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Evaluation of Fire Safety Management in a Higher Education Institution: A Case Study of University of Port Harcourt

Brilliance O. Anyanwu[1], Onyewuchi Akaranta[1] and Ify L. Nwaogazie[1*]

[1]Centre for Occupational Health, Safety and Environment, University of Port Harcourt, Nigeria.

Authors' contributions

This work was carried out in collaboration between all authors. Author BOA carried out literature survey, data collection and analysis and wrote the first draft. Author OA served as project supervisor and designed the study, while author ILN served as co-supervisor and directed action on statistical data analysis. All authors read and approved the final manuscript.

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ABSTRACT

The study was carried out to determine the level of fire safety awareness and the level of fire safety implementation in the University of Port Harcourt. Secondary data were collected from the fire service unit of the University to show the number of fire occurrences and major causes of fire incidents in the University. The primary data were collected by means of questionnaires administered to 250 persons out of which 220 were retrieved representing a response rate of 88%. Twenty questions were designed as questionnaire parameters; the first ten are to assess the level of fire safety awareness amongst respondents in University of Port Harcourt while the second ten are to evaluate the fire safety implementation /practice in the University. The responses are rated as strongly agree (4), agree (3), disagree (2) and strongly disagree (1). Data analyses were facilitated via the evaluation of Kendall's coefficient of concordance (w), that is, the degree of agreement amongst the respondents. The results revealed an average level of awareness and a low implementation /practice level amongst the respondents. Lack of awareness on the emergency number to call in the event of fire, lack of fire safety policy, lack of knowledge on the different types

**Corresponding author: Email: ifynwaogazie@yahoo.com, ifeanyi.nwaogazie@uniport.edu.ng;*

of portable fire extinguishers, inadequate provision and inspection of firefighting equipment, lack of inspection and review of past fire incidents, nonchalant attitude of turning off electrical appliances after use, electrical installations/repair not being handled by competent persons and the staff and students not having adequate information, instruction and training on fire safety are the gaps identified. Kendall's analysis revealed a high degree of agreement amongst the respondents on both fire safety awareness (0.78) and fire safety implementation /practice (0.90), respectively. Thus, the study recommends a fire safety organogram for delegation of duties, training of staff and students on basic fire safety, provision and inspection of fire preventive and protective methods, employment of competent personnel to handle electrical works to ensure the protection of lives, assets, environment and reputation of the institution.

Keywords: Fire safety; awareness; practice; Kendall's coefficient; University of Port Harcourt.

1. INTRODUCTION

1.1 Incidence of Fire: Benefits and Losses

Amongst all the hazards of a building, fire has existed since the first use of building by mankind and is the most common hazard that building occupants face. Fire kills more people every year than any other force of nature [1]. But at the same time, fire is extraordinarily helpful. It gave humans the first form of portable light and heat. It also gave us the ability to cook food, forge metal tools, form pottery, harden bricks and drive power plants.

Fire outbreak is a perennial problem in Nigeria. Yearly cases of fire outbreak are reported in the country. Fire disaster losses recorded at home, institutions, commercial places, factories, oil facilities, platforms and many other sites or facilities worldwide run into billions of dollars annually [2]. Fire is a hazard in any part of a university premises. The consequences of fire incident in a university facility can be catastrophic and may include threat to the lives or health and safety of persons, damage to or loss of property and severe interruption to normal business activities or opportunities. Managing the risk of fire demands fire safety precautions based on a combination of appropriate prevention and protection measures depending upon building use and occupancy characteristics.

The University of Port Harcourt has high density of people made up of lecturers, students, commercial business owners, vendors and therefore has an obligation to ensure the health and safety of its employees, students and anyone else who enters the University workplaces. Thus, utmost care must be taken and precautions followed to imbibe good safety measures and practices so as to avoid fire outbreak.

A study by the Fire Disaster Prevention & Safety Awareness Association of Nigeria (FDPSAAN) [3] revealed that there is significant low level of awareness on fire safety in Nigeria. About 2% of 140 million people in the country have basic fire safety knowledge, while 80% lack such knowledge. Asodike and Abraham [4] in their survey of safety practice in some schools in Port Harcourt opined that perhaps the rare incidence of fire outbreak in schools in Nigeria accounts for the lack of acquisition of fire extinguishers and organized periodic safety training for staff. A study on fire safety practice by Ajao and Ijadunola [5] in Ile-Ife, Nigeria revealed that majority (62%) of the respondents had good to excellent knowledge of preventing fire outbreaks in offices. Only 28% of the premises had functioning wall fire extinguishers. Less than 10% of the premises had smoke detector, fire alarm, fire exits and emergency lighting system, respectively. Their study concluded that there was poor practice of fire safety in offices in Ile-Ife.

