.2)		
No	52 (54.2)	44 (45.8)		
Hands-on			3.484 (1)	0.062
Yes	38 (41.3)	54 (58.7)		
No	101 (53.2)	89 (46.8)		

CONTINUE

Table V: Association between demographic characteristics and past-experienced of fire safety and prevention with practices in fire safety and prevention among students (cont.)

Variables	Practice (n = 283)		χ^2 (df)	p-value
	Good n (%)	Poor n (%)		
Experience in a fire out-break (n=280)			0.263 (1)	0.608
Yes	15 (45.5)	18 (54.5)		
No	124 (50.2)	123 (49.8)		
Role at the time the fire occurs (n=280)				
Victim			4.693 (1)	0.030*
Yes	3 (21.4)	11 (78.6)		
No	136 (51.1)	130 (48.9)		
Responder			0.924 (1)	0.336
Yes	12 (60.0)	8 (40.0)		
No	127 (48.8)	133 (51.2)		
Knowledge in fire safety and prevention (n=282)			2.361 (1)	0.124
Acceptable	93 (52.8)	83 (47.2)		
Unacceptable	46 (43.4)	60 (56.6)		
Attitude in fire safety and prevention (n=280)			0.010 (1)	0.922
Positive	122 (49.4)	125 (50.6)		
Negative	16 (48.5)	17 (51.5)		

* p value <0.05
^a Fisher's exact test was used.

Predictors of knowledge, attitude and practices of fire safety and prevention among respondents

Analysis using simple linear regression revealed 9 factors, 2 factors and 3 factors which were respectively associated with knowledge, attitude and practices in fire safety and prevention. Following that, those variable with $p < 0.250$ (11 factors for knowledge, 8 variables for attitude, and 12 factors for practices) which were proceeded for multiple logistic regression analysis.

As shown in Table VI, the results indicated that only 3 variables were significant predictor for knowledge in fire safety and prevention. Non-Malay were 70% times less likely to have acceptable knowledge compared to Malay respondents (OR = 0.301, 95%CI: 0.095, 0.957, $p = 0.042$) while respondents who had fire drill training were 5.694 times more likely to have acceptable knowledge compared to those who had not (OR = 5.694, 95%CI: 1.187, 27.315, $p = 0.030$) and those who had hands-on

fire drill training were 2.353 times more likely to have acceptable knowledge compared to those who had not (OR = 2.353, 95%CI: 1.389, 3.986, p = 0.001).

For level of attitude in fire safety and prevention, hands-on experience in fire drill were the only significant predictor where respondents who had such past experience were 2.285 times more likely to have positive attitude compared to those who did not had such hands-on experience (OR = 2.285, 95%CI: 1.048, 4.980, p = 0.038). Similarly for level of practice, only one variable

were found to be its significant predictor. Respondents who had total household monthly income of (RM4,850 - RM10,959) were 3.000 times more likely to have good fire safety and prevention practice compared to those whom total household monthly income <RM4,850.

Table vi: Predictors for knowledge, attitude and practice in fire safety and prevention among students, using multiple logistic regression

Variables	Ad-justed OR	B	SE	Wald	95%CI of OR		P-value
					Lower	Upper	
Knowledge in fire safety and prevention^a							
Ethnicity group							
Malay	Ref.						
Non-malay	0.301	-1.199	0.590	4.137	0.095	0.957	0.042*
Had fire drill training							
No	Ref.						
Yes	5.694	1.739	0.800	4.726	1.187	27.315	0.030*
Hands-on in fire drill training							
No	Ref.						
Yes	2.353	0.856	0.269	10.117	1.389	3.986	0.001*
Intercept		-1.469	0.782				
Attitude in fire safety and prevention^b							
Hands-on in fire drill training							
No	Ref.						
Yes	2.285	0.826	0.398	4.319	1.048	4.980	0.038*
Intercept		1.650	0.223				
Practices in fire safety and prevention^b							
Total household monthly income (RM)							
< RM 4,850	Ref.						
RM 4,850- RM 10,959	3.000	1.099	0.476	5.336	1.181	7.620	0.021*
> RM 10,959	0.286	-1.253	1.142	1.204	0.030	2.678	0.273
Intercept		-0.134	0.231				

