A Physicochemical Evaluation of Water Quality of the Brijghat, Garhmukteshwar

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Abstract: *The control of physicochemical parameters is a crucial endeavour to preserve natural water bodies and other water supplies. In addition, temperatures are more significant, especially in so far as the growing temperature trend has affected global biodiversity and has taken surprisingly on various environmental processes, including phenology, topography, weathering, crop production, animal reproduction, migration via animal diversity to local and seasonal habitats. Therefore, considering the current situation, physicochemical parameters controls be a global solution for upcoming water crisis. A comparable appraisal and measurements of good, positive results on all practicable dimensions are required for the water quality assessment.*

Keywords: Water benefits, water conservation, physicochemical assessment

1. Introduction

To protect human health and security, water plays a crucial function. The entitlement of human beings to clean drinking water is now recognised (Maqbool *et al.*, 2018). Around 780 million people have no access to free, safe water, and around 2.5 billion do not have sufficient sanitation (Goldman and Narayan, 2019; Shan *et al.*, 2020). As a result of water-related illnesses and floods, nearly 6 to 8 million people die every year. Water safety inspection in many parts of the world is therefore a top policy agenda (Boazar *et al.*, 2019). In today's world the use of water is commonly referred to as domestic water in domestic sources (Moshtagh and Mohsenpour, 2019). This water is processed for healthy consumption and other uses. Its flavour, odour, colour, and concentration of organic and inorganic matter determines water content and suitability for use (Nazari *et al.,* 2018). The water quality and therefore the public wellbeing can be compromised by pollutants. Geological conditions, manufacturing and agricultural operations and water treatment facilities are the potential causes of water pollution (Sharma *et al.*, 2020). These also contain microorganisms, inorganics, organic materials, radionuclides, and designations of disinfectants (Moglia *et al.*, 2018).

The inorganic chemicals contain a higher proportion than organic chemicals as toxins in potable water (Kumar *et al.*, 2020). Any of the inorganic compounds are heavy metals in mineral form (Aithal and Aithal, 2018). Heavy metals build up in and interact with normal operation in human organs and nervous systems (Vardhan *et al.*, 2019). Over the past few years, major focus was on heavy metals such as lead, arsenic, magnesium, nickel, copper and zinc due to health concerns (Karri *et al.*, 2016). Furthermore, traces of metals such as cadmium and chromium are associated with cardiovascular diseases, kidney-related diseases, neurocognitive diseases and cancer (Kumar *et al.*, 2019; Rahman *et al.*, 2019). The physical and mental growth is known to be delayed in infants while mercury can result in

serious skin and cancer poisoning and damage to the kidneys and liver.

2. Material and Methods

2.1 Description of the Study Sites

The present study was carried out at the different Ghats at Brijghat, (Garhmukteshwar), which is situated Ganga river, Uttar Pradesh, India from the period of 2017 – 2020. Based on the suitability of sample collection, the water samples were collected from the three different locations at Brijghat, Garhmukteshwar from the three different climatic seasons like pre–monsoon (March – May), Monsoon (June – August) and post–monsoon (December – February). Sampling locations are having 1 km gap distance from each other thus the repetition of same water and quality will not be happened, and analysis of water quality will be more viable and authentic to produce the analysis inferences.

2.2 Sampling Procedure and Preservation Techniques

A stock of plastic containers and sterile sampling bottle was kept ready before the sampling and based on the prior decided sampling schedule, we planned to visit and collect sample from each Ghats periodically. Prior of each sampling visit, each container was cleaned with distilled deionized water or dilute nitric acid (based on the stock availability at laboratory).

The cleaned containers were rinsed many times with tap water. The cleaned containers were dried under room temperature and sometimes, hot dried also. Based on the research plan, each study Ghats were visited with a constant interval, and meanwhile sampling was done if it is convenient to collect sample. Sometimes, due to huge crowed, sampling was too hard even entry itself was a challenging task hence, in such situations, we strictly avoided taking samples.

