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A Study of Environmental Organic Pollutants Causing Cancer in Bathinda Punjab, India

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ABSTRACT
This study examined the relationship between toxins and morbidity in the Bathinda (Malwa Region) district of Punjab, India. The number of cases of this disease has increased significantly in Bathinda in recent years, raising concerns about the need for natural remedies. The aim of the analysis was to detect and assess diseases occurring in the air, water and soil of the region and assess their relationship to disease. Ecological samples were analyzed using advanced techniques such as gas chromatography-mass spectrometry (GC-MS). The study focused on toxins such as pesticides, polycyclic aromatic hydrocarbons (PAHs) and modern products. In addition, health information was analyzed to discern a potential link between the formation of malignant tumors and the activation of toxicants. Studies have shown a relationship between exposure to these bacteria and the development of cancer, lung, liver and gastrointestinal malignancies. Tips and tricks for holistic health drivers. More research is needed to confirm these findings and develop appropriate strategies to reduce the spread of harmful bacteria. This review provides a deeper understanding of the ecological determinants of disease and provides important guidelines for strategy development and effective mediation.
Keywords: Natural toxins, Pesticides, Polycyclic fragrant hydrocarbons, Gas chromatography -mass spectrometry, General wellbeing, Cancer-causing agents.

INTRODUCTION

This study investigates the presence and impact of ecologically natural toxicants in Bathinda ((Malwa Region), Punjab and their relationship with the prevalence of diseases in the region. Through detailed analysis and analysis of air, water and soil and using this information to measure negative growth, the analysis aims to identify the major diseases causing health risks.

The city of Bathinda in the northwestern state of Punjab in India has become a major concern due to the serious effects of poor development in recent years. Bathinda is often referred to as the sick capital of India and its lack of growth raises serious concerns about the social changes that have led to a health crisis. The region is characterized by extensive agriculture, modern foundations and dependence on nuclear power plants, which can be a source of ecotoxins. Presumed natural pollutants (VOCs) and pesticides are widely investigated for their carcinogenic properties. Toxins can come from many sources, including daily emissions, agricultural spills and vehicle emissions. Once in the climate, they can contaminate air, water and soil and enter the body through breathing, ingestion or skin contact.

Synthetic fertilizers, pesticides, growth of heavy metals in the soil, doubling of daily waste in the air, water pollution have finally become a major disease in the Malwa region of Punjab. The normal incidence per million population is higher in Punjab than in other parts of India. Among the districts of Punjab (Malwa), the most malignant growth is in the Malwa region (108.9 per 100,000 population), especially in the cotton growing belt of the Malwa region, i.e. in the southwest of Punjab More. As a result, the cotton belt of Punjab has become unhealthy and has been called the "Punjab Disease Belt". This condition is more common in cities and towns, especially among migrants and workers. The disease has plunged rural families into poverty and liability. Lack of facilities for treating diseases in shops and emergency clinics in Punjab has led Punjab patients to seek treatment with real support through poor 'Growth' to Acharya Tulsi Das Territorial Grows in Bikaner, Rajasthan. However, the state government has implemented various initiatives like setting up reverse osmosis systems in cities, testing groundwater for heavy metals, imparting health education to those who know the signs, side effects and what prevents poor growth, keeping a close check on synthetic chemicals in the crop material. Use Mukh Mantri Disease Rahat Kosh Scheme and Disease Library, but more needs to be done to prevent disruption. Many measures like running of general hospitals, cleaning of water bodies, banning water pollution by traders and MCs, excessive use and restriction of synthetic materials, promotion of agriculture, etc. need to be taken to control the disease.

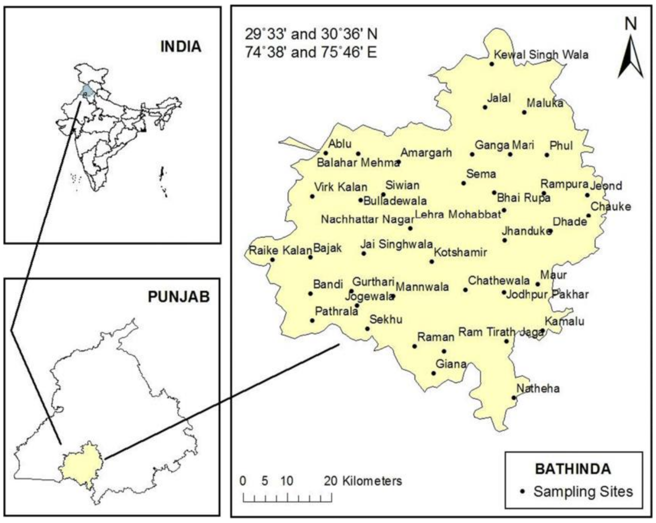

Figure 1: Map of Bathinda district, Malwa Region (www.googlemap.com)

The aim of this study is to investigate the ground water metal presence, pesticides and group of toxic substances present in the current situation of Bathinda and to determine their connection with the malignant growth in the roadside in the region. By recognizing and defining these diseases, we aim to gain a clearer understanding of the gambling community that contributes to poor development. This research is important to establish a healthy and sustainable way to reduce risks and reduce the disease burden in Bathinda. The existing literature investigates many effects with a focus on carcinogenic natural mixtures. We will then develop a strategy to collect and present natural samples, followed by our findings on chemical and non-toxic growth data. The discussion will interpret these results in the light of the available data and suggest possible measures to reduce toxic exposure. Finally, we will provide strategic recommendations and future directions for research to improve the overall health outcomes of Bathinda. All kinds of natural toxic problems are responsible for the increase in malignant growth rate in Bathinda, Punjab. Through analysis and analytics, we hope to make more efforts to solve the ecological health problems here and beyond.

