

Water Quality Status of Yamuna River and its Toxic Effects on Humans

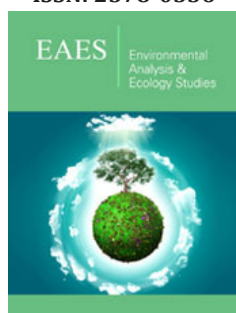
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Abstract

Yamuna river is holy river in India. The River Yamuna, the largest tributary of River Ganga has been one of the most prominent & important rivers of India. Unfortunately, certain stretches of River Yamuna are much polluted. Various urban centers e.g. Delhi, Mathura, Agra etc. Water is a most valuable natural resource for all living creatures on the earth, currently we have noticed that the contaminated water is the biggest problem in the world. The contaminated water is used for the drinking and agricultural purposes. The present review was conducted to evaluate water pollution status of Yamuna River after crossing the urban and industrial area of Delhi. This review study determined the concentrations of heavy metals like Cd, Pb, Ni and Zn in water and their toxic effect on human health.

Keywords: Yamuna river; Contaminated water; Sediments; Heavy metals

Introduction

The Yamuna river Table is the biggest tributary of the Ganga River. The main tributary of the Yamuna river originates from the Yamunotri glacier near Bandar Punch (38°59' N 78°27' E) in the Mussourie range of the lower Himalayas at an elevation of about 6320 meter above mean sea level in the district Uttarkashi (Uttaranchal). The catchment of the Yamuna river covers parts of the states of Uttaranchal, Uttar Pradesh (U.P.), Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh and the entire state of Delhi. The river Yamuna traverses a distance of about 1370km in the plain from Saharanpur district of Uttar Pradesh to the confluence with river Ganga at Allahabad. The major tributaries of the river are Tons, Betwa, Chambal, Ken and Sindh and these together contribute 70.9% of the catchment area and balance 29.1% is the direct drainage of main river and smaller tributaries.

On the basis of area, the catchment basin of Yamuna amounts to 40.2% of the Ganga Basin and 10.7% of the country [1]. Water quality plays a critical role in determining the ecological conditions and functions of aquatic habitats [2,3]. Pure intake water is a people birthright-as much a birthright as fresh air. As a issue of fact, in most of the African and Asian countries, even in comparatively higher countries such as India; pure intake water is not easily available. Of the 6 Billion people on earth, more than one billion lack accesses to safe drinking water and, about 2.5 billion do not have access to sufficient cleanliness services [4]. Among these contaminants, heavy metals comprise one of the most dangerous groups because of their determined nature, toxicity, affinity to accrue in organisms and undergo food chain extension and more still, they are nondegradable [5].

Heavy metals are sometimes called "Trace elements". They are metallic property of periodic table. The particular interest of Heavy metals in modern decades within the structure of environmental investigation. This has lacking uncertainty be due to the detail that extremely aware logical measures are accessible for influential and detect metal contented with elevated accuracy. medicinal geology is a subfield of geology so as to study the effect of substance in the surroundings, particularly trace element, on the physical condition of human and animals [6]. The heavy metals can't be tainted while natural contaminants decay into additional chemical with point in time. Heavy metals have poisonous effect still at little concentration, which might show deadly to a few living being. Their concentration in biota can be enlarged throughout bio-accumulations [7]. Heavy metals removal is a grave difficulty as well as very expensive [8]. The sharing of heavy metals in sediments can supply an proof of the anthropogenic crash on aquatic ecosystems and consequently help in assess the risk related with discharge waste [9].

Uses of Yamuna water

Still nowadays, water stand as individual of the mainly fundamental necessities of existence. We cannot assume our source of revenue lacking water. Yamuna waters supply a lot to behind our live in each way. several of the use of its waters be as follow:

- A. Area similar to Delhi, Mathura, Agra and Allahabad utilize the Yamuna water for household water supply. In Delhi, at a exact site i.e. Wazirabad, the whole water is unfocused specially for household supply.
- B. Approximately 93% of Yamuna water is use for the reason of irrigation through the aid of four irrigation canal which are Western Yamuna canal, Eastern Yamuna canal, Agra canal & Gurgaon canal.
- C. The Yamuna basin also has enormous possible to produce hydropower & presently approximately 400MW of hydropower is individual channel throughout this basin.
- D. River Yamuna provide a huge range of farming for fish and other aquatic animals.
- E. Waters of Yamuna are also use for swim as depict by Hindu myths and as well for wash clothing and utensils by near society.
- F. Furthermore, it is predictable to regarding 70% of the entirety livestock population in the Yamuna basin use flow water of stream and canal for bathing. among such a soaring belief on its waters, this stream certainly is one of the main area of anxiety as distant as ecological impact are anxious. The river is one of the mainly contaminated rivers in the earth [10].

