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A Study on Seasonal Variations in Water Quality Parameters of Dhaka Rivers

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P A P E R I N F O

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A B S T R A C T

Dhaka, the capital of Bangladesh, is encircled by six rivers like a garland. Dhaka's growing population, urbanization, and modernization are causing problems with wastewater discharges and water pollution in the river's water body. These rivers receive wastewater from numerous sources, which are discharged as industrial effluents, municipal sewage, household wastes, clinical wastes, and oils. The water of these rivers is being polluted to an increasing degree. This study investigated how the surface water in Dhaka's rivers varies throughout the year. The results of various water quality indices, such as DO, BOD, COD, pH, TDS, EC, SS, Turbidity, and alkalinity, were compared with the guidelines set by Bangladesh's Department of Environment (DoE) and the World Health Organization (WHO). Sample collection was done in two seasons in a year, dry season and wet season. In this study, researchers also aim to determine the effect of this wastewater on the river water and thus provide a report on the state of a numerical rating for determining the rivers' water quality.

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INTRODUCTION

Water is necessary for the existence of all forms of life. Most freshwater bodies worldwide are polluted, reducing the potability of the water. Due to urbanization, pollution has become a severe concern for human life. Moreover, especially in developing countries, rivers are the top choice for holding and carrying the responsibility of pollutants. Around 780 million people worldwide do not have access to clean and safe water, and around 2.5 billion people do not have proper sanitation. Because of this, between 6 and 8 million people die each year from water-related diseases and tragedies [1].

Dhaka, the capital of Bangladesh, is one of the world's ten 'Mega Cities.' With 22,478,116 people per square kilometer, Dhaka is the fourth-densest city in the world. This massive population in Dhaka needs a large quantity of water for everyday use, which the local government provides. The "Dhaka Water Supply and Sewerage Authority (DWASA)" handles the piped water supply for Dhaka City and its surrounding areas. 75% of the city's water supply is covered, and 78% comes from groundwater sources. Water treatment facilities treat the remaining 22% of the water before it enters the distribution system, which comes from sources of water bodies like the rivers near Dhaka City [2]. Also, the most crucial source of water for irrigation, commercial industries, animal farming, aquaculture, and wastewater dilution in Dhaka is the rivers. However, it is still well known that the water level on the rivers' surfaces is contaminated due to the direct elimination of commercial and industrial untreated wastewater into these rivers. Human activities in these rivers influence aquatic ecosystems by discharging untreated wastewater. Activities related to urbanization are one of the reasons for water pollution [3].

It was previously mentioned that Dhaka is one of the ten mega cities in the world; hence, ensuring the quality of the river water surrounding Dhaka is essential. Many of our country's population depend on the river for their livelihood by fishing, transporting heavy goods, using it for irrigation and household use, etc. So, there is a massive chance of being infected with water-related diseases by using the contaminated water of the rivers. This study aims to find the concentration of nine parameters or contaminants required to determine these rivers' Water Quality Index (WQI) in both the dry and wet seasons. The WQI value of these waters gives us an idea

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about the water quality status of Dhaka's rivers by comparing them with the standard value recommended by the World Health Organization (WHO) and other local agencies. There are various methods to calculate WQI. These are the "National Sanitation Foundation Water Quality Index (NSF WQI)," the "Weighted Arithmetic Water Quality Index Method (WAWQI)," the "Canadian Council of Ministers of the Environment Water Quality Index (CCME WQI)," and the "Namerow Pollution Index (NPI)." In this study, researchers use the WAWQI method to calculate the water quality index of the rivers' water.

Several technical publications on river water quality assessment have been reviewed in this study, and researcher have referred to them below.