1.1 Review of Literature:

Recent Advances in Understanding Environmental Organic Pollutants

Recent research also highlights the importance of pollutants such as polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and pesticides for clean human health. These toxins, mostly originating from modern crops, agricultural spills, and automobile exhaust, have become the focus of ecological health research due to their man made and carcinogenic properties.

Polycyclic Aromatic Hydrocarbons (PAHs)

Recent research has further elucidated the carcinogenic pathways of PAHs. A 2022 study by Zhang et al. confirmed the genotoxic effects of PAHs, highlighting their ability to cause DNA damage and mutations leading to cancer. Another study by **Liu et al. (2023)** examined PAHs in urban environments, demonstrating that these pollutants are prevalent in both outdoor and indoor air, posing significant health risks, particularly in densely populated areas.

Volatile Organic Compounds (VOCs)

The health risks associated with VOCs have been reinforced by recent studies. For example, **Wang et al. (2022)** found a direct link between long-term exposure to VOCs and an increased incidence of respiratory cancers. Additionally, a comprehensive review by Smith and Brown (2023) emphasized the role of indoor air quality in VOC exposure, identifying household products and building materials as significant sources of these harmful compounds.

Pesticides

Recent findings have further clarified the carcinogenic potential of various pesticides. A 2023 meta-analysis by Singh et al. confirmed the association between pesticide exposure and several types of cancer, including non-Hodgkin lymphoma, prostate cancer, and leukemia. Furthermore, a study by Chen et al. (2024) focused on pesticide residues in agricultural regions, demonstrating their persistence in soil and water, leading to chronic exposure and heightened cancer risk.

Environmental Pollution and Cancer in India

In India, the link between environmental pollution and cancer has been substantiated by recent research. A 2023 report by the Indian Council of Medical Research (ICMR) highlighted the correlation between high levels of industrial pollutants and rising cancer rates in urban areas. Another study by Sharma et al. (2022) focused on rural regions, finding that agricultural practices, particularly pesticide use, significantly contribute to cancer incidence.

Cancer Incidence in Bathinda

Bathinda continues to be a critical area of concern due to its high cancer rates. Recent studies have provided more detailed analyses of environmental factors contributing to this health crisis. A 2022 study by Kaur et al. investigated cancer patterns in Bathinda, identifying hotspots where cancer rates are exceptionally high and correlating these with proximity to industrial and agricultural pollution sources. Additionally, Singh and Verma (2023) analyzed cancer registry data, confirming that Bathinda's cancer incidence rates remain significantly above the national average.

Recent Studies on Pollutants in Bathinda

New research has provided more insights into the specific pollutants affecting Bathinda. For instance, Gupta et al. (2023) conducted a comprehensive examination of discuss and water tests from Bathinda, finding hoisted levels of PAHs and VOCs. Their study also revealed that these pollutants are primarily sourced from industrial emissions and vehicular traffic. Similarly, a 2024 study by Dhillon and Kumar focused on pesticide residues, reporting high concentrations in soil and water samples from agricultural areas, and linking these to the local cancer cases.

The recent literature from 2022 to 2024 reinforces the critical impact of organic pollutants on cancer incidence, particularly in regions like Bathinda, Punjab. Studies have consistently shown that PAHs, VOCs, and pesticides are prevalent in the environment and pose significant health risks, including cancer. Bathinda's high cancer rates continue to be associated with these pollutants, underscoring the need for comprehensive environmental monitoring and effective public health interventions to mitigate these risks. This ongoing research is crucial for informing policy and developing strategies to protect public health in affected regions.

1.2 Problem Statement:

High Cancer Incidence in Bathinda:

Bathinda has reported unusually high rates of cancer, raising concerns about the potential link between environmental factors and the disease.

Prevalence of Organic Pollutants:

The region is exposed to various environmental organic pollutants due to agricultural practices, industrial activities, and inadequate waste management.

Lack of Comprehensive Data:

There is insufficient data on the types and concentrations of organic pollutants in Bathinda, making it difficult to assess their impact on public health.

Unclear Causal Relationships:

The specific role that these pollutants play in the development of cancer in Bathinda remains unclear, necessitating focused research.

Vulnerable Population Groups:

Certain populations in Bathinda, including agricultural workers and those living near industrial areas, may be more vulnerable to pollution-related health risks, yet their specific risks are not well-documented.

Inadequate Public Health Policies:

Existing public health and environmental policies may not adequately address the prevention and control of pollution-related cancers, highlighting a gap in regulatory frameworks.

Urgency of Addressing the Issue:

Without targeted research and intervention, the ongoing exposure to harmful pollutants may continue to contribute to rising cancer rates, worsening public health outcomes in Bathinda.

Need for Regional Focus:

Most studies on environmental pollutants and cancer have been conducted in other regions, underscoring the need for research that is specifically focused on the unique environmental and social conditions in Bathinda.