1.2 Reasons for Promoting Good Standards of Safety

Every operation within any organization has impact on the safety not only of those undertaking and managing the work but also of others who may be affected by their work activities [6]. Failure to adequately manage safety often results in death or injury, chronic ill health and damage to property and/or the environment. Such results have a significant impact on the physical and economic wellbeing of society. These reasons may be categorized into three according to Andrew and Martin [6]. They include:

Morale (Human) reason: The most obvious result of a fire incident or an accident at work is that the persons directly involved are likely to suffer. The impact on these individuals ranges from death through to relatively minor injuries. Also, individuals involved in any form of safety event suffer some form of physiological ill health.

Financial reason (Economic costs): The financial costs to an organization following a fire outbreak are substantial. Regardless of whether people are injured or not, there will be a financial cost to an organization. Some accident costs are obvious, e.g. compensation payments, property damage, damaged product, sick pay, etc. Some accidents are not so obvious, e.g. replacement of staff, investigation costs and poor publicity.

Legal reason: There are rules and standards that are reflected in civil and criminal laws, which regulate, among other things, our work activities. These laws place statutory duties on employers, responsible persons and others to ensure the health and safety of employees and other persons who may be affected by the work activities. Failure to meet these obligations can result in a claim for compensation by the individual who has suffered a loss.

1.3 Major Causes of Fire in a University Premise

Human factors such as carelessness, negligence and lack of fire safety awareness are some of the leading causes of fire outbreaks. But the common causes of fire outbreak in a university premise fall under the following broad headings of Electrical appliances and installations, Cookers, associated cooking equipment and installations, Naked lights and flames, Heaters and heating systems, Chemical and LPG (hazardous materials), Smokers and smokers' materials, Waste and waste management and Arson.

Outsider setting fire deliberately, fires that are caused by electrical appliances and installations like the inverter, air conditioner. According to Andrew and Martins [6], there are a variety of different ways that electricity flowing through equipment and installations can cause a fire, these include: overloaded wiring, loose wiring connections, and electrical 'arcing' (sparking).

Lack of awareness by staff and students as to the priority of combustible and flammable material waste management is also responsible for poor management of waste, for example the poor disposal of rags contaminated by a pyropheric chemical by students in a school laboratory can trigger a fire. Arson can be defined as the deliberate or willful act offsetting fire to a building or item of property, be it an industrial property, dwelling house, car or any similar item.

2. MATERIALS AND METHODS

2.1 Study Area

This research work was carried out in the University of Port Harcourt. The University of Port Harcourt is located at the out sketch of the city of Port Harcourt, South-South Nigeria. The University is located at latitude 4°54′19.24″ and longitude 6°55′25.41″. It was established in 1975 as University College, and was given university status in 1977. The University originally had seven schools in 1977. It changed from a school system to a faculty system in 1982. The University now has nine faculties and a college. It also has three campuses/parks namely: Choba Park, Delta Park and Unipark.

The University has a fire service department that takes care of fire incidents in the campuses and its environs for the safety of staff and students. The fire service unit of the University was built in 2001 by a philanthropist, Chief O.B Lulu-Briggs.

2.2 Sample Size Estimation

Prevalence formula was adopted for the sample size estimation, that is:

$$N = \frac{z^2 P(1-P)}{T^2} \quad (1)$$

Where T is tolerance error (0.05), P is the prevalence taken as 18.5% and z is the level of significance that corresponds to 95% confidence level (that is, z = 1.96). Thus, direct substitution of Equation (1) yields,

$$N = \frac{1.96^2 (0.185)(1-0.185)}{0.05^2} \approx 232 \ persons$$

An attrition rate of 7% (or 18 persons) is added to the sample size of 232 to obtain an overall sample of 250 persons.

2.3 Questionnaire Design

The questionnaire was structured with four answer options namely: Strongly Agree, Agree, Disagree and Strongly Disagree with a corresponding weighting of 4, 3, 2, and 1, respectively. By self administration along with two trained staff of the University, two hundred and fifty (250) questionnaires were randomly distributed to four groups of people which include 37 Academic staff, 45 Non-Academic staff, 125 Students and 43 Business owners within the study area. From the 250 respondents, 220 questionnaires were retrieved, viz; 30 from academic staff, 40 from non-academic staff, 115 from students and 35 from business owners. The questionnaires were test run with twenty (20) staff and students in the University and were checked for accuracy, simplicity, consistency and understandability.

