

An Awareness Survey of Inhabitants Exposure to Radiological Impacts on Mines in Yauri LGA, Kebbi State, Nigeria

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Abstract—A cross-sectional survey was conducted in Yauri LGA, Kebbi State in between April, 2015 and January, 2016 in order to ascertain the level of awareness of inhabitant's exposure to radioactivity from the mines. Yauri LGA was sampled based on its metropolitan and suburban parts that receives heavy mining activities by stratified random sampling by proportions. An interactive medium was created to sample the opinions of inhabitants around these mines through questionnaire. A total of 150 questionnaires were designed, 30 were accepted by the respondents and 22 were returned with response from the correspondents during the survey and interview to document and assessment awareness of the inhabitants. The study unveiled facts about the inhabitant's awareness towards the environmental and health effect of indiscriminate mining activities around living places. The results show that over 70% of the inhabitants within the suburb and metropolis concurred to the potential health consequences in their dwellings as a result of exposure to radioactivity from the mines respectively. These results indicate that the environmental and health discomfort due to indiscriminate mining activities around living places will be more significant in the near future if no immediate efforts are put in place to mimic future malady. The second aspect of this study whose results will be published in the subsequent issue involved collection of soil, water and vegetation samples in order to further assess the level of radioactive elements viz: ^{226}Ra , ^{232}Th and ^{40}K occurrence in the study locality.

Index Terms—Environment; Health Effect; Mining Sites; Questionnaire; Radioactivity; Yauri Metropolis.

I. INTRODUCTION

Until recently, the global environmental agenda was leaned on the impacts of developed countries to the environment. This led an intensified study to report on environmental malady in developing nations, especially in dramatically populated urban areas and their surrounding shantytowns which contributes to the deaths and frailties of millions of people annually [1]. Human have continued to face diversified trend of ailments and some difficult to explain epidemics whose causes are yet to be clearly visualized by the radar of conventional scientific health experts [2]. Both the need for raw material consumption and the means to explore them in sustainable amount in the environment and their potential toxicity are increasing which lays further burden on the toxic levels [3].

At present, exploitation of alluvial deposits is being undertaken mostly by artisanal miners in different locations within the region that envelopes Yauri LGA in Kebbi State,

ranging from Anka, Bagega, Bukkuyum, Dareta, Zuru, Gwaranyo, Wurno, Kalambaina, Dange, Sakaba, Maga, Daki-Takwas to mention but few out of the numerous locations in Sokot basin of the famous Iullemeden basin [4].

To view the exposure of individual in this context from a different perspective, a fundamental weakness of radioecology may be foreseen as a tendency to consider radioactive contamination of the environment in isolation from other branches of environmental science [5]. While some environmentalist and health experts called low dose radioactivity to produce insignificant exposure hazards around living places, but multiple and cumulative exposure from primordial radionuclides that are exposed to closer proximities indiscriminately is showing the vast variation of the data gathered in the painstaking effort of Ibrahim and Ahijjo, [6] with increase in time intervals eventually more research may pave ways to the assertion of serious health maladies as no safe level of prolonged exposure to radiation is established [7]. In the work of Jibiri *et al.* [8], a herculean research task revealed the report that major staple food stuffs being consumed in Nigeria contain traces of radionuclide and these could be washed deep down beneath the earth and thereby increasing the level of radioactivity exposure to individual. As a result of these trends, the dwelling population and the living places are the likely recipient of residual inhibition of radioactivity from exploration and mining with a significant dose to the population [9]. The perception of the cited works from above will result in the parallel evolution of radioecology and conventional pollution science effort to curtail future menace since the first step towards achieving health safety of ambient air has long been neglected holistically for analyzing the safety parameters in air, water, vegetation and land of all the regions in the world to avail inhabitants around unsafe zones the opportunities for convergence of these evolutionary opportunities paths as always existed, but the primary interests of radio-ecologists have been lained within the boundaries of specific problems, usually associated with a small number of special cases such as global fallout, Sell-afield, the prominent Chernobyl accident and the recent Fukushima Daiichi nuclear disaster [10]. But little attentions are focused on more aching problems such as evolution of ailments that are clearly consequences of exposure to primordial radioactivity in the environment. The study was stream-lined towards a health as well as an environmental radiation awareness. And this paper therefore emphasizes on the importance to consider the awareness of inhabitants on common issues in order to

control unabated activities of mining and its contaminating effects from radioecology and pollution science perspectives and the possible ways in which a convergence of interests and solutions might be achieved.