1.3 Objective:

The primary objective of this study is to investigate the presence and concentration of specific organic pollutants in the environment of Bathinda, Punjab, and to analyze their potential link to the high incidence of cancer in the region. To achieve this overarching goal, the study is divided into several specific objectives:

Identification of Major Organic Pollutants:

To identify and catalog the primary organic pollutants present in Bathinda's air, water, and soil, focusing on polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and pesticides.

Quantification of Pollutant Levels:

To measure the concentrations of identified organic pollutants in different environmental media (air, water, and soil) across various locations in Bathinda, including industrial areas, agricultural zones, and residential neighborhoods.

Assessment of Pollution Sources:

To determine the potential sources of these pollutants, such as industrial emissions, agricultural runoff, vehicular exhaust, and activities related to thermal power plants.

Correlation with Cancer Incidence:

To analyze the spatial distribution of cancer cases in Bathinda and correlate this data with the levels of organic pollutants in different regions, thereby identifying potential hotspots where pollution and cancer rates are particularly high.

Health Risk Assessment:

To evaluate the health risks associated with exposure to these pollutants, particularly the risk of developing cancer, by using established risk assessment models and comparing the pollutant levels with national and international safety standards.

Public Health Implications:

To discuss the implications of the findings for public health, including the potential impact on local communities and vulnerable populations.

Policy Recommendations:

To provide evidence-based recommendations for regulatory policies and public health strategies aimed at reducing environmental pollution and mitigating cancer risks in Bathinda.

Future Research Directions:

To identify gaps in the current research and suggest directions for future studies to further understand and address the link between environmental pollutants and cancer in Bathinda and similar regions.

By addressing these objectives, this study aims to provide a comprehensive understanding of the environmental factors contributing to the high cancer incidence in Bathinda and to offer actionable insights for working on general wellbeing and natural quality in the area.

1.4 Significance:

- It's potential to reveal critical connections between local environmental factors and public health outcomes.

- This study could identify the types and levels of pollutants present in the environment and establish a link between these contaminants and increased cancer risk in the population.

- The findings could inform public health policies, drive regulatory actions to reduce pollutant exposure, and ultimately contribute to cancer prevention efforts in the region.

- This study provides a detailed analysis of specific organic pollutants, such as PAHs, VOCs, and pesticides, which are known for their carcinogenic properties. By identifying and quantifying these pollutants in Bathinda's environment, the research sheds light on the extent of environmental contamination and its potential health impacts.

- The study's findings can raise awareness among local communities about the health risks posed by environmental pollutants. Increased awareness can lead to community-driven efforts to advocate for cleaner environments and support measures to reduce exposure to harmful pollutants.

METHDOLOGY

1.5 Study Area

Geographic Scope:

The study would cover urban and rural areas within Bathinda district, examining both residential and industrial zones to assess varying levels of pollutant exposure.

Environmental Factors:

The study would analyze soil, water, and air samples from various locations within the district to detect the presence of organic pollutants, such as pesticides, industrial chemicals, and other carcinogenic substances.

Population:

The research would focus on the local population, potentially examining cancer incidence rates in relation to proximity to pollution sources, such as agricultural fields, factories, and power plants.

Sources of Pollution:

The study would identify major sources of organic pollutants, including agricultural practices (e.g., pesticide use), industrial emissions, and Ground Water methods.

Health Data Collection:

Data on cancer rates and types within the population would be collected from local hospitals, health centers, and cancer registries, allowing for a correlation analysis with the levels of pollutants found in the environment. Cancer patient data collection (2024) from Advanced Cancer Institute, Bathinda shown in table 1.

S.N.	Month	Cancer Patient Number
1.	January	489
2.	February	577
3.	March	583
4.	April	554
5.	May	455
6.	June	438
	Total	3096

Table 1: Bathinda Cancer Patient Data - 2024

This comprehensive approach would help in understanding the relationship between environmental pollution and cancer incidence in Bathinda, offering insights into potential mitigation strategies.

1.6 Reason of Cancer in Bathinda:

I. Extreme utilization of Pesticides and Composts:

Pesticides can cause both intense and lasting effects. Known ongoing impacts be caused by pesticides openness to incorporate malignant growth as well as regeneration problems and hormonal disorders. With appearance of green transformation, the state of Punjab came between top manure and pesticide clients in India. Punjab has simply 2.5 percent of the absolute agricultural land area in India and there consumes almost 18 percent of the country's pesticides. During the last fifty years India has expanded the use of pesticides from 154 MT in 1953-54 to 80,000 MT in 1994-95. Malwa's the cotton belt has less than 0.5 percent of the topographic area country, yet approximately 10% of the country's pesticides are used14 here. Report of the European Places for the Sacred and the Human Privileges ordered a review into the use of pesticides in Punjab during 2015 and deduced that regardless of establishment 1985 United Nations and FAO worldwide set of principles of the day pesticides council to tackle the global pesticide hazard use and continued variant of this policy set was also formally endorsed by the WHO. Anyway, the organization in Punjab like Bayer and Syngenta and their helpers organizations produce, distribute and sell items by ignoring the default ruleset. They have special concerns extreme adverse well-being effects seen in the 'cotton belt'. Punjab where 75% of pesticides are used across the state are consumed. There are huge mistakes in India state utilization of manure and Punjab state is located first about the use per hectare. Punjab state itself consumes around 9% of the complete manure in India and its utilization most notable based on the assumption per unit region of 190.1 kg/ha GCA vs 88.2 kg/ha across India. The uranium content in phosphate fertilizers is known to be 20 to 300 mg/kg. Excrement is mostly used in the state. These chemicals are also widely used in vegetable production, so the disease affects farmers and ranchers as well as consumers.