The questionnaire consisted of thirty (30) questions divided into four sections with section 1 having five questions as per respondents' background. Section 2 consists of ten parameters with regards to respondents' level of fire safety awareness while section 3 has ten parameters that dealt with fire safety implementation / practice. Finally, section 4 consists of five parameters as per the major causes of fire outbreak in the University. All the respondents in this survey were anonymous. Summary details on respondents' demographic information are as shown in Table 1.

2.4 Data Collection

Data were collected from two sources (primary and secondary sources). Secondary source of data was from review of related literature of effective fire safety management and from records of past fire incidents that have occurred in the University from January 2002 to June 2015 *(see Appendix A1)*, while the primary source were data collected using a well structured questionnaire administered to various categories of people found within the University facility including academic staff, non-academic staff, students and commercial business owners.

Out of 250 questionnaires administered, 220 were retrieved, representing a response rate of 88%. All 88% of the questionnaires retrieved were found suitable for the analysis. The resulting data collected served as a benchmark for evaluating the awareness, implementation/practice levels of fire safety management and the major causes of fire incident in the University. This is considered sufficient for the study based on the assertion of Moser and Kalton [7] that the result of a survey could be considered as biased and of little significance if the return rate was lower than 30-40%.

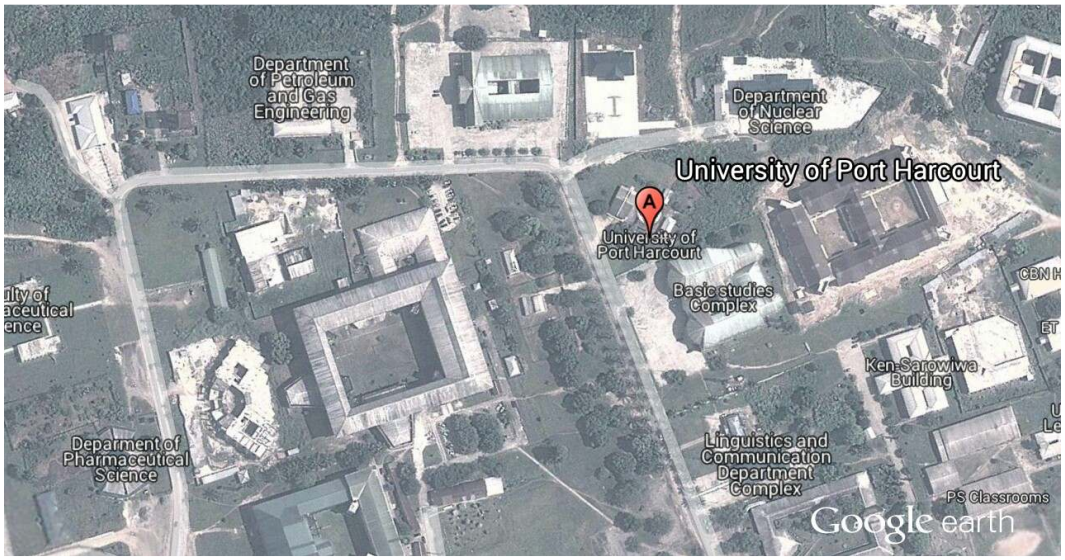

Fig. 1. Map of University of Port Harcourt
Source: Google earth [8]

2.5 Data Analysis

In data analysis Kendall's coefficient of concordance (w-statistic) was adopted to test for the degree of agreement between respondents on the questionnaire parameters. Kendall's w-statistic is a non-parametric statistic. It is a normalization of the statistic of the Friedman test, and can be used for assessing agreement among raters. Kendall's w value ranges from zero (no agreement) to one (complete agreement) [9]. Intermediate values signify low or high degree of unanimity between respondents. The responses are rated or assigned numerical values (known as the Likert series): Strongly Agree (SA) =4, Agree (A) =3, Disagree (D) =2, Strongly Disagree (SD) =1, yielding an average value of 2.5.