Pollution status of Yamuna river

Yamuna is one of the main river of India, originate since the Yamunotri glacier near Banderpunch crest of the minor Himalayas (38°59'N 78°27'E) in the Mussourie variety, at an height of concerning 6,320m exceeding signify sea level in the Uttarkashi district of Uttarakhand, India. The widespread catchment region of the stream is concerning 3.5×105km², cover some Indian state. The Yamuna catchment region of the National Capital Territory is 1% of the river's whole catchment region but contributes more than 50% of the pollutant originate in the Yamuna [11]. About, 85% of the river's contamination come since household source. The main source causative to the contamination of Yamuna is raw manure, industrial effluents, the removal of trash and deceased body, fascination of idol and contamination owing to in-stream use of water [12].

Separately from peak source of contamination, diffused source of contamination such as farming contamination and a variety of in stream use of water such as cattle wading, bathing, open defecation and cloth washing insert to the worsening of river water quality. household manure in the river aid in the continued existence of pathogens [13]. Industrialized release, discharge of natural substance into water, domestic waste etc. have cause a decrease in oxygen level and are a main cause for eutrophication. show reasonable level of poisonous metals in the water at some location.

The sample be in use crosswise a variety of location about Yamuna in Delhi and Haryana. The learn as well emphasize on the consequence of heavy metals on the vegetables rising on the river banks as well as on the inhabitants needy on river water [14]. Amongst a variety of natural and lifeless water contaminant, metal ions are poisonous, hazardous and damaging since of their tissue degradation in nature. Poisonous metals are also bioaccumulative and comparatively steady, as well as carcinogenic, and, consequently, require close monitor [15]. Monitor of heavy metal pollution is significant since increased concentration of heavy metals in potable water increase the danger to individual fitness and to the surroundings owing to biological exaggeration.

Appraisal of monitor information via multivariate arithmetical technique, similar to primary constituent examination joined with metal concentration examination and link examination might be new to conclude the cause for the decline of water quality and to classify extremely contaminated stretch in a known river system [16,17]. In adding to this, the spot wise disposition of heavy metal by produce heavy metal contamination catalog be able to accommodating in identify and quantify trend in water value [18,19] and be able to give an accumulate appraisal of largely water quality in a variety to facilitate might be utilize by plan maker for guideline and manage of contamination.

Majority of the heavy metal study conduct on river Yamuna contain simply obtainable the concentration of different heavy metals in the Yamuna River. Though, in our study contain included different arithmetical technique in arrange to change and authenticate main source of heavy metals in Delhi enlarge. This resolve also assist in thoughtful impact of a variety of industrialized and household behavior in and around Delhi on heavy metal contamination in the river Yamuna. We too ready the mainly new heavy metal contamination guide of River Yamuna, to decide the mainly seriously contaminated stretch along the extent of river [20]. The practice of trace element exposure must be sustained to keep away from likely utilization of polluted eatables. inhabitants must be careful regarding the dangerous effect of utilization of contaminated water and correlated eatables [21].

Effects on human health

Lead (Pb): Lead is physiological and neurological poisonous to human. severe Pb poison might outcome in a dysfunction in the kidney, reproduction system, liver and brain resultant in illness and death [22]. Pb head the intimidation still at tremendously little concentration [23]. A particularly grave cause of lead toxicity is its teratogenic cause. Lead poison also cause reserve of the mixture of hemoglobin; cardiovascular system and acute and chronic harm to the central nervous system (CNS) and peripheral nervous system (PNS). additional unceasing effect comprise anemia, fatigue, gastrointestinal harms and anoxia. Lead can cause difficulty in pregnancy, high blood pressure, muscle and joint pain [22]. In the adult inhabitants, reproductive effect, such as decreased sperm counts in men and impulsive abortions in women have been connected with high lead exposure. severe contact to lead induce brain damage, kidney damage, and gastrointestinal diseases,

whereas chronic contact might cause adverse effect on the blood, central nervous system, blood pressure, kidneys, and vitamin D metabolism [24-31].