Figure 2: Use of Pesticides on crops by Farmers in Bathinda.

Supplement	**Punjab**	**India**
N	188.47	84.54
P_2O_5	58.67	33.44
K_2O	3.05	10.36
Total	250.19	128.34

Table 2: Supplement wise per hectare utilization of composts in Punjab opposite at India level (in kgs)

II. Pollution by Industrial Waste:

Modern waste as well as sewage of metropolitan region is another main consideration answerable for disease in Malwa locale of Punjab. As per the PPCB report 2018, the Sutlej's water is evaluated as "A" class (unadulterated) at Nangal base camp, become "E" class and "D" class separately at the rise of Buddha Nullah in Ludhiana what's more, East Bein or Chitti Bein in the Doaba district. Since "D" class water is viewed as unsuitable and destructive for health. As the south-west belt of Punjab is waterway order region and most of individuals in Malwa district use to hydrate going through channels even without treatment. Other than the malwa locale of Punjab, this water further stream to certain areas of Rajasthan state and many individuals of this state are accounted for to be advancing side effects of disease. PPCB (Punjab Contamination Control Board) distinguished and enrolled 28 significant sources dirtying waterway Sutlej.

Figure 3: Industrial Wastes in Bathinda.

Figure 4: Thermal Plant of Bathinda.

III. Presence of Heavy Metals in Groundwater:

Water is the second largest source of heat for humans in the world, as it plays an important role in the functioning of the body. Over the years, the quality of water has decreased due to the destruction of the ecological environment and the release of untreated wastewater into the water environment as a result of different industrial and human activities, causing an increase in carcinogenic metal pollution. Selenium, beryllium, cobalt and nickel. These poisons can be harmful to humans. Metals can be traced in samples mixed with other substances in water. Carcinogenic metals such as mercury, chromium, arsenic, cobalt, sheet metal, etc. are also products of the earth's crust. These can dissolve in water seepage and accumulate in soil. We confirmed the presence of carcinogenic metals in soil in Bathinda district of Punjab. This study was conducted to understand the type and quantity of various carcinogenic metal particles present in groundwater of western Bathinda district of Punjab. pH ranges from 6.5 to 7.4, which is the farthest range for drinking groundwater. Cr and Hg exceeded the maximum values permitted by WHO and BIS water quality standards. Cr levels in soil have increased from 70 ppb to 360 ppb, with Lehra Mohabbat recording the highest Cr levels. Mercury levels in drinking water are as low as 1 ppb with all samples showing mercury fixation levels above the critical level. For three sites (JWS2-17.6 ppb, Bhambhia-11.9 ppb and Ganga-10.7 ppb), the combination of Se and As is expected to be as low as possible.

Material and Methods:

I. Water Sampling

We collect the sample in a polyethylene container with a volume of 500 ml, add 2 ml of concentrated HNO_3 as additional iron and put it in the cold. Before collecting the sample, some water flows for a short time from a manual siphon or from a well. In Table 3 we collected an example of the characteristics of the area.

S.No.	Sampling location	Longitude (E)	Latitude (N)

1.	Pitho	30.25094°	75.28457°
2.	Mehma Sarja	30.30200°	74.84476°
3.	Lehra Mohabbat	30.24499°	75.16401°
4.	Hanuman Chowk	30.21329°	74.94445°
5.	Bambiha	30.12956°	75.71142°
6.	Dhupali	30.36291°	75.26682°
7.	Bhai Rupa1	30.42879°	75.26682°
8.	Bhai Rupa2	30.42879°	75.26682°
9.	Dayalpur Mirza	30.40415°	75.13204°
10.	Mandi Kalan	30.21212°	75.25963°
11.	Nasibpura	30.08812°	75.01995°
12.	Gill Kalan	30.27275°	75.27658°
13.	Ganga	30.33182°	75.07812°
14.	Bathinda	30.2144°	74.93299°
15.	CUP**	30.1714°	74.9659°
16.	Nathana	30.31686°	75.08968°

Table 3. Details of Water sampling sites

Inductively Coupled Plasma Mass Spectrometry (ICP MS) - ICP MS is a logical tool used to estimate the following metals in water. The device is now the best logic device of its kind and has the highest accuracy. Additionally sensitivity and the ability to measure metal concentrations down to the parts per trillion (ppm) level. ICP MS is used to detect carcinogenic heavy metals. Argon gas is transferred into the air or sprayed through the water test. Plasma at a temperature of 7000 - 10000K and 27 MHz disrupts the fog and atomizes and ionizes metal particles. Metals are electrostatically isolated from each other four times based on their m/z ratio. Components are connected to each other based on the marker that appears when the electrical signal is focused on the metal particles, creating a connection. The area below the image shows the relationship of metals in water. High added value means high content concentration.

Procedure: Set the meter with 5ml, 50ml, 500ml of approximately iron samples, then put the tube from the bat tube into the water, then absorb the DW, and then put the gulf line into the water for testing. The test water turns into air when it comes into contact with the argon gas in the nebulizer. This fog ICP optical model combines the plasma temperature from 7000K to

10000K. Fog the weighted, aerosolized and ionized metal particles are separated from the central focal point by the neutral sepsis. The collision of metal particles with helium gas. When the metal is too heavy, the material is passed through the electrostatic quadrature structure, so that the material sticks to the particle measurement after a while, and then the electrical signal interacts with the generated metal material, forming visual images. Supplement to the article on the concentration of metals in water. The concentration axis, forming a large group from the integrity of the object changing in the attached form on the PC screen. High additives mean more content.