Assume that the object *i* is given the rank $r_{i,j}$ by judge number *j*, where there are in total *n* objects and *m* judges. Then the total rank to object *i* is given as:

$$\mathbf{R_i} = \sum_{j=1}^{m} r_{i,j} \quad (2)$$

And the mean value of the total ranks ($\bar{R}$) is given in Equation (3) as:

$$\bar{\mathbf{R}} = \frac{1}{2}\mathbf{m\,(n+1)} \quad (3)$$

The sum of the squared deviations (S_d) is given in Equation (4) as:

$$\mathbf{S_d} = \sum_{i=1}^{n}\left(R_i - \overline{R_i}\right)^2 \quad (4)$$

Kendall's W statistics is defined (Nwaogazie, 2011) by Equation (5)

$$\mathbf{W} = \frac{12S_d}{\left\{m^2 n\left(n^2-1\right)\right\}} \quad (5)$$

Where R_i is given by Equation (2) and it represents the total rank or rating given by respondents; *m* represents the total number of respondents while *n* represents the total number of objects (in this case, questions); and $\bar{R}$ is the mean value of the total rating represented in Equation (3).

3. RESULTS AND DISCUSSION

3.1 Results

Through the questionnaire instrument, the level of fire safety awareness, implementation / practice and causes of fire in the University of Port Harcourt were evaluated. The level of fire safety awareness, implementation / practice among workers based on the outlined parameters are as shown in Tables 2 and 5. Tables 3 and 6 show how the Kendall's statistic, w was calculated. Table 8 shows the major causes of fire in the University [10].

Table 3 shows how the Kendall's statistic, *w* was calculated. R_i for FSA1 was calculated from Table 2 using Equation (2) as follows:

R_i = (150 *4) + (60*3) + (10*2) + (0*1) = 800.

$\bar{R}$ is evaluated using Equation (3), viz:

$\bar{R}$ = 0.5 *(220)*(10+1) =1210 (same for all FSA parameters or questions); and

$$W = \frac{12\times 3118978}{220^2\times 10\left(10^2-1\right)} = 0.78\,(78\%)$$

Based on Equations (2) – (5), the Kendall's coefficient of concordance, *w* for the fire safety awareness data in Table 2 is 0.78. This indicates a high degree of unanimity among the various respondents. The level of fire safety awareness among the four groups of respondents in University of Port Harcourt is as shown in Table 4 and only the percentage of respondents that answered correctly is presented (see Fig. 2).

Table 1. Respondents' demographic data distribution

Experience/Study level		Gender distribution		Respondents grouping	
(Years)	**Respondents**	**Gender**	**Respondents**	**Grouping**	**Respondents**
< 1 yr	20	Male	158	Academic staff	30
1-5 yrs	103	Female	62	Non academic staff	40
6-10 yrs	52			Students	115
>10 yrs	45			Business owners	35
Total	∑220		∑220		∑220

Table 2. Fire safety awareness parameters among respondents in the university

FSA-P±	Corresponding questions	Respondent option			
		SA	A	D	SD
FSA-1	The very right thing to do when you notice a fire is to raise an alarm and call for emergency response team	150	60	10	0
FSA-2	Students/workers are aware that there is need to leave the escape routes unobstructed at every time for easy flow of people when the need arises	90	70	35	25
FSA-3	I am aware of the emergency number to call in the event of fire outbreak in the university	20	22	80*	98*
FSA-4	On hearing a fire alarm, the first thing to do is to pack all your belongings before evacuating the building	0	15	105	100
FSA-5	A signage indicating "Exit routes" in case of emergency would enhance fire safety	135	76	9	0
FSA-6	Any kind of fire extinguisher can be used to fight any fire regardless of the source	90*	52*	38	40
FSA-7	Most workers/students in the University are not familiar with the exit routes present in its facility (or exit routes on campus buildings are difficult to find)	138*	69*	8	5
FSA-8	Installation of a central alarm to notify people of an emergency would reduce risk of casualties in the event of a fire outbreak	113	90	15	2
FSA-9	Adequate signage indicating an appropriate muster point in case of an emergency is important	132	77	4	7
FSA-10	Poor housekeeping, bush burning and electrical faults are some of the causes of fire outbreak in the University	134	83	2	1

**Depicts the identified gaps; ±FSA-P = Fire Safety awareness parameter (Parameter = Question 1- 10)*

Table 3. Evaluation of Kendall's *w* statistic for respondents on fire safety awareness

