Radioactive Pollution in the Ground Water of Bihar - A Brief Study

¹Rahul Kr. Chaudhary^{*}, ²Dr. N. K. Chauhan

¹Ph. D. Research Scholar, ²Prof. and Head

Department Of Natural and Applied Science, Vikrant University, Gwalior, India

Email ID: rahulchaudharymsc@gmail.com

Accepted: 01.05.2025	Published : 13.05.2025

Keywords: Radioactivity, Radioactive Decay, Radioactive Waste, Pollutants, Radioactive Hazard.

Abstract

A Radioactive pollution has become a matter of concern in Bihar. The increasing amount of Uranium, Thorium, Radium, and Arsenic in the ground water of various district of Bihar has invited serious diseases like cancer and other skin problem. Ground Water Year Book (GWYB), which is released by Central Ground Water Board also has been described it in detail. Actually radioactive pollution occurs when radioactive elements like Uranium, Thorium etc. are present in the environment ,they emits dangerous ionizing radiation that is called radioactive decay. Mainly three different kinds of ray alpha ray, beta ray and gamma ray are associated with this radioactivity. In this review paper we will discuss the effect of this pollution in the different district of Bihar.

Paper Identification



*Corresponding Author

Publications

© International Journal for Research Technology and Seminar, Rahul Kr. Chaudhary, All Rights Reserved.

INTRODUCTION

Radioactivity is the release of energy from the decay of the nuclei of certain kind of atom and isotope. The decay is in the form of alpha rays, beta and gamma rays. They have different penetrability.

International Journal for Research Technology and Seminar ISSN: 2347-6117 (Print) | ISSN: 3048-703X (Online) International | Peer-reviewed | Refereed | Indexed Journal Volume 28 | Issue 05 | Jan-Jun 2025



If we will study on the uranium there isotopes U-238, U-235,U-234 are radioactive. Uranium-238 has a half-life of about 4.4 Billion years, so a 4.4 billion year old rock has only half of U238 with which it started.



When Uranium undergoes fission about 2.5 Neutron produce at least 2Mev kinesis and energy in order of 200 Me V. Uranium also shows health effect, its main target is kidney. The kidney damage has been seen in human and animal after inhaling uranium compound. It is very carcinogenic hence not safe to touch

TYPE OF RADIATION - It can be classified as following

1. **IONISING RADIATION:** (Electromagnetic radiation having high energy with short wave length)

2. NON IONISING RADIATION: (These are longer wave length electromagnetic waves)

RADIOACTIVE POLLUTION

The release of radiation substance into environment which cans causes irreversible damage to the production the power generated from 1gm is equivalent to the power generated from 2083 kg of coal. Alarge amount of energy released in the exchange of small amount of nuclear fuel, the major problem of producing the radioactive waste which creates the radioactive problem.

SOURCES OF RADIOACTIVE POLLUTION

NATURAL SOURCES	ARTIFICIAL SOURCES	
Cosmic rays	Medical source	
Terrestrial radiation	nuclear exploration	

Nuclear power

Industrial source

Nuclear/Radiation accident

RADIOACTIVE POLLUTION IN THE GROUND WATER OF BIHAR

The main pollutants which affect the ground water of Bihar are Uranium, Thorium, and Arsenic etc. A 2020 study by the UNIVERSITY OF MANCHESTER and MAHAVIR CANCER INSTITUTE found uranium in the ground water of 10 district of Bihar. The highest level was found in SUPAUL district, which provisional level set by WHO is only 30 MPL, this contamination is only due to natural Uranium aquifer rocks, ground water chemistry and oxidation state.



POLLUTANTS IN GROUND WATER OF BIHAR

The main pollutants in the ground water of Bihar are Uranium, Thorium and Arsenic. Uranium and Thorium are radioactive, while Arsenic is non-radioactive.