Moreover, sampling was done a high degree of precautions as sample containers was immersed completely into the lotic water and keep waiting to the complete fulfillment of sample containers. Once sample contained is filled with sample, each container was tightly fitted with cork sealed hence the probabilities of bubbling's was taken into consideration and its affinities was minimizes effectively. The collected sample was stored and transferred into refrigerators up to the analysis of samples. The fresh collected and stored samples were analysed the various parameter specific standard protocols. The following parameters were planned to investigate their details are like; Alkalinity, Biochemical Oxygen Demand (BOD), Chromium (Cr), Conductivity, Dissolved Oxygen (DO), Iron (Fe), Lead (Pb), pH, Salinity, Total Dissolved Solids (TDS), Total Hardness, Total Solids (TS), Total Suspended Solids (TSS) and Turbidity, Generally, sampling of water with a regular periodical gaps but this study was quite different in terms of sample collections, transportations, presentations and analysis of the fresh as well as stored samples with the help of newly invented or describes techniques. As usual, they carried their study for a time interval however, a great precaution in sampling as well as sample handling was taken care and it was consistently remaining in practices until the sample analysis for best possible results.

2.3 Data Handling and Statistical Analysis

The filled excel sheet with data was arranged in a systematic hierarchy by mentioning of day, date, month of data collection of the study area. To avoid pseudo-data, the preorganized datasheet along with a well-planned and maximum attention was taken care of during the time data entry into the excel sheet. However, the categorized data were well identified with their definition however the profiling of parameters and relevancy were kept at the respective place for proper and systematic analysis.

3. Results and Discussion

The present study examines the water quality differences of many ghats in Brijghat, Uttar Pradesh, India. The physical relationship between household and industrial waste in river water has altered the pH value of various sites. The extent of domestic dumping around the area of different ghats mainly kills floral and faunal diversity. To optimise potential outputs, we concentrated intensely on the certain point at first and later, we found certain tentative precautionary steps as observations and thus successfully made the observations on physicochemical analysis of the river water. The findings were covered by many factors and environmental variables.

It was found that the annual means temperature of air is varied throughout the year. It varied from season to season and from month to months. The collective minimum mean temperature of different ghat's water was observed as 17.45 ± 0.15 °C (SD) while a drastic changing pattern was noted in case of optimum annual mean temperature. The optimum mean temperature of air was recorded as 35.92 ± 0.53°C (SD) with an average annual mean temperature of air was 26.38 ± 1.50°C (Table 1). However, it was found that the changing trend of temperature is one of the deciding factors

regulating floral and faunal diversity. The water temperature is often a changing variable in this study.

At the initial stage of sampling, it was presumed that there were a minimum number of issues may be found while sampling but the actual condition of each ghats was quite adverse and there were a lot of issues were reported during sampling as well as data collection. It makes us to remake and redesign our sampling plan at various ghats with maximum accuracy in a more precise way. We processed collected water samples in an ideal and standardized conditions.

The descriptive statistics of data were scored in MS Excel file (2019, Home and Students Licence) and mean (±) and standard deviation (SD) was presented in the results at the appropriate place. The univariate data were analysed separately and each ghats was considered as a factor. We have chosen Chi-square statistical test to quantify the level of significance at 5%. Other than the Excel 2019, SPSS (16 version) was also used for parametric analysis of the obtained data for data analysis.

Table 1: Seasonal variations in the water parameters of Brijghat, Uttar Pradesh

Months	Air temperature (°C)	Water temperature (°C)	Water depth (m)	Turbidity (NTU)
	(Mean ± SD)	(Mean ± SD)	(Mean±SD)	(Mean±SD)
Jan	17.45 ± 0.15	17.50 ± 0.10	2.15 ±0.62	3.80 ± 0.61
Feb	19.10 ± 0.51	18.23 ± 0.21	3.18 ±0.70	3.67 ± 0.25
Mar	21.74 ± 0.25	20.43 ± 0.54	3.10 ±0.68	3.17 ± 0.12
Apr	23.23 ± 0.21	22.00 ± 0.25	3.12 ±0.63	3.23 ± 0.64
May	25.64 ± 0.56	25.65 ± 0.23	4.10 ±0.23	4.32 ± 0.17
Jun	35.92 ± 0.53	33.57 ± 0.33	4.51 ±0.68	4.60 ± 0.27
July	34.12 ± 0.56	32.10 ± 0.41	4.53 ±0.47	4.45 ± 0.66
Aug	34.56 ± 0.75	33.57 ± 0.32	4.46 ±0.87	2.10 ± 0.52
Sep	30.31 ± 0.10	29.13 ± 0.83	4.13 ±0.33	2.32 ± 0.64
Oct	27.23 ± 0.56	26.56 ± 0.78	4.43 ±0.55	2.89 ± 0.43
Nov	21.20 ± 0.45	20.13 ± 0.42	3.80 ± .89	3.78 ± 0.10
Dec	19.07 ± 0.21	18.10 ± 0.31	3.52 ± .21	2.29 ± 0.82