II.Soil Sampling

Soil measurements were collected from 16 sites in different Villages, with 2 randomly selected sample from each village. Each sample was photographed at a depth of 70-80 cm at several selected points in the study area. The measurement points are 2 km apart to cover a large area and to remember the distance difference between the Earth. They were dried for uniformity and examination, examined to remove stones, rocks, roots and straw, then flattened and passed through a 150 micron mesh filter to homogenize the contents. Then collected in plastic bags at that time and very safe. The weight of each soil sample in each package is still around 20 grams. Each of the 16 samples examined to determine the characteristics of the 15-ton high-pressure water-driven press. For this study, 34 mm size and 4 mm thick contamination samples were prepared. Inject the concentrated soil extract into the GC system. The sample is vaporized and passed through the capillary column, the difference between the organic compounds is separated according to their volatility and interaction with the column in the stationary phase. Soil separated compounds exit the GC column, they enter the mass spectrometer, where they are ionized and fragmented. Each pellet of different soil sample was processed and analysed for approximately 37 min and a variable range of 28 elements were detected with different concentration levels as shown in Table 5 (a, b).

In Bathinda district a lot of pesticides are used to increase the productivity of crops due to which cancer cases are increasing. Data of these pesticides was taken from farmers and they were asked the names of known pesticides used and the farmers told the names of a lot of pesticides which are mostly used in Bathinda district to increase the productivity of crops. The list of these pesticides is given in Table 4 below.

Figure 5: Discussing with People how Pesticides Spread Cancer in Bathinda.

S. no	Active ingredient	Trade name	Crop
1.	2, 4-Dimethyl Sodium Salt and Ethyl Ester	Kissan-80	Sugarcane, Wheat, Aquatic weeds
2.	Acetamiprid	Pride, Manak, Nagarjuna Ennova, Avtar Pride	Cabbage, Okra, Chilli, Rice, Cotton
3.	Carbendazim	Bengard	Paddy, Wheat, Cotton, Barley, Brinjal, Grapes, Ber
4.	Cartap	Padam	Rice
5.	Cartap	Hydrochloride Sanvex	Rice
6.	Chlorpyrifos Dursban,	Chloro (Sacban)	Rice, Paddy, Beans, Gram
7.	Clodinafop Propargyl	Point, Bijili	Wheat
8.	Cyphermenthrin	Ripgaurd Rice,	Wheat
9.	Paraquat Dichloride	Parasac	Potato, Cotton, Rice, Wheat, Maiz
10.	Lambda-Cyhalothrin	Corolamdba, Hero	Cotton, Rice, Brinjal, Tomato
11.	Thiamethoxam	Clux, Actara, Sactara	Rice, Cotton, Sorghum, Wheat

Table 4: list of pesticides which is most used in Bathinda District

RESULT

1.8 Ground water:

II.Chromium (Cr)

The concentration of Cr in the investigated water varies from 70 to 360 µg/l, with the greatest emphasis on groundwater of Lehra-mohbbat city. A typical Cr value is 90 µg/l. IS 10500:2012 recommended an adequate outermost reach of 50 µg/l shown by the red line in Fig. 3 for Cr in drinking water and without alternative sources there is no unwinding. All of them drinking water test has Cr content as far as possible according to BIS [8]. Carcinogenic nature probes rodents, results showed no increase in growth frequency, the carcinogenic nature of Cr (VI) is higher than Cr (III) and consequently, to find out the degree speciation of a cancer-causing nature is required. Subsequently, the groundwater of the Bathinda region was affected by Chromium carcinogenic nature. As a result, the water is not fit to drink in Bathinda in south-west Punjab. IARC investigates rodents, not found any evidence of disease and growth on a given part of chromium (III) orally and nevertheless some evidence of chromium (VI) carcinogenic nature as shown in Figure 6.

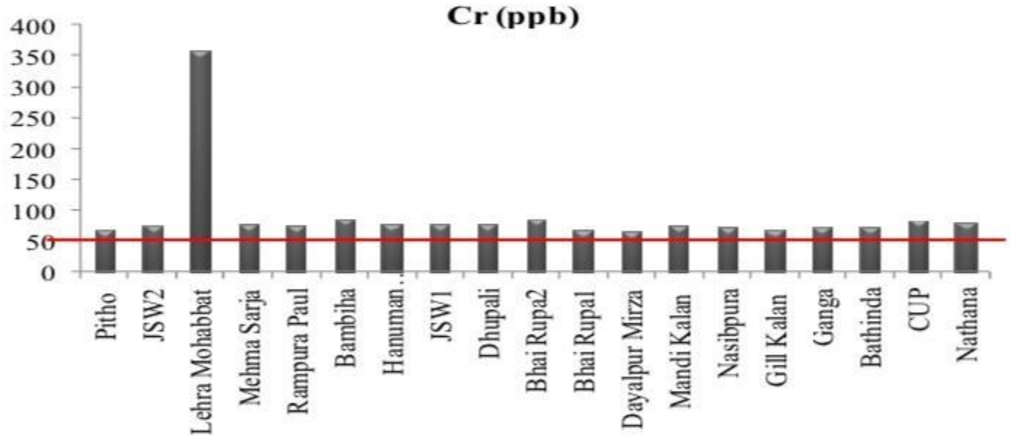

Figure 6. Cr level in Bathinda of south-western region, Punjab, India

III.Mercury (Hg) :

The pooling of mercury in the gathered water tests went from 4.6 µg/L to 20 µg/L. Least fixation was seen on examples from Nasibpura and the greatest emphasis was placed on examples from the town of Bambiha in the Bathinda region of southwestern Punjab. A typical value of mercury (Hg) in the examples was calculated to be 10 ug/l. BIS 2012 [8] recommended a limit of 1 µg/l for drinking water. we measure the grouping of Hg in water. The (potable) test from the control area contains Hg higher than possible (red line) as shown in Figure 7.

