PUBLIC AWARENESS AND WILLINGNESS TO TEST FOR RADON IN OSOGBO, OSUN STATE, NIGERIA

Abstract

The study was conducted to assess the knowledge of the public about radon risk and possible impediment they might face for radon testing in Osun State, Nigeria. One hundred people from different category of discipline were the population for this research. A descriptive research design of survey type was used and a semi-structured questionnaire was administered to the people. The questions raised addresses perception of people about radon and their readiness to engage in testing. The result of the survey shows thatmajority of the respondents are educated and this increase the reliability of the study.Majority of the respondents are not aware of radon and the risk attached. Majority, (84%) of the respondents have not tested their homes for radon. 58% of them do not know how to carry out the radon test, 54% of them do not know where to buy radon test kits. 68% of them are unaware about the radon test, 74% of them could not afford the radon test kit because it is expensive. There was financial constraint for the testing as majority earn below the minimum wage for workers in Nigeria and majority of respondents are not unemployed.From the Chi-square test, the willingness to test of the respondents is dependent on their level of awareness.More awareness through media and lectures is therefore recommended for members of the public.

Keywords: awareness, willingness, radon, testing, survey

Introduction

Radon is a radioactive gas that is present everywhere(Djounova & Ivanova, 2023; Khan et al., 2019). Radon is without odour, colour and taste. Radon is the major cause of lung cancer among population that do not smoke(Hazar et al., 2014; Lin et al., 2023). The leading cause of lung cancer in the United States and the second cause of lung cancer after tobacco smoking (Esan et al., 2020a; Hazar et al., 2014; Smith et al., 2013; Wang et al., 2000). Radon originates from rocks and soils and has the tendency to accumulate in indoor area and mines(Syuryavin et al., 2020; Usikalu et al., 2020). 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; Khan, 2019). Since it is a radioactive gas, it can be inhaled in indoor or outdoor air or ingested from radon enriched liquid substance(Gandolfo et al., 2017; Salih et al., 2019; Tchorz-Trzeciakiewicz & Rysiukiewicz, 2021).

Radon contribute the largest part of the public exposure to ionizing radiation(Copes & Peterson, 2014; Gandolfo et al., 2017; Rey et al., 2024). 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. Voluntary testing of radon in homes is not common as large population of the people have not heard about radon(Pacella et al., 2023; Perko et al., 2024). Besides, radon test kits are not being produced or readily available in Nigeria market. The minority that may have heard about radon got the knowledge from school (Esan et al., 2020a). Several studies on radon awareness and understanding have been carried

out in many countries. (Cholowsky et al., 2021; Duckworth et al., 2002; Esan et al., 2020a; Hazar et al., 2014; Khan, 2019; Wang et al., 2000).

In a research (Esan et al., 2020a) in Obafemi Awolowo University (OAU), Ile-Ife, Nigeria; 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 and its health risk exists among university employee of OAU. Likewise, another study in Utah(Smith et al., 2013), 75% of Utah's resident never tested their home for radon and 80% could not identify radon as a risk factor for lung cancer, 40% were unaware of radon itself. A related research concluded (Cholowsky et al., 2021), among 2,390 people, only 20% were ready to test for radon after getting awareness information, 65% needed 2 to 5 times awareness information over several months and 15% of the people needed 6 to 10 awareness information encounters over many years before they could test for radon.

Therefore, understanding radon as a health issue has low nationwide awareness(Smith et al., 2013; Timmons & Lunn, 2023). Even, among the people that have knowledge of radon, non-availability of radon testing kits in Nigeria serve as a major barrier to test. Many developed countries have planned and guidelines for radon level monitoring; 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 (McGrath et al., 2021; Rabi et al., 2017). For instance, in Italy, radon is measured yearly to avoid seasonal variation of result. Finland and Sweden adopts monthly radon measurement when heating appliances are used in buildings. In Ireland and Britain, radon is measured at three months intervals and result addressed according to the season whereas in the United States, radon measurement is part of buying and selling criteria of houses (Copes & Peterson, 2014).

Review work has been done in various part of the world on radon (Antignani et al., 2021; Jobbágy & Hult, 2020; Martell et al., 2021; Vogeltanz-Holm & Schwartz, 2018). Despite the fact that radon measurements have been done in various places and environments in Nigeria(Ademola & Ojeniran, 2017; Ajiboye et al., 2016; Asere & Ajayi, 2017; Usikalu et al., 2020). However, sparse data exist on radon awareness and perception of its health risk in various places including the research area. This research would serve as contribution to baseline data and knowledge of radon in the research area.