Islam et al. [4] has studied the Buriganga rivers' water quality throughout the dry season. They took water samples and analyzed parameters including pH, electrical conductivity, cations, anions, heavy metals, and others to evaluate whether the water quality was within acceptable limits. Sampling points were selected based on their importance. In this study majority of the water quality indices in the Buriganga River were within the permissible range established by the Bangladeshi standard for water quality. However, it was discovered that the concentrations of Pb^{2+}, K^{+}, and Mn^{2+} exceeded the allowable limits, indicating that the Buriganga River water quality is unsuitable for human consumption. The study indicates that Residents beside the Buriganga River should be careful when consuming the polluted rivers' water, and the appropriate officials must take necessary action to restore the reduced water quality of the river [4]. Hasan et al. [5] studied the water in the Dhaleshwari River in Bangladesh, specifically where the central effluent treatment plant (CETP) of a recently relocated tannery processing zone dumped its effluent. They evaluate the river water's level of contamination using several water quality indices to determine the spatiotemporal variations in river water quality caused by the tannery industrial park. Including the contamination index (Cd), the drinking water quality index (DWQI), the heavy metal pollution index (HPI), and the irrigation water quality index (IWQI) using the CCME method. The IWQI values indicated the quality level was "Excellent" (0-25). Regarding heavy metal contamination, the HPI rating indicated a 'Critical' (> 100) water condition, and the Cd rating (> 3) indicated that the river water contained a significant level of contamination [5].

Tahmina et al. [6] described the Turag River's water quality by measuring physicochemical and microbiological parameters to determine the pollution from excessive industrial and anthropogenic activities. During the wet and dry seasons, the researchers took water samples from four different locations in Turag River. They analyzed the samples for different indices like temperature, pH, salinity, dissolved oxygen, and other chemicals. They also tested water samples for the existence of microbes in them. The researchers compared the obtained values with the recommended values for river water quality. Finally, they determined the water quality of rivers by calculating the water quality index (WQI) during both seasons. The water condition of Turag River was highly polluted in both the wet and dry seasons [6].

Some selected water quality parameters along the river Buriganga were measured by Rahman and Al Bakri [7] between 2008-2009. Moreover, this study identified that 3,500 cubic meters of waste from other industrial areas are discharged daily through 22 large outlets along the banks into Buriganga. This study shows that Buriganga River water quality is not acceptable for aquatic ecosystems during both dry and wet seasons. However, the pH, PO -P, and Pb are within acceptable limits in both seasons [7].

In "Water Quality Assessment of Balu River, Dhaka Bangladesh," Sultana et al. [8] tested the water in Balu River for its pH, EC, and some other heavy metals that were present in it. Five samples were collected on March 10, 2018, which means the season was dry. The study found that the pH of the water was 7.76, and its electric conductivity (EC) varied between 910 and 1082 μS/cm. So, it can be said that the water of Balu River is alkaline while the electrical conductivity range is practically within the acceptable limit for Bangladesh standards [8].

The Water Quality Index of Semenyih River, Peninsular Malaysia, was carried out by Al-Badaii and Shuhaimi-Othman [9]. The concentration of heavy metals in this river is determined using "Multivariate Statistical Techniques." Therefore, this study demonstrates that multivariate statistical techniques are valuable for analyzing and interpreting data sets to evaluate water quality. The study said that the water of this river needs to be treated before using for domestic purposes [9].

MATERIAL AND METHODS

Study area

Six rivers, like a garland, surround Dhaka city. To the east are Balu and Sitalakhya, on the west are Turag and Buriganga, to the north is Tongi Khal, and to the south is Dhaleshwari [10]. Balu River, which runs through the east of Dhaka, is one of the most polluted areas. It is responsible for the contamination of Sitalakkha River, also found east of Dhaka. This pollution is increasing day by day, and it is becoming a threat to Saydabad water treatment plant [11, 12]. The river Buriganga, located in the western part of Dhaka, receives massive wastewater. Many tanneries located in the dams of Burigangaga use more than 200 chemicals, including many types of acid, preservatives, lime, sodium chloride, chromium, Etc., that cause river pollution [13]. Around the industrial towns of Tongi and Savar, Tongi Khal and Turag River streams are on Dhaka's western and northern edges. Tongi EPZ area, close to Tongi Khal and Turag Rivers, is location of many tanneries, Dyeing industries, brickfields, metal industries, battery manufacturing industries, drug companies, detergent manufacturing industries, ink production industries, textile, iron and steel workshops, and Pb-Zn melting industries [14]. Dhaleswari River, located in the southern part of Dhaka, receives a significant amount of residential waste, industrial waste, agricultural pesticides, and pollution. Figure 1 shows the map of rvers aroud Dhaka.

