RADON RISK AWARENESS AMONG UNDERGRADUATE STUDENTS OF ADEKUNLE AJASIN UNIVERSITY, AKUNGBA AKOKO, NIGERIA.

Abstract

The study was conducted to assess the knowledge of undergraduate students of Adekunle Ajasin University, Akungba Akoko (AAUA), Ondo State, Nigeria, about radon risk and possible impediment they might face for radon testing. One hundred students were randomly sampled from six faculties in the university. A descriptive research design of survey type was used and a semi-structured questionnaire was administered to the students. Three research questions raised were solved using descriptive statistics. The survey found that 88% of the responders were not aware that high radon exposure could cause lung cancer and 94% does not believe in the health effect of radon. Concerning radon testing, 8% knew that radon could be detected, 12% had knowledgeable awareness of how to test for radon, and 8% possesses information about where to procure radon test kits. Insufficient knowledge of radon risk exist among the undergraduate students of AAUA. More awareness through media and lectures is therefore recommended for members of the university community.

Keywords: radon, risk awareness, testing, undergraduate students.

Introduction

Radon is a radioactive gas that is present everywhere (Khan, Gomes, and Krewski 2019). Radon is without odour, colour and taste. Radon is the major cause of lung cancer among the population that do not smoke (Hazar et al. 2014) and the leading cause of lung cancer after tobacco smoking (Esan et al. 2020; Smith, Martel, and Harding 2013; Wang et al. 2000). Radon originates from rocks and soils and has the tendency to accumulate in indoor area and mines. Uranium-238 is present in rocks and soil, during decay process, it breaks down to radium-226 which also decay to radon-222 with the emission of alpha particle in the process. Radon can move from the point of its production and enters the groundwater, soil surfaces, air and houses (Duckworth et al. 2002; Esan et al. 2020; Khan 2019). Since it is a radioactive gas, it can be inhaled in indoor or outdoor air or ingested from radon enriched liquid substances. Radon contribute the largest part of the public exposure to ionizing radiation (Copes and Peterson 2014). The concentration of radon in indoor air depend on soil, the type of building materials and water used in homes (Gandolfo et al. 2017; Salih, Aswood, and Hamzawi 2019; Tchorz-Trzeciakiewicz and Rysiukiewicz 2021). Radon can enter the buildings through many ways like: opened floor joints, cracks in walls and floor, narrow openings and sewage pipes (Syuryavin et al. 2020; Usikalu et al. 2020). The concentration of radon in homes depend on factors like rate of ventilation, rate of production of radon or its entry point from sources (McGrath et al. 2021; Rabi, Oufni, and Amrane 2017).

Unlike some developed countries, there is no public agency saddled with the responsibility of creating public awareness on radon exposure and health risk in Nigeria. Testing of radon in homes voluntary is not common as large population of the people have not heard about radon before. Radon testing kits are not produced or available in Nigeria market which made it more difficult for people to test. Even among people

that have knowledge of radon, non-availability of radon testing kits in Nigeria market serve as a major barrier to test. The minority that might have heard about radon got the knowledge from formal education (Esan et al. 2020). In a research (Esan et al. 2020) 41% of staff with background in science have knowledge about radon, 19% from health science background and 12% from social science background. The academic background varies significantly with the level of knowledge and the authors concluded that poor awareness of radon exist among university employee of Obafemi Awolowo University, Ile Ife, Nigeria. Likewise, in another study (Smith, Martel, and Harding 2013), 75% of Utahs resident never tested their home for radon and 80% could not identify radon as a risk factor for lung cancer while 40% were unaware of radon. Therefore, understanding radon as a health issue has poor nationwide awareness.

Many developed countries have plans and guidelines for radon level monitoring such as: education of the citizen about radon; reducing the level of radon if found too high; testing of radon in homes and pre-building steps to guide against radon in newly constructed buildings. For instance, in Italy, radon is measured yearly to avoid seasonal variation of result. Finland and Sweden adopt monthly radon measurement when heating appliances are used in buildings. Likewise, in Ireland and Britain, radon is measured at three months intervals and result addressed according to season whereas in the United States radon measurement is part of buying and selling criteria of houses (Copes and Peterson 2014). Several measurement of radon has been done in Nigeria by several researchers (Ademola and Ojeniran 2017; Ajiboye et al. 2016; Asere and Ajayi 2017; Asere et al. 2022; Esan et al. 2020; Usikalu et al. 2020). Review work has been done in various part of the world on radon (Antignani et al. 2021; Jobbágy and Hult 2020; Khan, Gomes, and Krewski 2019; Martell et al. 2021; Nilsson and Tong 2020; Perko and Turcanu 2020; Vogeltanz-holm and Schwartz 2018). However, sparse data exist on radon awareness and perception of its health risk in various places including the research area. This research work would add to the work done and the result contribute to the baseline data in the area.

