Radon

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Abstract

There are questionnaire data. Questionnaire data were paper-based data. Figure 1 shows own calculations using questionnaire data, Figure 1 can be published.

Remarks on public awareness about radon and radon measurements in Tirana urban area, Albania

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Abstract: The extent of public knowledge about radon is important. A educational survey was conducted in order to assay the public knowledge about radon and radon measurements in housings in Tirana, in November 2018. Eighty-three percent of respondents had not heard of radon. The hundred percent of respondents had either no radon measurements or did not know that indoor radon measurements were conducted in their housings. This suggests that the public had largely no information about radon and radon measurements in housings. Public communication campaigns and a large scale survey may assess public knowledge about radon, radon health risk, radon testing and mitigation and be possibly integrated with extensive and intensive indoor radon measurements. This could be a promising way to increase radon awareness and potentially indoor radon measurements in housings in Tirana, Albania.

1. Introduction

Increasing evidences have identified radon as the second leading cause of lung cancer after cigarettes, being responsible for three percent to fourteen percent of all lung cancers [1]. Lung cancer relative risks for non-smokers were respectively estimated to be 1.0, 1.2 and 1.6 for indoor radon level exposure of 0, 100 and 400 Bq m^{-3} [1], while the relative risk was higher for smokers. Evidences have shown that the lung cancer relative risk statistically increases from long-term exposure to indoor radon "at levels of the order of 100 Bq m^{-3}" [2]. A World Health Organization (WHO) survey of 36 countries found that almost all countries have set reference levels for existing housing between 200 Bq m^{-3} and 400 Bq m^{-3} [1], and some countries have set lower reference levels for new houses (200 Bq m^{-3}) than for existing buildings [3]. According to the 2013 Basic Safety Standards (BSS) Directive – Directive 2013/59/Euratom, European member states are required to have a radon action plan and inform the population about the radon levels [4].

Qualitative and quantitative methods are used to collect data. Surveys and indoor radon measurements are used to collect information about indoor radon (concentration) levels and to produce distribution map of indoor radon levels. In Europe, national surveys produced a European map of indoor radon levels (10 km×10 km grid cells) [5]. Here, the number of measurements per grid cell (10 km×10 km) and indoor radon level changes in Europe (https://remon.jrc.ec.europa.eu/[2]). Qualitative studies (surveys) acquiring the extent of public knowledge about radon, radon health risk, radon testing and mitigation are important, because they assess the extent of public knowledge about radon. Surveys have found that misinformation about radon is common; the public has confused the health effects of radon with those of carbon monoxide and approximately fifty percent of respondents in many studies reported the inaccurate belief that radon causes headaches [6], not lung disease. Surveys help record the perceptions of respondents expressed in their own words (see [7], [8]]).

The Institute of Public Health is responsible for radon measurements and monitoring, for raising public awareness about indoor radon levels, radon health risk, and for demonstrating the importance of radon measurements, indoor radon testing and radon mitigation to reduce indoor radon concentration, while residents are responsible for radon testing and remediation [9], in Albania. The recent radon measurements covered an area of ten percent of Albania [10] with a number of measurements changing from one to forty-nine indoor radon measurements per grid cell (10 km×10 km) and with indoor radon concentration varying from 0 to 500 Bq m^{-3} (https://remon.jrc.ec.europa.eu/). Indoor radon (concentration) levels were recently measured in fifty workplaces in Albania exceeding the radon national reference of 300 Bq m^{-3} in one workplace in Tirana [9]. The fifty-four percent of Tirana urban area is made of soils containing high soil gas radon concentration (above > 30 KBq m^{-3}) [4]. Yet, surveys to assess the extent of the public knowledge about indoor radon and indoor radon level measurements are in need.

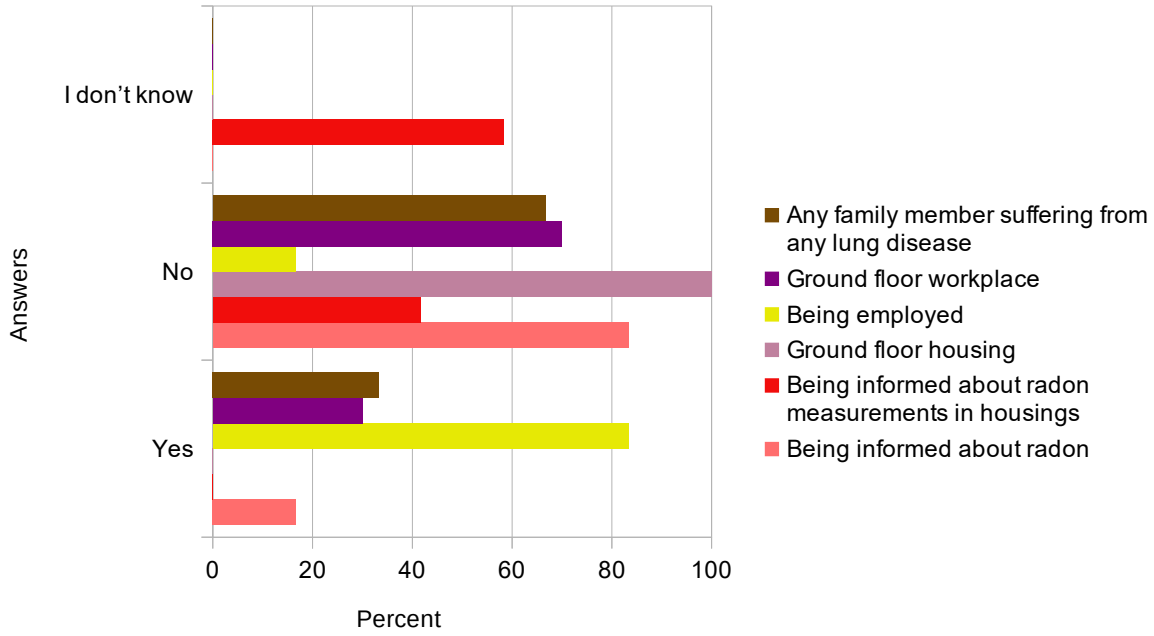
A survey was accomplished with the consent of participants (students and respondents) in Tirana urban area, in November 2018. The primary goal of this survey was to assess the extent of the public's knowledge about indoor radon and indoor radon measurements using a six-question questionnaire. The questionnaire was prepared by the author in compliance with the program of the Polytechnic University of Tirana and with the consent of twelve master students of Polytechnic University of Tirana. The questionnaire were filled in by each student with the acceptance of participants (respondents and students). Students were consulted by the lecturer (author) to understand the importance of the survey and how to conduct the questionnaire. Second, this survey helped to understand the importance of