Water quality parameters included in river assessments

Different parameters must be sampled to establish these rivers' water quality index. The parameters analyzed in this assessment consist of:

pH

In water quality testing, pH is one of the most widely used analyses. We are able to determine the acidity or alkalinity of a solution by measuring its pH. The range of the pH scale is between 0 to 14. The pH scale is logarithmic, so a unit drop of pH refers to the acidity goes up by ten times. For example, banana (pH 5) is ten times more acidic than milk (pH 6). Water is said to as neutral when its pH value is 7. Water is said to as acidic when its pH is lower than 7.0. And when the pH value exceeds 7.0, the water is known as basic or alkaline.

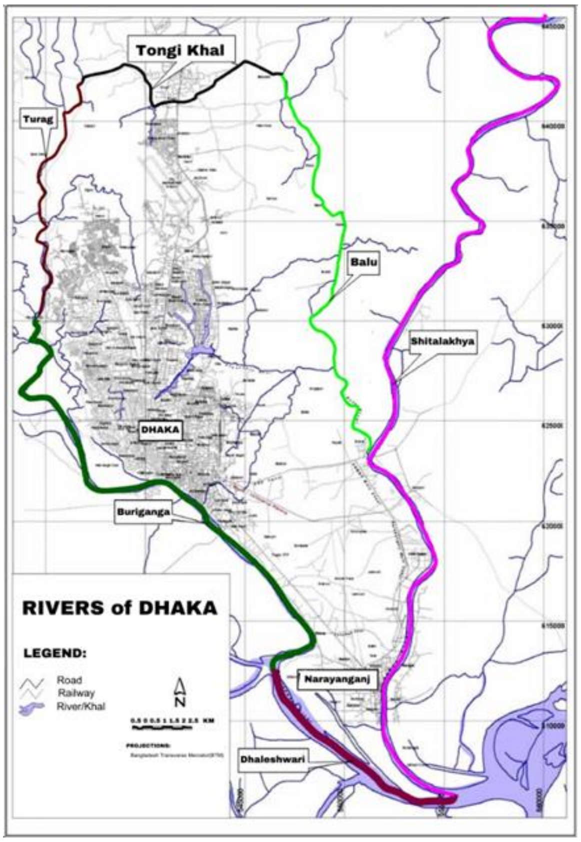

Figure 1. Map of rivers around Dhaka

Dissolved oxygen (DO)

Dissolved oxygen (DO) is a crucial parameter for determining the water quality. Fish and other species in water need oxygen to survive, and DO measures how much oxygen is dissolved in the water. It typically enters the water through photosynthesis by aquatic plants and the atmosphere. However, a number of factors have a possibility of affect DO levels such as temperature, salinity, atmospheric pressure, and pollutants. Fish and other aquatic organisms can suffer severe effects from low dissolved oxygen levels, including reduced growth, reproduction, and even death. When the rate of photosynthesis is higher than the rate of oxygen absorption into the atmosphere, excessive photosynthetic plant growth can oversaturate the water with DO to maintain the ecosystem's health and sustainability [15]. Monitoring and controlling the levels of DO in water is essential. This may be done by various methods, including aerating the water, reducing nutrient inputs, and reducing pollutant discharge.

Biochemical oxygen demand (BOD)

Biochemical oxygen demand (BOD) measures the amount of oxygen require to decompose microorganism in water. BOD is an important criterion in assessing water quality and is used to figure out how much organic pollution is in water bodies. BOD is important in river water quality assessments because it shows the level of organic contamination in the water. High levels of BOD indicate that in the water there is a large concentration of organic matter, which can result in a reduction of dissolved oxygen levels and harm aquatic life. Therefore, measuring BOD is crucial in determining a river ecosystem's health and identifying potential pollution sources [16].

Chemical oxygen demand (COD)

Chemical oxygen demand (COD) means the quantity of oxygen required to oxidise both organic and inorganic compound in water. COD is used to identify the pollution rate in the water bodies and it is a fundamental criterion for evaluating water quality. A high level of COD indicates a large amount of organic and inorganic substances in the water, which can harm aquatic life by decreasing dissolved oxygen levels and. “High levels of COD can also indicate the presence of pollutants such as heavy metals, pesticides, and other toxic substances in the water” [16].