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METHODOLOGY

This study adopted descriptive research design of survey type. This design is suitable for this study because the study involves collection of information from a sample of university undergraduate students on their perceived risk of radon. The population of the study comprised of undergraduate students of Adekunle Ajasin University Undergraduates, Akungba Akoko (AAUA), Ondo State, Nigeria. This study adopted simple random sampling technique to select one hundred (100) undergraduate students from the six faculties in the University and the faculties are: Science, Social Sciences, Education, Arts, Law and Agriculture. A semi-structured questionnaire was used in collecting data for this research, the questionnaire was closed-ended type. It comprises of section A and B. The section A comprises of demographic information of the respondent while section B contains the items that asked for the opinion of the respondents on the subject matter, this gives them a restricted response on a four Likert scale of type SA-strongly agree, A-agree, D-disagree, SD-strongly disagree.

The study examined three research questions:

- What are the perception of AAUA undergraduate students towards radon?
- What are the barriers of radon testing among AAUA undergraduate students?
- What are the health effects of radon?

Copies of the questionnaire were personally distributed to the respondents by the researchers, and efforts were made to see that the respondents understood the purpose of the study. Assistance was given where necessary in compliance with the instruction. At the end of the exercise copies of

completed questionnaire administered were collected by the researcher immediately. The researcher made it clear to respondents that, they are free to decide on whatever information they wish to share with the researcher and that they are under no obligation to tick any answer of their choice. Descriptive analysis involving frequency count, percentages, mean and standard deviation were used to analyze research questions.

RESULTS AND DISCUSSION

Demographic Characteristics

Question include Gender (male, female), Age (17-22, 23-27, 28-32) years, Faculty (science, social sciences, education, arts, law and agriculture), Academic level (100,200,300,400 and 500) levels.

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Table 1: The demographic characteristics of the undergraduates' students

CHARACTERISTICS		FREQUENCY	PERCENT (%)
GENDER	Male	49	49.0
	Female	51	51.0
	Total	100	100.0
AGE (years)	17-22	37	37.0
	23-27	54	54
	28-32	9	9.0
Total		100	100
FACULTY	Science	30	30
	Social Science	20	20
	Education	15	15
	Arts	15	15
	Law	5	5
	Agriculture	15	15
ACADEMIC LEVEL	100 L	31	31
	200L	33	33
	300L	21	21
	400L	10	10
	500L	5	5

Table 1 shows that 100 undergraduate students of Adekunle Ajasin University, Akungba-Akoko participated in this study in which 49% of the respondents are males while 51% of the respondents are females. This shows majority are females. 37% of the respondents are within the age range of 17-22years, 54% of the respondents are within the age range of 23-27years, while 11% of the respondents are within the age range of 28-32 years.

30% of the respondents were drawn from the faculty of Science, 20% of the respondents were drawn from the faculty of Social Science, 15% of the respondents were drawn from the faculty of

Education, 15% were from the faculty of Arts, 5% of the respondents were drawn from the faculty of Law while 15% of the respondents were drawn from the faculty of Agriculture. This implied that the majority of the respondents were drawn from the faculty of Science. 31% of the respondents are 100 level students, 33% are 200 level students, 21% of the respondents are 300 level students, 10% of the respondents are 400 level students while 5% of the respondents are 500 level students. This simply shows that the majority of respondents are 200 level students.

Perception of AAUA undergraduate students towards Radon

Responders were asked about their knowledge of radon. The characteristics of radon were listed and participants were to respond on a 4 Likert scale of strongly agree, agree, disagree and strongly disagree.

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Table 2: Perception of AAUA undergraduate students towards Radon

S/N	STATEMENTS	Strongly Agree		Agree		Disagree		Strongly disagree		Mean
		No	%	No	%	No	%	No	%	$\bar{x}$
1	Radon is a decay product of uranium in the soil, water and Open air	2	2.0	1	1.0	42	42.0	55	55.0	1.5
2	Radon has no odour	6	6.0	5	5.0	50	50.0	39	39.0	1.78
3	Radon is in a gaseous form	12	12.0	8	8.0	35	35.0	45	45.0	1.65
4	Radon can be detected	3	3.0	5	5.0	51	51.0	41	41.0	1.70
5	Smoking increases the chances of getting Lung cancer from Radon	3	3.0	3	3.0	50	50.0	44	44.0	1.65
6	High radon exposure can cause Lung cancer	8	8.0	4	4.0	40	40.0	48	48.0	1.72
7	Building materials (such as concrete, stone and brick) could be the source of radon in our homes.	13	13.0	7	7.0	53	53.0	27	27.0	2.06
8	Radon can enter the house from the ground through cracks in concrete and breaking pipes	18	18.0	6	6.0	44	44.0	32	32.0	2.10
	Weighted mean score = **1.77**									

The result in Table 2 revealed the perception of AAUA undergraduates towards Radon with the weighted mean score of 1.77 which is lower than the standard mean score of 2.50. All of the items from 1-8 depict lower means scores of 1.5, 1.78, 1.65, 1.70, 1.65, 1.72, 2.06 and 2.10 respectively indicating that AAUA undergraduate students have negative perception towards Radon. By adding the total number of disagree with strongly disagree; 97% does not know that radon is a decay product of uranium in the soil, 89% does not know that radon has no odour, 80% does not know that radon is a gas, 92% does not know that radon can be detected, 94% of the students does not know that smoking increases the risk of getting lung cancer if exposed to radon, while 88% does not know high radon exposure could cause lung cancer, 80% does know that building materials could be the source of radon in homes and 76% does know how radon can enter their houses. The results obtained in this study is similar to what was obtained in a study conducted by (Esan et al. 2020), where knowledge of radon and its health risk was found to be low among the sampled populace

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Barriers to Radon Testing among AAUA undergraduates

Responders were asked to indicate the barriers they might likely faced if to test for radon. They could choose from five barriers listed.