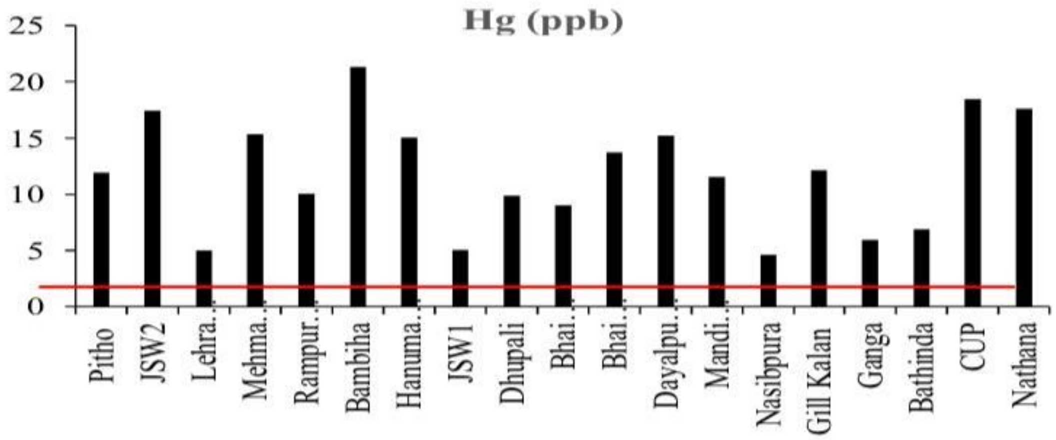

Figure 7. Hg level in Bathinda of south-western region, Punjab, India

IV.Selenium (Se):

Selenium (Se) fixation in drinking water tests in Bathinda region was in the range of 2.315 µg/L to 17.583 ug/l. The basic fixation was seen in the example from the city of Jai Singh wala-1 and the most extreme the fixation was for Jai Singh Wala-2 town. The Ministry of Indian Standards suggested 10 µg/l satisfactory shutdown and no unwinding for potable water. Selenium fixation in 16% of the collected tests exceeded the drinking water limit as shown in Figure 8.

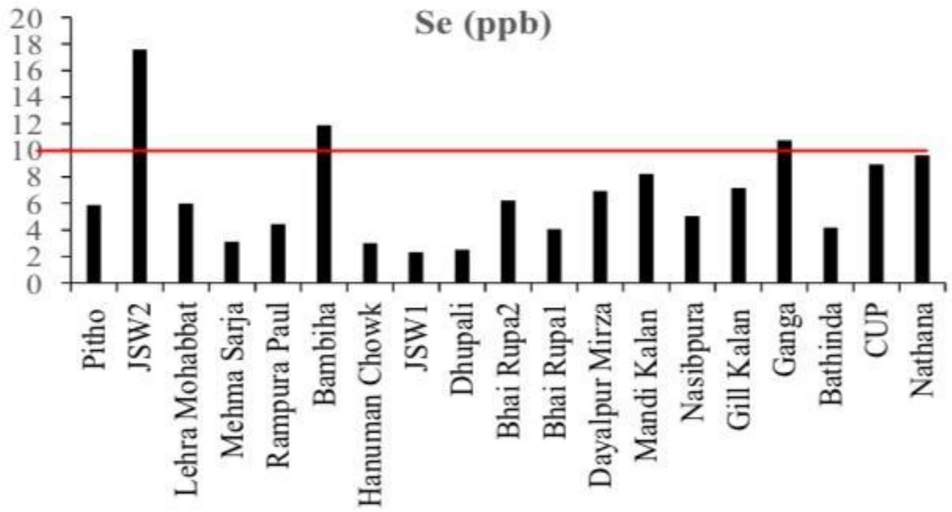

Figure 8. Se level in Bathinda of south-western region, Punjab, India

Selenium is an essential element for humans. According to several researches, it has been proven that the blood has levels of Se, Se vice versa related to the predominance of several types of malignant growth. Concentrates on urinary selenium levels have shown a great connection between the two deterioration of the digestive tract, rotten teeth, misfortunes with hair or nails, nail irregularities, skin spots and changes in the edges nerves, with a high content of selenium in the urine.

V.Cadmium (Cd):

Cadmium (CD) fixation in drinking water tests in the review region ranged from 0.117 to 2.99 ug/l. A typical value for cadmium (compact disc) is 0.0.597 µg/l. The least attention has been noted for the example from Bhai Rupa. The urban and most extreme fixation was for example from the Focal College of Punjab Grounds. BIS has recommended a limit of 3 µg/l for cadmium in drinking water and each of the examples except the Focal College of Punjab were well inside the boundary points as shown in Figure 9.