S/N	FSA-P	m	n	R	$\bar{R}$	$(R-\bar{R})^2$
1	FSA-1	220	10	800	1210	168100
2	FSA-2	220	10	665	1210	297025
3	FSA-3	220	10	404	1210	649636
4	FSA-4	220	10	355	1210	731025
5	FSA-5	220	10	786	1210	179776
6	FSA-6	220	10	632	1210	334084
7	FSA-7	220	10	780	1210	184900
8	FSA-8	220	10	754	1210	207936
9	FSA-9	220	10	774	1210	190096
10	FSA-10	220	10	790	1210	176400
Total					$\Sigma(R-\bar{R})^2$ =	3118978

Table 4. Level of fire safety awareness among the four groups of respondents in University of Port Harcourt

FSA-P±	Academic staff (%)	Non-academic staff (%)	Students (%)	Business owners (%)
FSA-1	100	100	96	86
FSA-2	67	63	78	71
FSA-3	57	38*	4*	14*
FSA-4	100	100	91	86
FSA-5	100	95	96	94
FSA-6	93	38*	22*	29*
FSA-7	17*	13*	2*	3*
FSA-8	93	80	96	94
FSA-9	93	98	96	91
FSA-10	100	98	99	97

**the identified gaps; +FSA-P1 = Fire Safety Awareness Parameter 1*

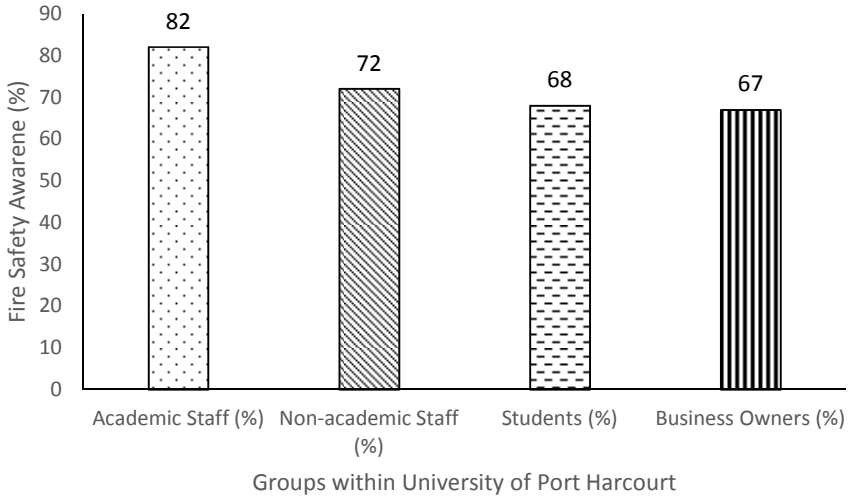

Fig. 2. Average level of fire safety awareness amongst the groups of respondents in University of Port Harcourt

Table 5. Fire safety implementation / practice parameters among respondents in University of Port Harcourt

FSIP-P	Corresponding questions	SA	A	D	SD
FSIP-P1[±]	The University has no means of communicating to its facility users in complying with all aspects of the fire safety risk assessment	142*	69*	9	0
FSIP-P2	The University does not provide its staff and students with adequate information, instruction and training on fire safety to secure a safe environment	115*	95*	4	6
FSIP-P3	Fire extinguishers in some buildings are not being checked and serviced frequently	148*	72*	0	0
FSIP-P4	All electrical installations/repair in the University are handled and maintained by competent persons	0	12	108*	100*
FSIP-P5	Electrical appliances are not turned off at the close of work and when not in use	106*	83*	13	18
FSIP-P6	Fire extinguishers are made available at strategic points in the university facility	5	2	92*	121*
FSIP-P7	The University provides necessary equipment to fight fire in its premise	4	3	96*	117*
FSIP-P8	The University does not have a fire safety policy	145*	64*	4	7
FSIP-P9	The University does not make routine inspections to ensure measures are in place and are being maintained to avoid fire outbreak	123*	91*	1	5
FSIP-P10	This University does not review past fire incidents to include any identified deficiency & a process by which it can be rectified	130*	84*	3	3

***Depicts the identified gaps; [±]FSIP-P1 = Fire Safety Implementation/ Practice for parameter 1 (question 1)*

Table 6 shows how the Kendall's statistic, *w* was calculated. R_i for FSIP-P1 was calculated from Table 5 using Equation (2) as follows:

R_i = (142 *4) + (69*3) + (9*2) + (0*1) = 793.