A small change in the surface water temperature was detected according to the seasonal change. However, few other influences such as festival celebrations, cultural activities, abrupt climate changes and the annotation of toxins and contaminants in a routine period have an important role in alternating temperatures. It is a cyclical type of phenomenon and these shifts were reported every year during the year of the investigation.

It was found the minimum water temperature was recorded as 17.50 ± 0.10 °C (SD) during present investigation. During the time of the study periods, the maximum temperature was noted as 33.57 ± 0.33°C (SD). It shows that the being a physical parameter, water temperature showed that temperature not only higher in a particular time periods but also it decreases up to a certain point during a specific period and this cycle is repeatedly exhibiting similar pattern which is varied with the time, month and environmental conditions.

Throughout the study periods, the annual mean temperature was observed as 26.38 ± 1.50 °C (SD) from the different

ghats of Brijghat during sampling periods. It was observed that the intensity of sunlight exposure, the surface of at different ghats are get worm particularly during mid-days. In case of early morning, temperature was comparatively lower in compression to the other phases of the day. In a specific way, night length varied according to the months and exposure of light also varied with the night and day length (Shirodkar *et al.*, 2012). During the summer season, the longer days are more open to the sun and more worming; while in the winter the shortened night-time is almost shorter. Thus, the prolonged day time and shorter night-time in summer affects the physicochemical features of the river water tested. In winter seasons the duration of the day is shorter but the length of the night is longer, and therefore in the shortened summer season, the winter seasons are sustained at lower water temperatures and less humidity inhibit the distinct enzyme reaction of biologically important fauna and flora (Shirodkar *et al.*, 2012).

Depth of water is a defining attribute of bodies of water. Depending on the depth of the stream, various unique properties can be found in different places within the river length and breadth. In general, water depth ranges from location to location and resource providers to supply in relation to a particular position and time. In this present study, different locations at Brijghat were sampled for the assessment of depth of water of a particular place. It was found that water depth was recorded as lowest within the range of 2.15 ± 0.62 (SD) meter during January month. It shows that the January month is having low amount water at Brijghat probably due to scarcity of water during winter season.

Availabilities of plentiful of water in July integrated with the rainy seasons and inappropriate management of rainwater in the study area. We have found the maximum water depth was recorded in rainy season especially in the month of July and its valued are ranged from 4.53 ± 0.33 (SD) meter. Sampling in this period was quite easy due to the abundance of water in all the locations of Brijghat. Due to water abundance, a few numbers of local gatherings were also observed but common fishing man and locally expert peoples were common throughout the year.

We have taken a lot help from the local expert for general facts and data collection even importantly in the measurement of water depth. During this period, a higher precaution was taken care while visiting the sampling sites however a lot of new facts were preliminary recorded during the different phase of the observations. It was estimated that turbidity was playing a significant role in the determination of physicochemical properties of Brijghat water. We found that the turbidity was ranged from 2.10 ± 0.52 (SD) as minimum to 3.80 ± 0.61 (SD) as maximum (Table 2).

The metabolic activities of aquatic species are determined by pH concentration. Hence, pH concentration exhibits a remarkable importance in metabolism of aquatic species. The pH concentration is also considered as an indicator of sample water. Through pH value, the level of pollutant and waste presence can be easily detected. Therefore, we had tried a practical attempt to explore the variation and or change in the physicochemical characteristics of Brijghat

water quality for the conservation of water quality as well as its associated floral and faunal diversity. The results of pH measurements show that, pH value was ranged from 7.7 to 7.0. Water quality is a primary characteristic which determines the scope of faunal diversity and thus the aquatic species have adapted with a certain feature which determines their presence or migration even if a particular species did not migrate, in the adverse conditions, they may be extinct. Hence, characteristics of water and its parameters balances have a great significance on its livelihoods (Zhang *et al.*, 2017).