II. MATERIALS AND METHODS

A. Study Area

Yauri metropolis and its suburb have a record of heavy mining activities which are very close to living places such Danko Baracks and Magama that were exploited. It lies on Latitude 11° 1' 17" (11.0214°) north and Longitude 4° 30' 53.7" (4.5149°) east with an Elevation of 206 meters (676 feet and most of its terrains shows features of flat land and shrill rocks. It is located in the Kebbi State at extreme northwest of Nigeria bordering Niger and Benin Republics in West Africa. It has an annual average temperature of 31.3°C [11].

B. The Frame-work of the Survey

A survey through questionnaire was designed to help fill evidence gaps against widespread adoption of unempirical findings. This may lead to including the lack of consensus regarding accepted principles for evaluation and interpretation of a combined approach to unveil potential dangers of radioactivity. Two tasks were targeted in developing the questionnaires to assist awareness and decisions in evaluating opinion of the respondents, with one task addressing retrospective findings and the other addressing prospective interpretation. The intents were to promote a structured approach to reduce the potential for subjective interpretation of evidence and drive consistency in decision making. A public survey was embarked on for the radiological impacts of the mines and mining operations on the inhabitants by adopting a suitable sampling techniques to conduct interviews in the mining communities using questionnaires. The questionnaires were designed based on two intents which are relevance and credibility. Relevance addresses the extent to which the findings may accurately apply to the setting of interest to the target communities. While credibility addresses the extent to which the study findings accurately answer the research questions.

150 questionnaires were designed and distributed to the target audience which are predominantly dwellers of the mining communities. They were all distributed as scheduled but only 30 were accepted by the respondents and 22 were adequately responded to and returned. This may be due to poor orientations entertained by the dwelling population and a preconditioned mind towards the correspondents employed for the survey.

The questionnaire provided a guide for assessing the degree of confidence that should be placed from observational studies and promotes awareness of the subtleties involved in evaluations. This was to facilitate input from the real-world conditions, diverse populations and mass response from residents who dwells around mining sites and are engaged directly or indirectly in practices that further lead to elevated exposure to primordial radionuclides amongst other environmental catastrophe due to activities of mining in the locality.

The questionnaires were administered to the respondents by the correspondents of this survey through a stratified random sampling by proportion with the expression of equation 1 according to CWIQ [12].

$$\Sigma_{\sigma} = \frac{S_{\rho}}{\sigma} (N_k) \quad (1)$$

where:

Σ_{σ} is the sum of the questionnaires distributed,

S_{ρ} is the number of sample points,

σ is the sum of the sample points and

N_k sum of Questionnaires.

The strata were ensured to be mutually exclusive and collectively exhaustive [13]. This was done to improve the representativeness of the sample and also to reducing sampling error and biasness.

The number of sample points identified and accessed during the survey were used in the modelled equation 1.1 in order to empirically justify the proportion of questionnaires allotted to any the sample points in each location. This also justifies the variation of the mathematical relationship for the questionnaires distribution which is presented in the result of Table 1 and below.

TABLE I: THE BACKGROUND OF THE RESPONDENTS

S/no	Description	Survey Items	Responses
1	Locality	City	24
		Village	58
		No Response	68
2	Gender	Male	21
		Female	9
3	Occupation	Civil servants	3
		Businessmen	5
		Farmers	6
		Miners	8