asking a larger number of residents about radon and radon measurements in coming years. This paper shows the results of the survey resulting to twelve completed questionnaires conducted for educational purposes in Tirana urban area, Albania, in November 2018.

2. Results and discussion

The survey potentially showed the first recent public knowledge and information about radon and radon measurements in Tirana urban area. Eighty-three (83.3) percent of respondents (light red color in Figure 1) had not heard of radon; and forty-one (41.7) percent and fifty-eight (58.3) percent of respondents (red color in Figure 1) had respectively no radon measurements or did not know that indoor radon measurements were conducted in their housings.

Figure 1: Percent of answers received from respondents about radon and radon measurements in their housings, in Tirana urban area, in November 2018. Source: Own calculations.



Respondents (58.3 percent) that did not know that indoor radon measurements were conducted in their housings have potentially rented their housings missing information about indoor radon measurements of their housings in the past. Eighty-three (83.3) percent of respondents were employed and thirty percent (of 83.3 percent) worked on the ground floor (violet color in Figure 1). Seventy percent of employed respondents worked in upper floors (second and upper stores) of the buildings. Thirty (33.3) percent of respondents had one family member including themselves suffering from any lung disease. None of respondents had their housings on the ground floor (light violet color in Figure 1).

Figure 1 clearly shows that a large part of respondents (83.3 percent) were not informed or had no information about radon; 100 percent of respondents had no information about radon measurements of their housings. Yet, the 100 percent of twenty-one respondents had not heard or had no knowledge about radon and radon measurements in Tirana urban area in November 2019 (these data are not shown in Figure 1). This indicates that information and knowledge about radon, radon measurements in housings is likely lacking in Tirana urban area. While all respondents were not living on the ground floor, thirty percent of employed respondents were working at ground floor indicating a possible higher radon health risk for residents working at the ground floors than residents working at upper floors. Radon concentrations at underground and ground levels are comparable and statistically higher than that of first and second floors [12]. The thirty percent of respondents had a family member suffering of any lung disease indicating these persons could be more vulnerable to indoor radon levels. This survey cannot indicate any relationship of lung diseases and indoor radon levels, however, this suggests that a large scale survey of radon awareness and radon measurements could record indoor radon levels and lung disease incidents.

Radon measurements are made in Albania, however, the number of measurements varied from one to forty-nine per grid cell (10 km×10 km), covering ten percent of entire land of Albania. Indoor radon level as shown by measurements were up to 500 Bq m^{-3} (https://remon.jrc.ec.europa.eu/) exceeding the radon national reference level of 300 Bq m^{-3} [9] in Albania. Considering the indoor radon levels exceeding the radon national reference level (of 300 Bq m^{-3}), the ten percent of indoor radon level measurement coverage [10] is a small area of Albania (including Tirana) compared to other European countries e.g., Czech Republic (https://remon.jrc.ec.europa.eu/). Although, there are surveys of indoor radon level on the ground floors and workplaces in Albania including Tirana [13], I note the long-term, seasonal indoor radon measurements (see [4]) could be associated with the increasing number of indoor radon measurements at all floors of housings, workplaces and public dwellings. This is a way to measure indoor radon level at the underground and ground floors and upper floors potentially caused by radon gas penetration and building materials. Yet, there is a need for mapping radon gas for all urban areas in Albania. This information could be available to public, local and central governmental institutions indicating potential higher and lower radon health risk areas. Radon soil gas measurements and indoor radon measurements and their mapping are useful tools for radon testing in housings and dwellings to further knowing about mitigation measurements and associated costs in dwellings. Surveys of radon measurements can then be integrated with communication campaigns dedicated to

radon information and radon measurements to increase public and local government awareness. There are observations showing a significant correlation between radon knowledge and indoor radon tests (measurements) [14]. Residents had higher levels of awareness and were more likely to consider radon testing in their housings in case local authorities (government) enhanced public radon awareness than residents living in local government not increasing public radon awareness (see [15]). Though radon testing and remediation can be challenging (e.g. [16]), there are evidences showing positive reinforcement effects of communication campaigns on radon awareness and testing [17]. For example, Bulgaria has developed a Radon Risk Communication under the National Radon Program using survey through the Internet for assessing public perceptions and the level of knowledge of radon and then using media as publications on websites, magazines, TV interviews and radio and local seminars to inform public [18]. Public communication campaigns may provide information packages explaining radon health risk and the importance of radon measurements in housings, and may let public give any feedback about radon testing and mitigation in their housings.

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