Total dissolved solid (TDS)

Total dissolved solids (TDS) refer to the amount of organic and inorganic compounds present in water that can pass through a filter. These substances include minerals, salts, metals, and other dissolved particles. In the context of the paper, TDS is a parameter used to measure the concentration of specific constituents in wastewater generated from fossil fuel extraction activities. It is important to determine TDS in water because high TDS levels can affect water quality and make it unsuitable for certain uses. For example, high levels of chloride and sulphate in drinking water can cause taste and odour problems, increase pipe corrosion, and decrease the efficiency of boilers and heat exchangers [17].

Electrical conductivity (EC)
Electrical conductivity, or EC, is a way to measure how well water can carry an electric current. It is an important parameter to determine the level of dissolved minerals and salts in water. Most inorganic acid, base, and salt solutions have good conductivity. However, distilled water has a conductivity of fewer than one mhos/cm because conductivity is the inverse of resistance [18].

Turbidity
Turbidity is a measurement of the cloudiness or haziness of water resulting from suspended particles such as clay, sediment, and organic matter. It is a crucial parameter for evaluating water quality, as high turbidity can interfere with disinfection processes and reduce the effectiveness of water treatment. The amount of suspended particles in water that cause turbidity is measured by Nephelometric Turbidity Unit (NTU). The higher the NTU value, the more turbid the water is [19].

Suspended solids (SS)
Suspended Solids (SS) are tiny particles that are present in water and are visible to the naked eye. These particles can come from various sources, such as soil erosion, industrial waste, and sewage. Suspended solids can cause water to appear cloudy or murky and can also affect water quality by reducing the amount of oxygen available for aquatic life. “Total Suspended Solids (TSS) measures the total amount of suspended solids in water and is an essential parameter for monitoring water quality” [22].

Total Alkalinity
The ability of water to neutralize acid is measured by its total alkalinity. It refers to the sum of all the bases in the water sample, including bicarbonate, carbonate, hydroxide, and other weak bases. Alkalinity is an essential parameter in many environmental and industrial processes, including water treatment, agriculture, and aquatic ecosystem management.

Table 1. Standard value of different water quality parameter

Parameter	Standard
pH*	6.5-8.5
DO*	6 mg/L
BOD*	2 mg/L
COD*	4 mg/L
TDS*	1000 mg/L
EC*	1000 µS/ cm
Turbidity*	10 NTU
SS*	10 mg/L
Alkalinity**	130 mg/L

*World Health Organization,
**Department of Environment, Bangladesh [20, 21]

WQI calculation
Water quality indexes are calculated using the Weighted Arithmetic Index Method. The steps of this method are given below:

Step 1: Use this formula to calculate the unit weight (W_n) values for each parameter

$$W_n = \frac{k}{S_n} \quad (1)$$

where,

$$K = \frac{1}{1/_{S1}+1/_{S2}+1/_{S3}\dots\dots\dots\dots+1/_{Sn}} = \frac{1}{\Sigma 1/_{Sn}} \quad (2)$$

S_n= Desirable standard value of the n^{th} parameters
W_n= 1(unity) when all selected parameter unit factors are added together
Step 2: Determine the sub-index (Q_n) by using the following equation:

$$Q_n = \frac{[(V_n - V_0)]}{[(S_n - V_0)]} * 100 \quad (3)$$

where,
V_n = mean concentration of the n^{th} parameters
S_n = Desirable standard value of the n^{th} parameters
V_0 = Real values of parameters in clean water (generally $V_0 = 0$, for most parameters except for pH=7 and DO=14.6)

$$Q_n = \frac{[(V_n - V_0)]}{[(S_n - V_0)]} * 100 \quad (4)$$

Step 3: combining steps 1 and 2, WQI calculate as follows:

$$Overall\ WQI = \frac{\sum W_n Q_n}{\sum W_n} \quad (5)$$

RESULTS AND DISCUSSION

Assessing water quality is essential to ensure the safety and sustainability of water resources for human consumption and other uses. Table 2 shows that we measured several physicochemical parameters, including pH, turbidity, COD, TDS, DO, BOD, alkalinity, and electrical conductivity, in six different rivers of Dhaka throughout both the dry and the wet seasons. The results were used to determine the Water Quality Index (WQI)