$\overline{R}$ is evaluated using Equation (3), viz:

$\overline{R}$ = 0.5 *(220)*(10+1) =1210 (same for all FSIP-P parameters or questions); and

$$w = \frac{12 \times 3612938}{220^2 \times 10\left(10^2 - 1\right)} = 0.90\ (90\%)$$

Based on Equations (2) – (5), the Kendall's coefficient of concordance, *w* for the fire safety implementation/practice data in Table 5 is 0.90. This indicates high degree of agreement among the respondents. The level of fire safety implementation /practice among the four groups of respondents in University of Port Harcourt is shown in Table 7 and only the percentage of respondents that answered correctly are presented. The low level of fire safety implementation /practice amongst respondents in University of Port Harcourt expressed as percentage (extracted from Table 7) is as presented in Fig. 3. The fourth section of the questionnaire had five questions of which the respondents were to answer "yes" or "no" among the five questions responsible for fire at the University. A total of 102 respondents gave response as having knowledge on the cause of fire incidence at the University (see Table 8). However the secondary data collected from the fire service department of the University of Port Harcourt on the causes of fire gave a total fire incidence of two hundred and twenty eight (228) between 2002 – 2015 (See Table A1 Appendix A)

3.2 Discussion

Results on Tables 2 and 3 show that staff, students and business owners have good knowledge of fire safety issues, except that only 19% of the respondents claimed that they are aware of the emergency number to call in the event of fire outbreak in the University. Having an immediate external help to call could help prevent a fire from escalating hence saving more lives and property. On the different types of extinguishers used, result indicates that 65% of the respondents do not know that different extinguishers are used to fight different classes of fire depending on the source. This poor knowledge can put lives and properties at risk. For example, the case of electrical fire, it should not be extinguished with water given that water is a good conductor of electricity, electrocution

Table 6. Evaluation of Kendall's *W* statistic for respondents on fire safety implementation and practice

S/N	FSIP-P±	M	n	R	$\bar{R}$	(R- $\bar{R}$)^2
1	FSIP-P1±	220	10	793	1210	173889
2	FSIP-P2	220	10	759	1210	203401
3	FSIP-P3	220	10	808	1210	161604
4	FSIP-P4	220	10	352	1210	736164
5	FSIP-P5	220	10	717	1210	243049
6	FSIP-P6	220	10	331	1210	772641
7	FSIP-P7	220	10	334	1210	767376
8	FSIP-P8	220	10	787	1210	178929
9	FSIP-P9	220	10	772	1210	191844
10	FSIP-P10	220	10	781	1210	184041
Total					Σ(R- $\bar{R}$)^2 =	3612938

±FSIP-P1 = Fire Safety Implementation/Practice Parameter - 1

Table 7. Level of fire safety implementation/practice among the four groups of respondents in University of Port Harcourt

Parameter	Academic staff (%)	Non-academic staff (%)	Students (%)	Business owners (%)
FSIP-P1*	7	13	0	6
FSIP-P2	17	13	0	0
FSIP-P3	0	0	0	0
FSIP-P4	17	5	4	0
FSIP-P5	30	13	10	14
FSIP-P6	10	10	0	0
FSIP-P7	10	10	0	0
FSIP-P8	10	13	3	0
FSIP-P9	3	8	1	3
FSIP-P10	10	8	0	0

**FSIP1 = Fire Safety Implementation / Practice for Parameter 1*

may occur if water is used. Also for flammable liquids like LPG and petrol, water should not be used as an extinguishing medium or explosion may occur.

On the knowledge of exit routes present in the University facilities, only 6% of the respondents are familiar with the exit routes. Unfortunately, exit routes in some buildings on campus are not conspicuously designated while in others no sign for exit route(s). This can jeopardize lives in case of an emergency if no knowledge of exit route exist amongst users of the building to help them escape. Table 5 indicates a low implementation/practice level in University of Port Harcourt. Ninety-six (96%) said that the University has no means of communicating with staff and students in complying with all aspects of fire safety risk assessment. This can pose a challenge to staff and students in identifying potential hazards to fire. Having knowledge of fire hazards can reduce fire incidents from occurring. It is the duty of the management to communicate this aspect to its employees and students through in-house seminars/workshops.

Ninety-five (95%) of the respondents claimed that they are not provided with adequate information, instruction and training on fire safety. Basic information and training on fire safety would educate staff and students on what causes fire and how it can be fought at an initial stage. The management has the responsibility of providing basic information and training on fire safety. The bulk of the respondents said that fire extinguishers made available in some buildings are not being checked and serviced frequently. Checking and servicing expired fire extinguishers can help avoid corroded extinguishers from exploding.