Variable selection method:
^(a) knowledge used forward method; ^(b) attitude and practice used backward method.
 OR - Odds ratio, B - Beta coefficient; SE - Standard error, CI - Confidence interval, (*) - p value <0.05
 Knowledge: Nagelkerek R Square = 12.3%, Omnibus Tests of Model Coefficients: p <0.001, Classification percentage = 66.4%.
 Attitude: Nagelkerek R Square = 3.2%, Omnibus Tests of Model Coefficients: p = 0.031; Classification percentage = 87.8%.
 Practice: Nagelkerek R Square= 0.095, Omnibus Tests of Model Coefficients: p = 0.18, Classification percentage = 59.6%.

DISCUSSION

Fire incidences particularly of domestic setting (residential) is still very much a global public health problem that is mostly preventable. While high-income countries have demonstrated significant progress in decreasing fire incidences and their impact in the past decades, many of their advances in prevention has yet to be effectively adopted or adapted in low- and medium-income countries (19).

In adapting the World Health Organization (WHO) Plan for Burn Prevention and Care (20), this study focuses on the antecedent of burn (fire safety and prevention), which corresponds to the need for data and measurement (specifically risk factors) outlined in the document. From another perspective, this study also explore the stage of susceptibility within the spectrum of natural history of disaster-related injuries (21) among occupants in hostels of a public university.

To that end, the knowledge, attitude and practice can be used as a baseline to determine the current state of understanding, their psychological tendency and actions or behaviour towards fire incidences, fire safety and prevention which would be useful for the development of key interventional strategies and approaches as well as a benchmark for effectiveness in future studies. However, it should be noted that the differences in terms of instruments used (domains and items), benchmark or cut-off, target population or results presentation would have made it impossible for exact comparison with previous studies in the literatures.

For example, a study (22) among residents of Tanke community in Ilorin (general public) in Nigeria showed that 55.5% and 81.0% of the respondents had good level of knowledge on risk factors and good preventive practices towards domestic fire accidents respectively. Mkharem, Adam and Supeni (2018) on the other hand reported that 80.0% and 90.0% of residential occupants in their study had fair level of awareness and knowledge respectively.

Meanwhile Yeteru et al., (2016) and Agyekum, Ayarka and Opoku, (2016) (23) presented individual results of each question for which comparison would not have been plausible. Another study by Boubaker, Mekni and Jerbi (2017) (24) with several similarities of the practice questionnaire to the one used in this study reported poor practices (0.76 in a scale of 4) among residential of a region in Saudi Arabia using a cumulative grade point average (CGPA) system.

While this study found that 62.0% of the respondents in this study had acceptable level of knowledge in fire safety and prevention (being fair to good), it was inconsistent with a comment by a local fire expert. Mohd Isa who expressed concern that many people in Malaysia did not have the knowledge on how to put out the fire and prevent it from spreading (25) was similarly echoed by a previous local study in year 2014 on fire safety awareness and management in mall (8).

However, the contrast of findings could have been due to the educational background of the respondents as this study focuses on university level students instead of the general public. Besides that, there were also lack of studies on attitude and practices in the context of fire safety and prevention particularly in the setting or the population of this study from an extensive literature search conducted.

Comparing outcomes from a closely related study on fire safety measures at a local university (26), the level of knowledge in fire safety among the hostels' occupants was consistent with results in this study despite notable differences of instrument (questionnaire) being used. It should be noted that corresponding to the university's policy in this study that does not allow cooking and smoking in the hostels, the focus on electrical fires does not include purposive breaching, violation or contravention of the policy.