Research Methodology

This study was carried out at Ilesha, Osun State, Nigeria.The population of the study is made up of people in Ilesha at Osun State, which included the trader, medical personnel, transporter and other practitioners in the chosen area. The sample size included 100 respondents.The respondents were chosen carefully to reflect the important features of the population.

The research questions include:

i. What concepts do people sustain about Radon?
ii. How do people perceive reducing the risks due to exposure to Radon?
iii. What is their readiness to test for radon?
iv. Which health effect do they conceive to be of risk to human health and the environment?

Descriptive method of analysis was used to analyze the data collected through questionnaire with the use of SPSS version 25 and Microsoft Excel 2013. Furthermore inferential statistics was used to test the hypothesis with the use of chi-square analysis. Meanwhile, the data set were presented in table; and representations of frequency distributions of the data sets were employed to give concise information about the features of the data gathered. The survey instrument consisted of closed ended questions in two sections. Social – demographic characteristics and radon awareness and risk perception.

Demographic and smoking

Information were asked in which the respondents tick as appropriately applied to them. Questions included: gender (male, female), age (18-30, 31-50, 51-70), educational background (Primary school, Secondary school, NCE/Technical education, University, Others), employment status (employed, not employed), type of residence (single family, multiple family), ownership status (own residence, rent/lease), household income (10,000 - 30,000, 31,000 - 50,000, 51,000 – 100,000, 101,000 – 200,000, 200,000 and more) Naira, smoking status (current smoker, former smoker, never smoke, do not smoke, do not know).

Radon Awareness and Risk Perception

Participants were asked to tick yes/no as according to the level of knowledge they had about radon. Information in the questions included: awareness of radon, nature of radon, properties of radon, perception on the presence of radon, perception of radon as carcinogenic, perception on detection of radon, rating radon as a health hazard, perceived health effect, and readiness to test for radon.

RESULT AND DISCUSSION

The questionnaires administered during the survey were analyzed and presented with the use of Frequency Table; therefore the results of the one hundred (100) questionnaires administered are shown below:

Table 1: Social demographic Characteristics of the Respondents

Characteristics	Numbers	Percentage%
Gender		
Male	27	54.0
Female	23	46.0
Age (years)		
18-30	42	84.0

31-50	6	12.0
51-70	2	4.0
Educational background		
Primary School	5	10.0
Secondary School	9	18.0
NCE/Technical	1	2.0
University Education	28	56.0
Others	7	14.0
Employment Status		
Employed	13	26.0
Not employed	37	74.0
Type of Residence		
Single family	42	84.0
Multiple Family	8	16.0
Ownership Status		
own residence	15	30.0
rent/lease	35	70.0
Household Income		
10,000-30,000	16	32.0
31,000-50,0000	14	28.0
51,000-100,000	12	24.0
101,000-200,000	4	8.0
200,000 and more	4	8.0
Smoking Status		
Current smoker	4	8.0
former smoker	7	14.0
never smoked	38	76.0
don't know	1	2.0

From Table 1, out of 100 respondents to the Osun State radon survey, 54% of the respondents are male while 23% are female. This means that there are more male than female respondents.84% of the

respondents are within the ages of 18-30 years, 12% are within the age range of 31-50 years; while 4% of the respondents are within the age 51-70 years. This means that majority of the respondents are young and active.Education background of the respondents showed that 10% hadPrimary education, 18% only had secondary education, and 2% had NCE/Technical education, 56% had University education; while 14% indicated that they have other kind of education which was not specified in the questionnaire. This shows that majority of the respondents are educated and this increase the reliability of the study.The employment status of the respondents indicated that 74% are not employed; while 26% are gainfully employed. This implies that majority of respondents are not unemployed which is a proof to the high rate of unemployment in Nigeria.The type of family of the respondents indicated that 84% have single family while 16% have a multiple family.The residence ownership status of the respondent's shows that 30% of them live in their own resident while 70% live in a lease apartment.Data was collected on the household income of the respondents. This shows that 32% of the respondents earn between #10,000 -30,000; 28% earn between #31,000 - 50,000; 24%earn between #51,000 – 100,000; 8% earn between #101,000 – 200,000; while 8% earn #200,000 Naira and above. This means that majority of the respondents earn below the minimum wage of workers in Nigeria and the implication of this is that majority of the respondents do not have more financial power to take care of themselves.There was financial constraint for the testing. The smoking status of the respondents shows 8% of them are current smokers, 14% are former smokers, 76% have never smoked, while 2% of the respondents do not know.