Only 5% said electrical installations/repair in the University are handled and maintained by competent persons and 86% said that they are nonchalant about putting off electrical appliances at the close of work and when not in use. This low practice on electrical installations/repairs may cause wrong installations and loose wiring which can lead to fire incident.

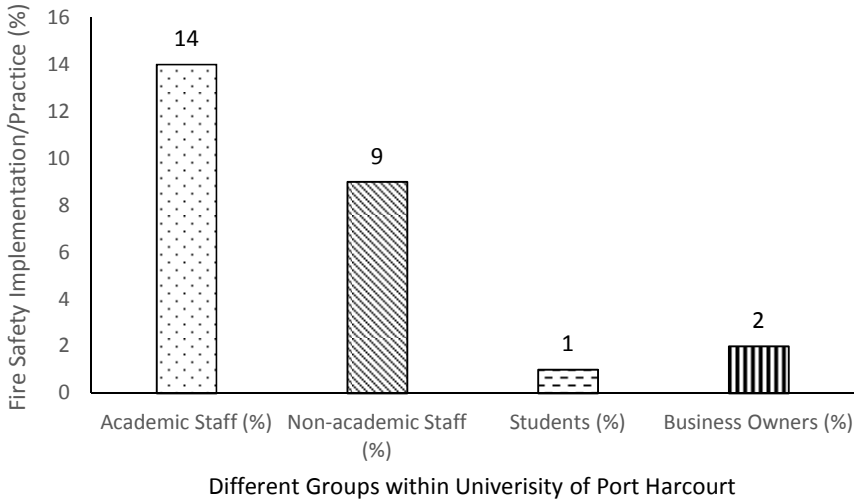

Fig. 3. Low level of fire safety implementation/ practice amongst the groups of respondents in University of Port Harcourt

Table 8. Causes of fire in the University as per respondents' response

S/No.	Causes of fire in the university	Respondents	Percentage (%)
1	Electrical fault	35	34.3
2	Students using boiling ring	12	11.8
3	Bush burning	13	12.7
4	Overloading of electrical circuit	17	16.7
5	Don't know	25	24.5
	Total:	∑102	∑100%

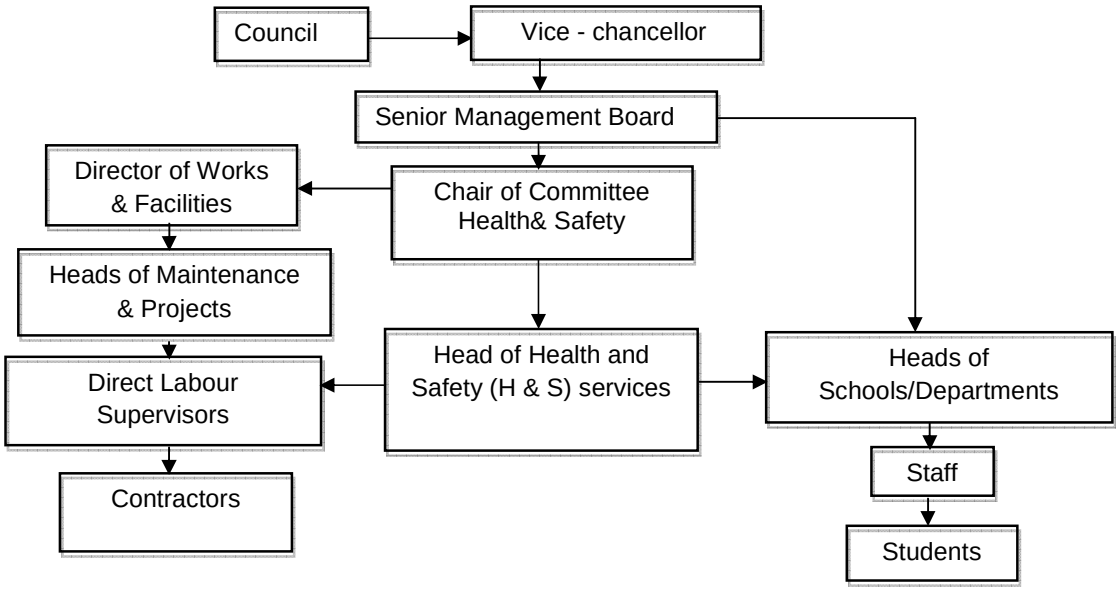

Fig. 4. Fire safety organogram for delegation of duties for University of Port Harcourt

Three percent (3%) of the respondents claimed that fire extinguishers are made available at strategic points in the University facilities indicating that there are no fire extinguishers in the University. Fire extinguishers are used to fight fires at the incipient stage by trained persons to stop the fire from escalating. If they are not provided at conspicuous places, it may be difficult to fight a fire at the early stage and therefore fire may escalate and destroy lives and properties.