Table 2. Concentration of physiochemical parameters in surface water from various rivers in Dhaka, Bangladesh. Data are collected from numerous individual studies. The values that are presented indicate the average of all the data

Parameters	Sampling sites	Dry season (December-March)			Wet season (July-October)			References
		Average	Range		Average	Range		
			Min.Value	Max.Value		Min.Value	Max.Value	
pH	Buriganga	7.3	7	7.5	6.88	6.7	7	[23]
	Dhaleshwari	7.2	7	7.5	7.1	6.9	7.4	[23]
	Turag	7	6.8	7.5	6.85	6.5	7.8	[23]
	Tongi Khal	7.9	7.5	8.4	7.6	7	8.3	[24, 25]
	Balu	6.85	6.84	6.88	6.7	6.58	6.86	[26]
	Shitalakhya	7.5	7.1	7.8	7.3	6.8	7.8	[23]
DO (mg/L)	Buriganga	0.1	0.1	0.3	4.8	4.5	5.1	[23]
	Dhaleshwari	2	1	4.5	5	4	6.2	[23]
	Turag	0.1	0.1	0.3	5	4	6	[23]
	Tongi Khal	0.37	0.16	0.91	4.4	3.8	5.6	[14, 24]
	Balu	2.8	1	3.4	0.9	0.8	2.4	[26]
	Shitalakhya	3	2	4	8	3	10	[23]
BOD (mg/L)	Buriganga	18	5	25	5	4	5.5	[23]
	Dhaleshwari	4	1	7	2	1	5	[23]
	Turag	46	12	50	5	2	10	[23]
	Tongi Khal	42	5.6	91.9	6	0	8	[14, 24]
	Balu	8	7.32	8.71	6.2	5.2	7.15	[26]
	Shitalakhya	30	5	40	2	1	6	[23]
COD (mg/L)	Buriganga	200	50	220	30	10	40	[23]
	Dhaleshwari	17	10	30	15	10	20	[23]
	Turag	130	50	250	20	10	50	[23]
	Tongi Khal	118	33	212	200	180	210	[14, 24]
	Balu	270	250	280	190	170	210	[14]
	Shitalakhya	110	40	130	25	20	40	[23]
TDS (mg/L)	Buriganga	500	300	600	80	50	100	[23]
	DhaleshwarI	220	200	250	110	100	150	[23]
	Turag	550	300	750	40	10	100	[23]
	Tongi Khal	1480	750	2200	1030	350	1620	[14]
	Balu	1925	1395	2458	1710	1287	2130	[26]
	Shitalakhya	300	200	500	180	80	230	[23]
EC (µS/ cm)	Buriganga	801	1124	543	134.1	116.2	168.6	[23]
	Dhaleshwari	408	306	452	169.8	143.3	183.1	[23]
	Turag	1055	515	1275	157.4	133	194.2	[23]
	Tongi Khal	1127	587	1579	780	680	890	[24, 25]

	Balu	710	620	780	150	140	160	[26]
	Shitalakhya	712	412	990	275	165	425	[23]
Turbidity (NTU)	Buriganga	50	10	80	30	10	50	[23]
	Dhaleshwari	27.25	15.25	40	79.6	47.2	130.4	[27, 28]
	Turag	35	28	40	54.78	12.31	97.2	[29, 30]
	Tongi Khal	11	5	20	18	11	28	[25]
	Balu	21	19.5	22.5	10.5	8	13	[26, 31]
	Shitalakhya	35.7	50	19.6	21.58	46.33	11.3	[32]
SS (mg/L)	Buriganga	32	23	38	47	45	48	[23]
	Dhaleshwari	1200	400	1600	250	225	275	[33]
	Turag	115	100	125	95	70	115	[30]
	Tongi Khal	94	26	166	155	140	180	[24, 34]
	Balu	375	350	400	180	100	300	[31, 35]
	Shitalakhya	18	11	27	46	40	58	[23]
Alkalinity (mg/L)	Buriganga	137.37	106.11	159	53	44	67	[23]
	Dhaleshwari	88	80	110	49	40	60	[23]
	Turag	185	110	386	57	41	80	[23]
	Tongi Khal	306.8	167.2	400.4	220	200	250	[25]
	Balu	382.4	427.14	305	91.5	122.04	61.02	[36]
	Shitalakhya	124	100	140	58	34	80	[23]