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Table 3: The barriers to Radon Testing among AAUA undergraduate students

S/N	STATEMENTS.	Strongly Agree		Agree		Disagree		Strongly disagree		Mean
		No	%	No	%	No	%	No	%	$\bar{x}$
9	If I had a radon problem, it would be costly to fix.	65	65.0	28	28.0	4	4.0	3	3.0	3.55
10	I do not believe in the health effect of radon.	55	55.0	39	39.0	5	5.0	1	1.0	3.48
11	The results of radon tests are not reliable	23	23.0	67	67.0	4	4.0	6	6.0	3.07
12	I do not know where to buy a radon testing kit	40	40.0	52	52.0	3	3.0	5	5.0	3.17
13	I do not know how to test my home for radon.	50	50.0	38	38.0	5	5.0	7	7.0	3.31
	Weighted mean score = **3.32**									

The result in Table 3 revealed the barriers to radon testing among AAUA undergraduate students**,** with a weighted mean score of 3.32 which is higher than the standard mean score of 2.50. All of the items from 9-13 depict higher means scores of 3.55, 3.48, 3.07, 3.17 and 3.31 which are higher than 2.50 indicating all items are barriers to radon testing among AAUA undergraduate students Item 9 which has the highest mean score of 3.55 shows students indicated that the major barrier to radon testing is that they do not know where to buy a radon test kit. Adding the total number of agree with strongly agree; 93% believes testing for radon could be costly, 94% does not believed

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in the health effect of radon, 90% believes radon test results might not be reliable, 92% does know where to buy radon test kits while 88% does not know how to test their homes for radon. This study is consistent with the findings of (Esan et al. 2020) who found that about 74% of their study participants reported that their major barrier to radon testing is abstract knowledge with regard to how and where to procure a radon test kit.

Health effects of Radon

Participants were asked what health effect were associated with radon. Six options were provided but not all of them are radon induced health effect. This is to test the knowledge of the students whether they really know the health issue associated with radon.

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Table 4: The health effects of Radon

S/N	STATEMENTS.	Strongly Agree		Agree		Disagree		Strongly disagree		Mean
		No	%	No	%	No	%	No	%	$\bar{x}$
14	Radon is a leading cause of Lung Cancer	49	49.0	42	42.0	3	3.0	6	6.0	3.34
15	Drinking water in which radon is dissolved, exposes the kidney and bone marrow to diseases or damage..	38	38.0	51	51.0	8	8.0	3	3.0	3.14
16	Radon causes Leukemia (blood cancer)	55	55.0	32	32.0	7	7.0	6	6.0	3.36
17	High level exposure to radon leads to cardiovascular (heart) diseases.	42	42.0	45	45.0	8	8.0	5	5.0	3.24
18	Exposure to radon causes damage to the skin cells	40	40.0	52	52.0	6	6.0	2	2.0	3.24
19	Breathing air that contains radon could cause Lung cancer	4	4.0	12	12.0	34	34.0	50	50.0	1.70

Weighted mean score = **3.00**

The result in Table 4 revealed the health effects of radon, with a weighted mean score of 3.00 which is higher than the standard mean score of 2.50. All of the items from 14-18 depict higher means scores of 3.34, 3.14, 3.36, 3.24, and 3.24 respectively showing the students believed all items are the health effects of radon whereas only item 14 and 19 are the major health effects of radon. Adding agree with strongly agree, majority (91%) of the students believed radon is a leading cause of lung cancer while very few (20%) believed breathing air that contains radon could cause lung cancer. The contradictory response of the students in Table 4 shows that the students have negative perception to the health effects of radon. This result is consistent with the work of (Smith, Martel, and Harding 2013) where 80%could not identify radon as a risk factor for lung cancer and (Hazar et al. 2014; Khan, Gomes, and Krewski 2019) where the population did not consider radon exposure as their first priorities.

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Conclusion

Research question one which stated that what are the Perception of AAUA undergraduate students towards radon, revealed that AAUA undergraduate students have negative perception towards radon as students indicated that they do not know that radon can enter the house from the ground through cracks in concrete and breaking pipes. Research question two which stated what are the barriers to radon testing among AAUA undergraduate students indicated that the major barrier to radon testing is that they do not know where to buy a radon test kit even they had money to buy it. Research question three which stated what the health effects of radon are, revealed that the major health effect of radon is lung cancer. This study confirmed that the knowledge of undergraduate students of Adekunle Ajasin University, Akungba Akoko, about radon is very poor. The university management is therefore advised to create platform to increase awareness and sensitized the entire university community about radon.

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