While the results in this study indicated that most of the respondents (87.9%) had positive attitude (being fair and good) with approximately half of them had good level of practices (49.3%), only 33.0% of the respondents who had good practices and correspondingly good level of knowledge. Further analysis to determine the association between the variables found only ethnicity and total household income of the sociodemographic factors being significantly associated with knowledge and practices respectively but none with attitude.

Following the bivariate analysis, logistic regression analysis found that ethnicity significantly predict the level of knowledge in that non-Malay respondents were 0.301 times less likely to have acceptable knowledge compared to Malay students, as previous studies similarly reported significant differences comparing between ethnicity – Māori to non-Māori (27) as well as among Native American/Alaska Natives to Afro-Americans (28). In terms of total household income, those respondents which household earn between RM4,850 – RM10,959 were three times more likely to have better practices in fire safety and prevention but did not significantly predict knowledge or attitude. This contradicted findings reported by a Swedish study which found an insignificant effect of income on the risk of fire (29).

A key salient observation in this study was perhaps on the past experiences of fire drills being significant predictor

of 5.694 times more likely to have good knowledge in fire safety and prevention compared to those without such experiences. Also similarly noteworthy, those who had hands-on training in fire drill were also significant predictor which increases the likelihood of good knowledge and positive attitude towards fire safety and prevention by 2.353 and 2.285 times.

In contradiction to the conventional expectation that improved knowledge leads to positive attitude and correspondingly good practices, Lund and Aarw (2004) (30) in their review of evidences from intervention studies described that the KAP model in accident prevention (via attitude modification as key to behavioural changes) were rather weak compared to other models. Based on the available evidences, it appear that both behavioral modification which provide avenues for interpersonal interaction as well as structural modification by inherently introduces measures or mechanism such as legislative framework shown better effectiveness in attitude changes.

In the case of this study, it is suspected that the respondent practices were the outcomes of being trained subconsciously during their upbringing – household practices and participation in fire drills instead of the explicit or formal knowledge transfer on fire safety and prevention. This was demonstrated in the result of practice in this study where there were more respondents who had good practices compared to those with good level of knowledge and that the past experiences in fire drill were found to be significant predictor of knowledge and attitude.

CONCLUSION

Fire safety and prevention is particularly an important aspect of multi-dwelling residential structure such as hostel. In ensuring that the occupants are adequately protected against any fire incident, understanding the current level of knowledge, attitude and practices on fire safety and prevention as well as the associated risk factors prepare the building management or operators in fire risk assessment, planning, coordinating and implementing fire safety and other preventive measures such as evacuation.

While the results from this study found 62.0% of the respondents had acceptable knowledge, 87.9% with positive attitude and 49.3% of students had good practices in fire safety and prevention, only a handful of socio-demographic factors as well as past experiences in fire drill and training were factors with significant association, much less of them being significant predictors of KAP respectively besides inconsistency of agreement to findings from previous studies or mostly incomparable as was discussed.

Due to the limited scope of this study, it is not possible

to establish an explanation to some results (ethnicity and total household income being significant predictor of knowledge and practices in fire safety and prevention respectively) although they could serve as a lead for a larger and more robust scale of studies including systematic review or meta-analysis. While a scoping or a systematic review was not carried out in this study, an extensive non-systematic search in various databases appear to return a limited number of research on this area of study which makes it potentially worthwhile to carry out one.

It should also be acknowledged that there were limitations which may have affected the findings from this study. One most significant were the COVID-19 pandemic which forces significant and abrupt changes to the methodologies employed in data collection affecting the availability of respondents corresponding to the nationwide movement control order which resulted in lower than anticipated response rate. In addition, the majority of the respondents being Malay (95.0%) may not have reflected the population accurately. As such, it is recommended that future improvement to the study should consider that the respondents' distribution of ethnicity based on the Malaysia population demography.

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