for each river and season. In the study, Buriganga, Dhaleshwari, Turag, Tongi Khal, Balu, and Shitalakhya river water samples had overall mean pH values of 7.3, 7.2, 7, 7.9, 6.85, and 7.5 during the dry season, and 6.88, 7.1, 6.85, 7.6, 6.7, and 7.3 throughout the rainy season. At Tongi Khal, the average pH (pH = 7.9) was found to be highest in the dry season. This occurred Due to large base saturations into a small amount of water during the dry season [37]. During the wet season, however, in order to dilution effect, the pH value of the water was mildly lower, and Balu River had the lowest mean pH value (pH = 6.7). For fish and other aquatic species, DO is a crucial factor. According to WHO, the specific value for DO is six mg/L, and the ideal value is 14.6 mg/L. The lower DO value represents the most polluted water. The lowest average DO value was found during the dry season at all the rivers compared to the wet season. The discharge of organic waste is one of the leading causes of low DO levels. The lowest DO value was found at the Buriganga and Turag rivers. This is evident that DO is low, mainly in industrial and non-agricultural areas. In the study, the lowest value of BOD (2 mg/L) is found at Dhaleshwari River during the wet season. The highest BOD value (46 mg/L) was detected for Turag River in both dry and wet seasons compared to the Buriganga River (18 mg/L), Dhaleshwari (4 mg/L), Balu (8 mg/L) and Tongi Khal (42 mg/L), Shitalakhya (30 mg/L) in the dry season. According to this research, during the dry season, the concentration of COD is highest (270 mg/L) in Balu River and lowest (200 mg/L) in Buriganga River and throughout the wet season, the lowest at Dhaleshwari River (15 mg/L) and the highest at Tongi Khal (200 mg/L), which is absolutely beyond standards. The value of BOD and COD were increased with increase in the pollution load [38]. Total dissolved solids (TDS) represent the concentration of dissolved components in water, including metal ions. The highest TDS value found in this study was at Balu River (1925 mg/L) throughout the dry season, which crossed the limited rate. During the wet season, the values were relatively low because of the dilution of contaminated water with rainwater. From the data table, it was noticed that turbidity varied among the rivers and seasons. All but Tongi Khal showed the range within Bangladesh standards though crossing the world standard guidelines holding 11 NTU throughout the dry season and 18 NTU throughout the wet season. On the other hand, SS can include various materials that dissolve in the water during the sampling period. In most cases, dry season water contained more SS than wet season water. Only the Shitalakhya River presented a comparati-

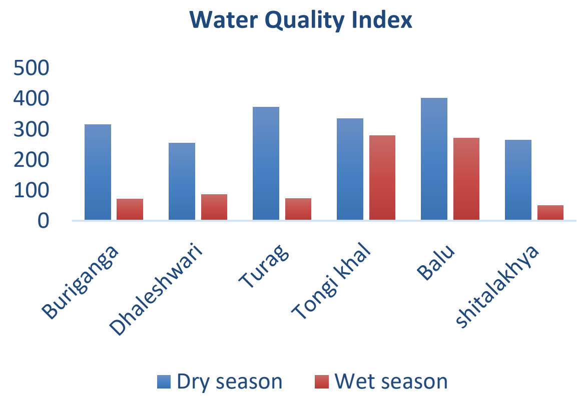

Figure 2. Seasonal variation in WQI

vely lower SS of 18 mg/L in dry and 46 mg/L in wet seasons. EC represents the capacity to pass electrons through the water. The more the water is polluted, the more the electron can pass easily through the water. The data shows that during the dry season, water is more conducive to electron transfer than during the wet season. The highest value (1127 µS/ cm) was found at Tongi Khal during the dry season, and the lowest value (134.1 µS/ cm) was found at Buriganga River throughout the wet season.