Table 2:RADON AWARENESS AND RISK PERCEPTION

Characteristics	**Frequency**	**Percentage**
Awareness of radon		
Yes	22	44.0
No	28	56.0
Nature of radon		
Gas	35	70.0
Solid	2	4.0
Not sure	13	26.0
Perceived Properties of Radon		
Yes	19	38.0
No	12	24.0
Not sure	19	38.0
perception on the presence of radon everywhere		

Yes	21	42.0
No	7	14.0
Not sure	22	44.0
respondents' perception on if radon is carcinogenic		
Yes	17	34.0
No	8	16.0
Not sure	25	50.0
respondent's perception on if radon can be detected		
Yes	18	36.0
No	7	14.0
rating of radon as a health hazard		
Minor	17	34.0
Major	23	46.0
Moderate	10	20.0
perceived health effect associated with radon		
Lung cancer	27	54.0
Asthma	15	30.0
Other	2	4.0
Not sure	6	12.0
Readiness to test for radon		
Yes	3	6.0
No	42	84.0
Not sure	5	10.0

Table 2 shows the awareness of the respondents about radon, 44% of the respondents are aware about radon, while 56% are not aware about radon. The implication of this is that majority of the respondents are not aware of radon and the risk attached to it. Therefore, there is need to increase effort on campaign and awareness program on radon. The Table also show the respondents' perception on the nature of radon, 70% of the respondents perceived that radon is a gas, 4% of the respondents perceived that radon is a solid, 26% of the respondents are not sure of the nature of radon, while none of the respondents perceived radon has a liquid substance.

Concerning respondents' perception about the properties of radon, 38% of the respondents perceived that radon has odour, colour or taste; 24% of the respondents indicated that radon does not have odour, colour or taste, while 38% of the respondents are not sure if radon has odour, colour or taste. On perception on the presence of radon everywhere, 42% of the respondents perceived that radon is present everywhere, 14% of the respondents indicated that radon is not found everywhere, while 44% of the respondents are not sure if radon can be found everywhere or not.

Table 2 also shows the perception of the respondents on whether radon is carcinogenic or not, 34% of the respondents perceived radon to be carcinogenic, 16% of the respondents perceived radon not to be carcinogenic, while 50% of the respondents are not sure if radon is carcinogenic or not. The Table shows the respondent's perception on if radon can be detected, 36% of the respondents indicated that radon can be detected, 14% of the respondents perceived that radon cannot be detected; while 50% of the respondents are not sure whether radon can be detected or not. Majority perceived that radon cannot be detected.

In Table 2 respondents' rating of radon as a health hazard is shown. 34% of the respondents rate radon to be a minor health hazard, 46% of the respondent's rate radon to be a major health hazard, while 20% of the respondents rate radon to be a moderate health hazard. On the respondent's perceived health effect associated with radon, 54% of the respondents indicated the health effect associated with radon is lung cancer, 30% believed it to be asthma, 4% revealed there are other health effect associated with radon, while 12% of the respondents are not sure of the associated health effect associated with radon.

Table 2 shows if respondents have measured the radon concentrations in their homes. Just 6% of the respondents have their homes tested for radon while majority (84%) of the respondents have not tested their homes for radon. Out of those who have not done the measurement, 58% of them do not know how to carry out the radon test, 54% of them do not know where to buy radon test kits, 68% of them are unaware about the radon test, 74% of them could not afford the radon test kit because it is expensive as majority of the respondents earn low income. However, 60% of them believed that radon test kit is needed to carry out the test. Although 58% of those who have not measured radon in their homes are ready to take the test if all the reasons for not taken the test are being taken care of.

From Chi-square test, the willingness test of the respondents is dependent on their awareness. The Significant value is 0.005%. It is lesser than 0.01 which is the level of significant.

CONCLUSION

The study revealed low knowledge about radon among respondents and poor perception of radon risk. There is a need to create more awareness through media, public lectures, and mass campaigns for the members of the community which should make them take better decision regarding the indoor potential

radon exposure risk and increase the radon home testing volition in houses and consequently reduce indoor radon risk.

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