On the provision of necessary equipment to fight fire in the University premise, majority of the respondents acclaimed that the management has not done enough in that area. There are no fire hydrants and fire hose reels in the premises. Fire hydrants are an active fire protection system that is installed as part of an overall strategy for the protection of life within a building. It can also be shared with other safety measures like the hose reels. Ninety- five percent (95%) acclaimed that the University does not have a fire safety policy indicating a low practice by the management. The aim of the fire safety policy is to explain how fire safety will be managed and communicated within the University of Port Harcourt. Where necessary, it will identify those personnel who have been assigned specific duties or responsibilities and it will indicate what those duties and responsibilities are. It will also identify all procedures that must be followed by all staff and other persons in the event of a fire emergency.

Ninety-six percent (96%) said that routine inspections and review of past fire incidents in the University are not carried out. Reviewing records of past fire incidents can help include any identified deficiency and a process by which these problems can be rectified. The level of fire safety awareness demonstrated by the respondents in University of Port Harcourt could be attributed to the fact that the University is a fast growing institution with new centres preaching the good news of safety so people are informed that safety is everyone's concern. Going by the average statistics on fire safety awareness amongst respondents in University of Port Harcourt; we have the following ranking (first to the least): Academic staff, Non-academic staff, Students and Business owners (see Fig. 2). Also, Fig. 3 shows the implementation and practice level amongst the respondents indicating a low practice level. This shows no commitment by the management in providing fire prevention and protection measures. It is on this ground that fire safety organogram for delegation of duties is presented (see Fig. 4) for the benefit of University management.

The identified gaps could be attributed to people's attitude towards fire. People do not anticipate fire. This makes them and the management complacent towards fire safety. Lack of fire safety enforcement by the University authority explains the gaps identified in the aspects of fire safety implementation/ practice. There was 78% level of agreement amongst the

respondents on fire safety awareness and 90% level of agreement amongst the respondents on fire safety implementation/practice showing high levels of agreement among them as shown by Kendall's analysis.

4. CONCLUSION

Based on result of study, the following conclusion can be drawn:

i. Results from this study indicated an average level of fire safety awareness and a low level of fire safety implementation /practice;
ii. The gaps identified include; lack of awareness on the emergency number to call in the event of fire, lack of fire safety policy, lack of knowledge on the different types of portable fire extinguishers, inadequate provision and inspection of firefighting equipment, lack of inspection and review of past fire incidents, nonchalant attitude of turning off electrical appliances after use, electrical installations / repairs not being handled by competent persons and the University not providing its facility users with adequate information, instruction and training on fire safety;
iii. Results also showed that the major causes of fire outbreak in the University were from electrical fires due to faulty electrical appliances or circuits, overloading of sockets, overcharging of phones and laptops, use of electric heaters and boilers, wrong installation of electrical appliances like air conditioner, loose wiring and electric arcing and bush burning; and
iv. On the Kendall's w-statistic, there was a high degree of agreement between respondents on the level of fire safety awareness (78%) and on the level of implementation/practice (90%).

5. RECOMMENDATION

Based on the outcome of the study, the following recommendations are made:

1. Management of the University should give staff and students proper and regular fire safety training to be able to identify types of extinguishers and the corresponding type of fire to use them for;
2. Management should ensure that fire preventive and protective measures are provided to help fight fire at the incipient stage;
3. Management should ensure that electrical installations/repair is done by competent persons that have full knowledge of the job;
4. The University management policy should include the existing and new buildings to show emergency exit points, muster points, installation of water hydrants, and an organogram for the University (see Fig. 4 for proposed organogram);
5. The management of the University should engage in regular inspection and servicing of firefighting equipment to ensure measures are in place and are being maintained; and
6. The management of the University should review past fire incidents to identify the causes and how they can be rectified.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX A

Table A1. Major causes of fire incidents from 2002-2015 in University of Port Harcourt, Rivers State

Causes of Fire in University of Port Harcourt	Number	Percentage (%)
Electrical fires	96	42.1
Bush burning	81	35.5
Others which include faulty vehicles, fuel/gas explosion, sabotage and open flames.	51	22.4
Total	228	100

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