In the consideration of major characteristics, pH is considered as one of most important characteristics which plays and also determines the floral and faunal diversity of the aquatic bodies. The results of pH measurements show that, pH value was ranged with an average of 6.41 ± 1.29 (SD; Table 2). The spectrum of pH for floral as well as faunal diversity was an important deciding factor of the physicochemical properties of Brijghat water. However, pH is usually considered one of the most widely employed and efficiency determining of the water, which is balanced by other parameters. Its changes have resulted in many floral and faunal changes. The death rate of current marine species and even adult survival were often changed. Seasonal shifts in the pH values of Brijghat have also been observed to contribute to seasonal migration of fish, as water quality influenced by the seasonal parameter variance.

Table 2: Summary on the physicochemical analysis of Brijghat, Uttar Pradesh

S. no.	Parameters	Climatic seasons		
A	Physical Properties	Summer	Pre-monsoon	Winter
1	Appearance	Colorless and clear	Colorless and clear	Colorless and clear
2	Odour	-	-	-
3	Turbidity (NT units)	4	3	3
4	Total dissolved solids (mg/L)	322	310	317
5	Electrical conductivity (Mics/cm)	451	448	459
B	**Chemical Properties**			
6	pH	7.4	7.7	7
7	Alkalinity - ph ($CaCo_3$)	2	2	3
8	Total Alkalinity ($CaCo_3$)	125	119	120
9	Total Hardness ($CaCo_3$)	168	165	158
10	Calcium (Ca)	50	49	45
11	Magnesium (mg)	11	13	14
12	Total Iron (Fe)	0.38	0.31	0.25
13	Manganese (Mn)	0.03	0.01	0.02
14	Free Ammonia (NH_3)	0.05	0.02	0.03
15	Nitrite (No_2)	0.02	0.01	0.02
16	Nitrate (No_3)	11	4	9
17	Chloride (Cl)	50	49	41
18	Fluoride (F)	0.5	0.1	0.2
19	Sulphate (So_4)	20	17	22
20	Phosphate (Po_4)	0.15	0.1	0.11
21	Tidy's test 5hrs (O_2)	0.18	0.5	0.1

Table 3: Seasonal variations in the nutrient concentrations of Brijghat, Uttar Pradesh

NO$_3$-N	NH$_3$-N	N-NO$_2$	N-NH$_4^+$	TP
2.7±0.5	0.5±2.0	0.0	0.1±0.1	0.8±0.2
2.9±1.1	0.9±1.5	0.0	0.2±0.3	0.5±0.3
9.4±2.5	1.6±4.1	0.0	0.4±1.2	1.5±0.2
9.6±0.3	0.9±2.0	0.0	0.5±0.3	0.5±0.1
5.3±0.7	0.1±1.8	0.0	0.9±0.4	0.9±0.3
6.9±1.1	0.3±0.6	0.0	0.5±0.3	0.6±0.1
7.8±2.1	0.5±1.5	0.0	0.9±0.5	0.1±0.1
5.5±1.3	0.4±1.6	0.0	0.5±0.1	0.2±0.1
6.4±1.0	0.6±0.7	0.0	0.4±0.2	0.2±0.3

Acidic compounds have altered water content and their physicochemical features are converted into slight alkaline water. In addition, forms of vegetation which have played a significant role in deciding the physicochemical characteristics of water along with the water sources and the hand. Brijghat was found to be surrounded by number of agricultural crops, and wastes are stowed for potential use at the end of each plant, or are simply lost in the forms of cultivation, often going through separate channel systems. The movement through separate channels of agricultural waste materials caused impediment to the passing of daily water and altered the physicochemical properties of water.

Temperature control represents an imperative effort for the protection of water supplies and their natural reservoirs and other water services. In addition, it would be more important to track temperatures especially, because as of now, the rising temperature trend has had major impacts on global biodiversity, and surprisingly as a factor deciding different ecological procedures, such as phenology, topography, weathering, crop production, reproduction of animals, migration through animal diversity in local and seasonal environments. Consequently, bearing in mind the present situation, temperature surveillance may be considered a threat to global concern and its modification periodicity includes an equal appraisal and, in all practicable respects, findings of positive and beneficial outcomes.

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