As a result of its capacity to represent the significance of multiple water quality indices on the water's quality, it is commonly used for the identification and assessment of total water pollution [39]. The graph shows us the variation of the water quality index of six rivers throughout both wet and dry seasons. The index suggested that water of Balu Rivers is more polluted during the dry season than the other five rivers of Dhaka. This is especially true for the rivers located in the city's central district, which receives significant chemical and industrial waste. The values show that all the rivers contained more than 100 WQI values during the dry season. According to the WQI scale, a value of more than 100 is unsuitable for drinking and fish culture. So, none of these rivers in Dhaka suits drinking and fish culture. Now if we are looking at the WQI value of the wet season according to the WQI scale, the water of Tongi Khal and Balu Rivers has more than 100 WQI values which exceed the permissible limit for drinking & fish culture. On the other hand, Dhaleshwari River contains a WQI value of 75-100 which is considered very poor-quality water according to the WQI scale. Hence, the water of the Buriganga River contains a WQI value of 70.98 which is considered poor-quality water and can be used for agriculture and industrial purposes. Although the water of the Shitalakhya River holds the best water quality status among all the rivers, it is considered good water quality throughout the wet season. It can be used for human consumption, agriculture and industrial purposes.

Table 3. WQI range, condition, and potential uses of the water sample [40, 41]

WQI	Water quality status (WQS)	Potential uses
0–25	Excellent	Human consumption, agriculture and industrial
26–50	Good	Human consumption, agriculture and industrial
51–75	Poor	Agriculture and industrial
76–100	Very poor	Agriculture
>100	Not suitable for human consumption and fish culture	Needs to be treated properly before use

CONCLUSION

Different water quality indices were determined to evaluate the pollution status of the rivers. All of the river's water quality status was found within the 'Not suitable for human consumption and fish culture' (>100) range during the dry season based on the drinking water quality index (DWQI) using Weighted Arithmetic Index Method and during the wet season, the water quality status was found between 'good,' 'poor,' 'very poor' and 'not suitable for human consumption and fish culture.' From the results, it can be concluded that Buriganga, Turag, and Balu rivers are the most polluted. Subsequently, observed WQI values suggested severe degradation of water quality of the rivers falling under the category unfit for drinking purposes. WQI values further highlighted untreated sewage discharge points as significant pollution sources. Overall, the results of this study highlight the urgent need for effective measures to control and prevent water pollution in Dhaka's rivers, particularly during the wet season. Such measures may include the proper management of industrial and agricultural practices and the implementation of strict regulations to prevent the discharge of untreated wastewater into the rivers**.**

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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Persian Abstract

چکیده

داکا، پایتخت بنگلادش، توسط شش رودخانه مانند گلدسته احاطه شده است. جمعیت رو به رشد داکا، شهرنشینی و مدرن شدن باعث ایجاد مشکلاتی در تخلیه فاضلاب و آلودگی آب در بدنه آبی این رودخانه شده است. این رودخانه‌ها فاضلاب را از منابع متعدد دریافت می‌کنند که به صورت پساب‌های صنعتی، فاضلاب شهری، زباله‌های خانگی، زباله‌های بالینی و روغن تخلیه می‌شوند. آب این رودخانه‌ها به میزان فزاینده‌ای در حال آلوده شدن است. این مطالعه چگونگی تغییر آب‌های سطحی رودخانه‌های داکا در طول سال را بررسی کرده است. نتایج شاخص‌های مختلف کیفیت آب نظیر DO، BOD، COD، pH، TDS، EC، SS، کدورت و قلیائیت، با دستورالعمل‌های تنظیم‌شده توسط دپارتمان محیط‌زیست بنگلادش (DoE) و سازمان بهداشت جهانی (WHO) مقایسه شد. نمونه‌برداری در دو فصل از سال، خشک و مرطوب انجام شد. در این مطالعه، هدف پژوهشگران نیز تعیین تأثیر این پساب بر روی آب رودخانه و ارائه گزارشی از وضعیت یک رتبه عددی برای تعیین کیفیت آب رودخانه‌ها می‌باشد.