III. RESULTS AND DISCUSSION

From table 1, the distribution of the questionnaires to the respondents were based on two critical variables which are categorized on those living in the cities and villages respectively. It could be observed that more respondents from remote centers did participation in this survey than these from the cities. The proportions of respondent's participation to non-participants was found to be about 55%. This is significantly in good agreement with the theory of the study. From another perspective, Table 2 presents the gross response of the participants to questionnaires for awareness, sources of radiation and effects of exposure to elevated background radiation by the inhabitants of mining communities in the suburb and metropolis of Yauri, Kebbi state. It was embarked upon in order to properly examine the radiological impacts of dwelling in close proximities to the mining sites. To dilate on this, radiation due to unearthed soil, unexplained ailments were carefully incorporated into the major queries for the survey. Their responses were analyzed by Likert method for awareness, source of irradiation and medium of radiations. In sequel to these outlines, the statistical descriptions of the responses show that over 73% of the respondents concurred to be aware of some forms of adverse effects of exposure to

background radiation from these mines. Although, the practical basis of the unabated exploitation was blamed on means of survival and struggle against economic hardship. Consequently, over 60% of the responses shows that the

occurrences of some difficult to explain ailments could be potentially linked to exposure to radiations from the mines as put forwards by Mallo [14].

TABLE II: INVESTIGATIVE DATA FROM THE RESPONDENTS

S/no	Description	Survey Items	Responses	Description	Survey Items	Responses
1.	Awareness	Yes	15	Awareness	Yes	9
		No	7		No	7
		Nil	8		Nil	6
2.	Sources of Radiation	Agree	5	Source of irradiation	Agree	7
		Strongly agree	8		Strongly Agree	11
		Disagree	6		Disagree	4
		Strongly disagree	3		Strongly disagree	6
		Nil	8		Nil	2
3.	Effect	Agree	4	Medium	Agree	10
		Strongly agree	12		Strongly agree	10
		Disagree	2		Disagree	5
		Strongly disagree	4		Strongly disagree	2
		Nil	8		Nil	3

On another attempt to directly establish links between some ailment to the radioactivity effects of mines on the inhabitants in Yauri, about 67% of the respondents affirms strongly that the mines could be a medium of higher exposure to radiations that can cause unknown ailments to the inhabitants. It also imperious to note that this study revealed about 91% opinions of the respondents in good agreement with the design of this work on the creating awareness for the inhabitants of the mining localities against radiological impacts of mining in their communities.

Fig. 1 is a graphical illustration of the survey for this study which shows that about 75% of the inhabitant within the sample location have their significant livelihoods in the remote locations where access to good health centers poses serious challenge. Also, male inhabitants are more prone to the exposure to radioactivity from these mines than the female inhabitants which may be blamed on the active participation of males than the females. The survey also revealed that awareness of the potential dangers of the menace in suburb and the metropolis appears unequal. This can be a supportive evidence to the field work conducted with instrumental precisions result, where more mines were found in the remote locations than the urban centers.

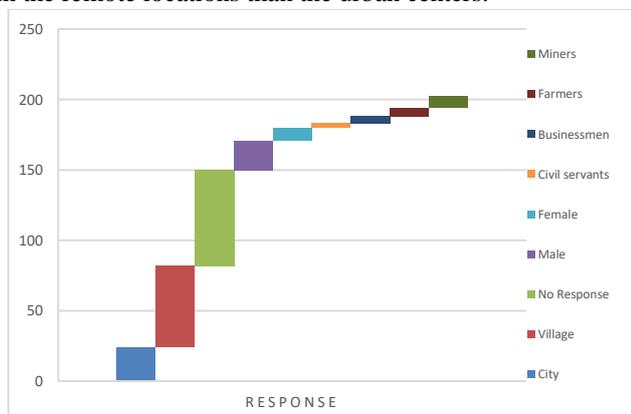


Fig. 1. Stepped Bar chart of the inhabitant's responses

It was in order words found out that about 34% which represents the most significant number of the respondents turned down to be seriously ignorant of their potential exposure to radioactive contaminations in the environments they live indiscriminately around their living places. This is a

growing concern on the table of policy makers in order to educate individuals on the environmental issues in a holistic approach.

IV. CONCLUSION

This study has shown that numerous environmental impacts of mining which the major of them is radiological exposure of the inhabitants from the mines. However, most of the inhabitants awareness of the menace was reawaken with the interactive mean created in this survey. But a good agreement was noticed based on issues of exposure to radioactivity that may results to one or more difficult to explain ailments in the communities.

Hence, this study will avail policy makers the opportunity to diversify more efforts on environmental issues to save future generation from a serious radiological impacts.

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