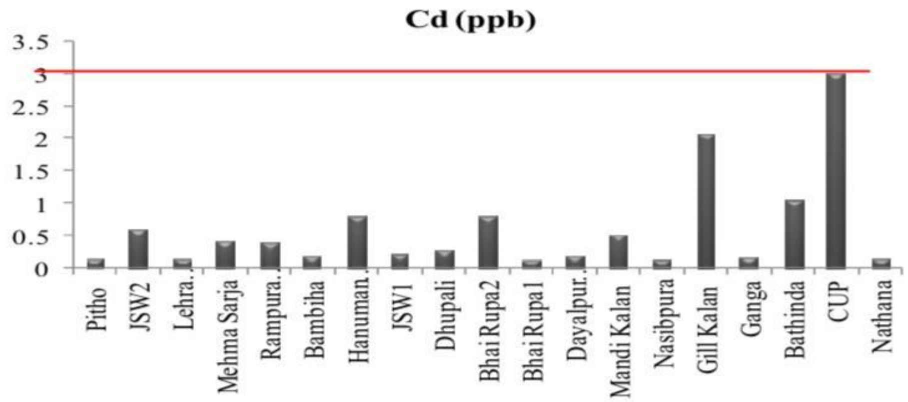

Figure 9. Cd level in Bathinda of south-western region, Punjab, India

VI.Arsenic (As):

The concentration of arsenic in the groundwater of the monitored region ranges from 0.81 to 2.912 µg/l, as stated in The Indian Guidelines Agency has suggested 10 µg/l if possible and 50 µg/l if possible for drinking water. Since the focus in each of the review area examples was inside the proposed positive breakpoint as shown in Figure 10.

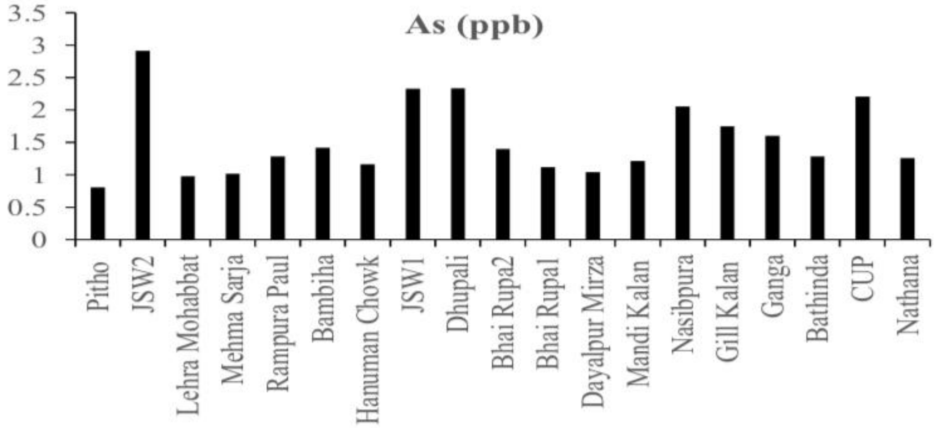

Figure 10. As level in Bathinda of south-western region, Punjab, India

1.9 Soil:

Table 4(a,b) shows the convergence of 28 components identified in 16 soil tests that were collected from 16 towns in the Bathinda region. 2 examples were collected from each city. Tests 1,2,3 were by Pitho, Mehm Sarja and Lehra Mohabbat. Similarly (4,5,6 (Hanuman Chowk, Bambiha, Dhupali), (7,8,9 (Bhai Rupa1, Bhai Rupa2, Dayalpur Mirza), (10,11,12

(Mandi Kalan, Nasibpura, Gill Kalan), (13,14,15 (Ganga, Bathinda, CUP**), (16) (Nathana) as shown in Table 1(a,b).Furthermore, several significant components such as CaO, Fe2O3, TiO2, MnO were identified with limits of 9773-132462, 24300-56700, 4100-7300 and 400-800 ppm individually Among the significant components, CaO has the greatest diversity than other heavy metals such as Pb, Cs, Ce, Ba, Sn, Sb and La factor ranges of 25-32, 0-13, 78-116, 349-542, 0-7, 0-6 and 17-41 ppm separately Toxic components like As, Cu, Cr, Co, Ni were found in the ranges of factors 33- , 71-154, 72-291 and 25-95 ppm separately In the different groups 38-310, various components Zn, Sr, Zr, Sc, V, Rb, Ga Nb, Y and Mo were also found, 125-408, 222 -363, 4-14, 41-85, 97-264, 13-22, 10-18, 26-37, and 0-2 ppm respectively.