Cadmium (Cd): Cadmium is a well recognized heavy metal toxicant through a precise gravity 8.65 times greater than water. The aim organs for Cd toxicity have been recognized as liver, placenta, kidneys, lungs, brain and bones [32]. Depending on the harshness of contact, the symptom of effect includes nausea, vomiting, abdominal cramps, dyspnea and muscular weakness. harsh contact might result in pulmonary edema and death. Pulmonary effect (emphysema, bronchiolitis and alveolitis) and renal effect might happen follow sub chronic in halation contact to cadmium and its compound [33]. Cadmium is a harsh pulmonary and gastrointestinal irritant, which can be deadly if inhale or ingested. Following severe intake, symptom such as abdominal pain, burning sensation, nausea, vomiting, salivation, muscle cramps, vertigo, shock, loss of consciousness and convulsion typically emerge inside 15 to 30 min [34].

Acute cadmium intake can also reason gastrointestinal tract erosion, pulmonary, hepatic or renal injury and coma, depending on the route of poisoning [34,35]. Chronic exposure to cadmium has a depressive cause on level of norepinephrine, serotonin, and acetylcholine [36]. Rodent studies have exposed that chronic inhalation of cadmium cause pulmonary adenocarcinomas [37,38]. It can as well as cause prostatic proliferative lesion counting adenocarcinomas, after systemic or direct contact [39].

Nickel (Ni): Individual nickel disclosure originate since a variety of source and is extremely variable. Nickel is generally current in human tissues and, beneath circumstances of elevated disclosure, these level might enhance a lot [40-42]. Foodstuff intake, gastric emptying and peristalsis of the intestine are of substantial impact for the bioavailability of nickel, since absorption of ingested nickel is minor while it is administrate in food or in water simultaneously through a meal. The occurrence of food in the stomach extensively alter the bioavailability of nickel salts [43-45]. Nickel compound have be well recognized as carcinogenic in lots of animal species and by numerous modes of human exposure but their essential mechanisms are still not fully understood [41,42,46-48]. Nickel hypersensitivity also cause asthma, conjunctivitis, inflammatory reaction to nickel-containing prostheses and implant, and systemic reactions after parenteral administration of nickel-contaminated fluids and medications. The sensitivity to nickel would emphasize the need to monitor nickel contented in intake water and nickel-allergic subjects must be alert of the augmented assimilation while drinking water on an empty stomach [45].

Zinc (Zn): Different study have suggested that zinc inhalation and drinking contaminated water might cause signs of gastrointestinal dieses or modification in gastrointestinal soft tissue. One instance of a single individual who consumed around 3 grains of a zinc chloride define serious symbols that happen almost instantaneously after interaction through the complex, contain scorching, mouth and esophagus was vomiting and paining [49]. Zinc plays a main part the usual increase and preservation of the immune structure, such

as in the lymphocyte reaction to mitogens and as a cofactor for the thymic hormone thymulin [50,51]. Actual restricted in sequence advise that overdoses oral intake of zinc can origin slight neuron fall down and modify of emission of the hypothalamus in rats [21,52].

Discussion

The toxicologist has continually detected the heavy metal absorption in various water bodies, plants, vegetables, etc. individual physical condition is straight affect by the utilization of contaminated water, fish, fruits, vegetables, plants etc. which are the major source of food for human. The harshness of adverse health effects is related to the kind of heavy metal and its compound form, and is also time and dose dependent. Among many other factors, speciation plays a key role in metal toxicokinetic and toxicodynamic and is highly influenced by factors such as valence state, particle size, solubility, biotransformation, and chemical form.

The heavy metal concentration resolute in water is collected through both the dissolve and the suspended metals. Part of the suspended metals come from the sediments, producing a correlation between sedimentary and suspended metal concentrations. Citizens might experience during disease on drinking water with high concentration of heavy metals. They might contain physiological effect as on kidney, digestive system, circulatory system, nervous system etc. different additional organs and diverse systems of the body.

Conclusion

This review article summarizes the recent circumstances of contamination in the waters of Yamuna. poisonous heavy metals are establish in nature in the earth but they become concentrated as a result of human activities. Heavy metal contamination of aquatic environments is a major global concern as huge amounts of heavy metals are discharged into water bodies as effluents of mining, metallurgy and electroplating industries. The metals go through the surroundings during aquatic life system and plants and animals surrounding the river. The heavy metal and pesticide load in water of Yamuna River is a matter of concern as population of Delhi is dependent on the water of Yamuna. The hazard of bioaccumulation and biomagnification of the heavy metals make them a big threat to human health and welfare. The prevalent dire condition of Yamuna River is serious problem and an urgent initiative by the Delhi government is needed to prevent further deterioration. Government should take immediate preventive measure.

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