URANIUM: it is found average concentration of 0.0003% of the earth crust. The level of Uranium in natural igneous rocks and sedimentary rocks may vary from 0.5 to 4.7 mu gram/mg carbonate rock; the average level is mug ram/gm. There are only three known primary Uranium are minerals URANINITE (UO2), PITCHBLENDE (U308) and **DAVIDITE.** Some time they are altered to from the bright secondary Uranium mineral (complex oxide, silicates, phosphates, and van date) the natural isotopic composition of Uranium is U-238 U-235 and U-234, all are radioactive. U-238 is alpha emitter, decaying through 18 member Uranium natural decaying series into Pb-206. While U-235 has 15 member that end in stable Pb-207. This series includes only two long lived (7 several days) radioactive member name Pb-231 (T=3.28 year) and Ac -

227 (T=21.77 days) Uranium compounds can produce neutron radiation, even if they are not irradiated.

<u>AERB</u>: (Atomic energy regulatory board) set 60 microgram per liter (ppb) of Uranium in drinking water. In SIWAN, BHAGALPUR and PURNIA district it found that more than 30 ppb and in Patna it found that 40 to 45 PPB and it increases. This is matter of concern.



THORIUM: it is also a radioactive element, having atomic number is 90. The common form of Thorium is Thorium-232. It is used in magnesium alloy. It is used as a catalyst in the industry and used for the atomic energy source. In India Kerala produces large amount of Thorium. Obtain from Monazite and contain 2.5%, this is silver like shiny, which appears black when comes in the contact of air. The increasing amount of Thorium in ground water in various district of Bihar also leading the diseases, and matter of concern.



ARSENIC

The % of Arsenic in ground water continuous increasing and it causing many diseases. Most Arsenic is not radioactive but some isotopes of Arsenic are radioactive. Stable isotope of Arsenic is As-75 while it has 32 radioactive isotope include As-71, As-72,As-74, As-76. Bihar heavy concern burden is largely due to high level of Arsenic a known carcinogenic in its ground water. Sunil Kumar, a professor at the agriculture university in Bihar (SOBOUR BLOCK) studies Arsenic level in 16 block of Bhagalpur district and given the data that Arsenic level is in KAHALGAM - 3880P ARTS PER BILLION PIRPAINLI - 3610 PARTS PER BILLION NATHNAGAR – 3500 PARTS PER BILLION

NUPUR BOSE from A.N College found Arsenic level as high as 1861 ppb and 500 ppb in BHOJPUR and VAISHALI district. It is found that Arsenic entered Bihar drinking water (GANGA RIVER) from Himalaya wash down in the form of ARSENOPYRITE a conjugated Arsenic and Iron. The increasing of Arsenic is not only inviting the cancer also physical disability.

 σ

EFFECT OF RADIOACTIVE POLLUTION IN BIHAR

Radioactive substance in ground water of Bihar, can causes health risk to human. The major health risks are KIDNEY DAMAGE- Uranium is nephro toxic heavy metal can causes kidney damage. BONE TOXICITY- High exposure of Uranium causes bone toxicity. CANCER- High radiation causes cancer. GENETIC DISORDER - Radiation cause genetic disorder. Other health issues are Leukemia, Cataracts, osteonecrosis etc.



OUR EFFORTS TO PROTECT AGAINST RADIATION

> Reduce radioactivity in drinking water by installing a water softener.

- Use ion exchange treatment system
- ➢ Modify your well.
- > Deepen the drill pattern too much

GOVERNMENT APPROCH

Central ground water authority (CGWA) is a central authority in India that regulates and manages ground water development. It uses penal provision of the environment protection act. CGWA appoint officers and to regulates indiscriminate boring and withdrawal of ground water. It issue no objection certificate (NOC) for the ground water extraction to industries or mining projects.

CONCLUSION

While reviewing these two sentences WATER IS LIFE and HEALTH IS WEALTH we have to keep in mind that we should get healthy water and we are protected from radioactive pollution. For this reason, along with the government in Bihar we too, the public, will have to make efforts.

REFERENCES

➢ Abdul et al., 2015

9

- Ali, khan and ilhahi,2019
- Banerjee et al.,2017
- Chen et al., 2016
- Development of Health and Human Service Centre For Diseases Control And Prevention Safer .(May 10, 2005)
- Ground Water Year Book (GWYB),2020
- http://www.world-nuclear.org/info/info5.html
- ➢ IAEA Bull, 2000, vol.42
- ➢ Kumar et al.., 2017
- Krik- OTHMER 1992
- Nel A. Science.308(2005) 804
- RAO K.R., Curr.Sci.,81 (2001) 1534
- > 10.1016/J.envers.2020110025