Sample No.	U	Th	K	CaO	As	Pb	Cr	Cu	Cs	Co	Zn	Sr	Ce	Zr	Sc
1.	3	15	72.5	17818	33	28	121	21	9	76	63	143	88	290	13
2.	3	15	235	12412	33	27	116	24	13	81	62	146	93	275	14
3.	4	16	185	12683	40	27	81	21	9	122	64	136	99	292	9
4.	3	12	90	14558	37	25	124	16	8	108	44	132	87	280	7
5.	4	15	123	10985	36	28	117	23	9	72	62	155	93	263	11
6.	2	15	268	24698	36	26	137	24	10	158	63	156	91	292	11
7.	5	15	180	39515	48	26	124	19	10	206	59	151	105	285	10
8.	3	15	123	9773	58	27	119	19	9	249	57	140	116	306	8
9.	4	17	130	16924	52	31	106	22	12	233	68	170	111	321	8
10.	4	12	85	91888	43	25	99	17	9	194	44	408	96	280	8
11.	4	16	68	12493	53	28	114	20	3	242	62	138	113	304	9
12.	3	13	40	63789	43	26	139	22	8	193	53	172	98	253	8
13.	3	14	63	36366	38	26	154	20	10	147	58	158	90	269	11
14.	4	14	50	58223	38	27	79	21	9	119	56	223	89	270	11
15.	5	16	245	56111	48	30	109	25	4	224	57	205	103	306	11
16.	2	12	428	127048	34	26	135	22	6	109	49	217	78	222	7

Table 5 (a): Measured values of 15 elements in soil samples of 16 villages Bathinda District

In spite of the fact that Uranium and Thorium in the deliberate soil tests were very low to cause any harm yet components like CaO, Co, Zr, Rb are tracked down in higher sums. CaO, Co, Zr were noted a lot higher than their passable qualities (Table 4) in every one of the towns (with the exception of one area of Bhai Rupa2 town having CaO centralization of 9773 ppm). 74% of towns have high worth of Rb. Among these the components that cause alkalinity like Ca, Rb are very high. These might be because of coal terminated TPP (Thermal Power Plant) at Bathinda which is not exceptionally distant from the contributed region. At the point when coal or lignite wealthy in limestone, produce debris having calcium oxide, it (Lime stone (CaO)) effectively diffuses in water bodies and make calcium hydroxide $Ca(OH)_2$ also, changed through downpour water to trenches or farming water frameworks and at last venture into the soils. In India, the debris content in the coal used in power creation is around 30 to 40%, which is somewhat more than the other created countries. Higher upsides of coal fly debris bringing about high harm to the plants as well as machines. Every one of the weighty components ordinarily found in the coal fly debris are noxious in nature.

Sample No	Ni	Fe_2O_3	Ba	Rb	Sn	Sb	Mo	TiO_2	MnO	Ga	Nb	La	Y
1.	46	47000	505	128	2	ND	ND	6900	800	17	15	33	33
2.	36	32900	437	107	1	1	ND	5400	500	14	13	24	28
3.	43	40600	437	116	1	3	1	6100	600	16	14	26	29
4.	43	41600	485	128	1	1	1	6100	700	17	14	29	32
5.	47	45600	483	138	7	4	1	6300	700	19	15	31	34
6.	35	33700	399	105	ND	2	ND	4800	500	14	12	29	29
7.	48	46100	482	125	ND	3	ND	6800	800	18	15	30	33
8.	45	41300	433	110	ND	ND	ND	5900	600	16	13	30	30
9.	44	44100	474	120	1	ND	1	6400	700	17	14	33	31
10.	46	43100	451	116	4	5	1	6200	700	17	14	28	30
11.	45	44900	432	122	1	3	ND	6000	700	17	14	31	33
12.	35	34200	426	104	1	1	ND	5200	600	14	13	34	29
13.	29	29300	393	106	2	3	ND	4600	500	14	12	17	28
14.	95	46700	487	127	3	4	1	6700	700	17	15	33	33
15.	41	41300	468	118	3	3	1	6300	700	15	15	28	32
16.	47	45700	487	125	2	2	ND	6800	800	17	15	27	32

Table 5 (b): Measured values of 13 elements in soil samples of 16 villages Bathinda District

(ND-Not Detected)

CONCLUSION

- This study features the huge presence of natural contaminations in Bathinda and their possible connect to the increasing malignant growth rates in the area. The investigation of water, soil, and air tests uncovered disturbing degrees of cancer-causing compounds, including polycyclic aromatic hydrocarbons (PAHs), polycyclic aromatic hydrocarbons (PAHs), (VOCs), and pesticides, which are logical supporters of the noticed wellbeing influences.

- The relationship between the clustering of these poisons and the incidence of disease in Bathinda highlights the urgent need for total natural control and stricter guidelines for modern emanations and horticultural practices. In addition, there are basic general well-being requirements aimed at reducing exposure to these hazardous substances.

- Unhealthy levels of Co, Cao, Pb, As, Ni and Y can lead to Cancer disease growth.

- The main sources of poisons (Co, CaO, Pb, As, Ni, Y, Rb and Zr) that are monitored in additional sum than their permissible limit points (Table 3) for this site may be coal-terminated TPP (Thermal) . Power Plant) in Bathinda (near the concentrated region) and pesticides, weedicides and fungicides used for rural purposes. To summarize, radioactive elements such as uranium, thorium and potassium (K-40) are not very happy with the formation of any tumors. An excess of alkalinity-causing components can be the stimulus for these radioactive components to become harmful6. As a result, excess alkalinity can be the primary reason for the development of cancer and alarming diseases.

- In this overview, the pollution of Cr, Hg, Se and Album is mainly seen in the water test taken from another location in the evaluation area. In each of the 19 examples, Cr and Hg are beyond the maximum allowable limits of the WHO and BIS drinking water quality guidelines. Cr ranged from 70 to 360 ppb and the highest level of Cr was observed in Lehra Mahabbat at 360 ppb which was 310 ppb above the most viable outermost drinking water reaches. If possible in drinking Hg is 1ppb and in all examples Hg fixation was above the protected drinking water level in all 100 percent of the tests.

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