

EFFECT OF IDOL IMMERSION ON DIURNAL WATER QUALITY PARAMETER IN FUTALA LAKE OF NAGPUR, INDIA

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Abstract: Idol immersion activities during festive occasions deteriorate water quality in urban lakes and considered as an anthropogenic activity. Water quality assessment is an important exercise to evaluate the nature and extent of negative impact of idol immersion on water quality parameters. As lakes have more fragile ecosystem because they do not have or very little self purification capacity and it gets polluted very quickly. The incidence of fish kills in urban lakes due to immersion or due to cloudy weather conditions or eutrophication etc. have been on rise in the recent years. In the present paper we discuss the diurnal changes in physico-chemical parameter during pre-immersion, immersion and post immersion of idols of Futala Lake.

Keywords: Futala Lake, idol immersion, water quality, environmental effect.

1. Introduction

Water is an important component for survival of life. All forms of life upon the earth depend upon water for their mere existence. Festivals are an integral part of rich and diverse cultural heritage of India. In India idol immersion is another anthropogenic activity (Gupta et al. 2011) Idol immersion activities during festive occasions deteriorate water quality in urban lakes. These idols are made up of plaster of paris, clay, and cloth supported by small iron rods, and are coloured with different types of paint (M. V. Reddy and A.V. Kumar 2001) Literature review suggests that idols are immersed in water bodies lead to significant alteration in water quality (Dhote et al 2011). Increase in chemical pollutants after idol immersion in the lake waters have been reported (Bajpai 2008). The floating material released through idol in the river and lake after decomposition result in eutrophication (Leland, 1991). Non-biodegradable materials and synthetic paints used for making idols are posing serious threat to aquatic life and environment. Water quality assessment is an important exercise to evaluate the nature and extent of negative impact of idol immersion on water quality parameters. Lakes have more fragile ecosystem because they do not have or very little self purification capacity and it is gets polluted very quickly.

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2. Material & Methods

2.1 Study area

Nagpur city is one of the India's fastest growing cosmopolitan city. Futala lake lie on western side of the city at a latitude of 21°09'11.74" N and longitude 79°02'32.77" E. The catchment area of futala Lake is 0.40km². It is one of the major site for idols immersion in Nagpur. The present work is carried out to study the physico-chemical parameter of futala lake to evaluate the diurnal changes in water quality parameters during pre- immersion, immersion and post immersion.

2.2 Sampling site and Sample collection

In the presents study prominent spot of idol immersion in futala lake were selected for water sampling. Sampling was done at three pre decided sampling site. Water Samples were collected by using sterilized water sampler bottle below 10 to 20 cm of the surface from study sites. Pre-immersion samples were collected a week prior to immersion activities. During the immersion period immersion samples were collected whereas post-immersion samples were collected one week after the completion of immersion



activities. The samples were collected from three stations; the frequency of sample collection was four times a day at the interval of 6 hours from Futala Lake in the month of September 2015

The samples were analyzed for various water quality parameters viz Transparency, Temperature, DO. pH, conductivity and TDS alkalinity , total hardness, free CO₂ , nitrate, ammonia, hydrogen sulphide and phosphate.

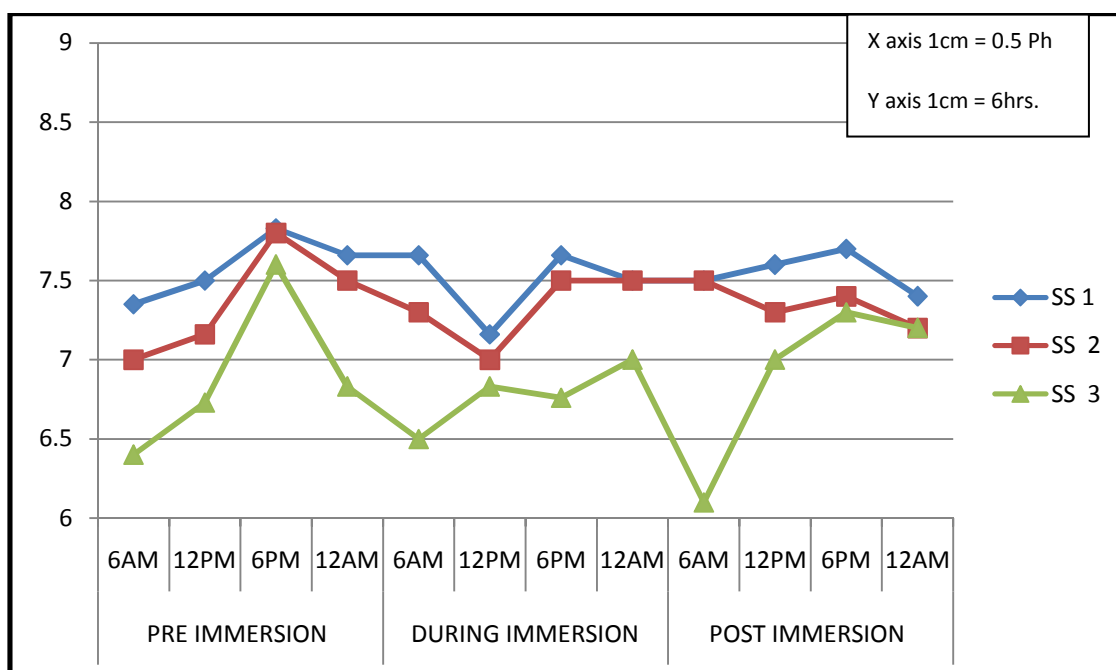
Transparency is measured with the help of secchi disk. The water parameter viz temperature, DO. pH, conductivity and TDS were analyze with help of meter and alkalinity , total

hardness, free CO_2 , nitrate, ammonia, hydrogen sulphide and phosphate were subjected to chemical analysis with the prescribed procedures (APHA 2005).

Results and discussions

pH: pH is the measure of the intensity of acidity or alkalinity and measure the concentration of hydrogen ions in water. The pH of water is important because it affects solubility of nutrient. The pH of Futala Lake ranges from 7-7.8, with a minimum pH of 6.4 and a maximum of 7.8. pH varied from 6.4 -7.8 in pre immersion, 6.5-7.6 immersion and 6.1-7.6 in post immersion. In the present study, a decrease in pH during immersion period has been observed.

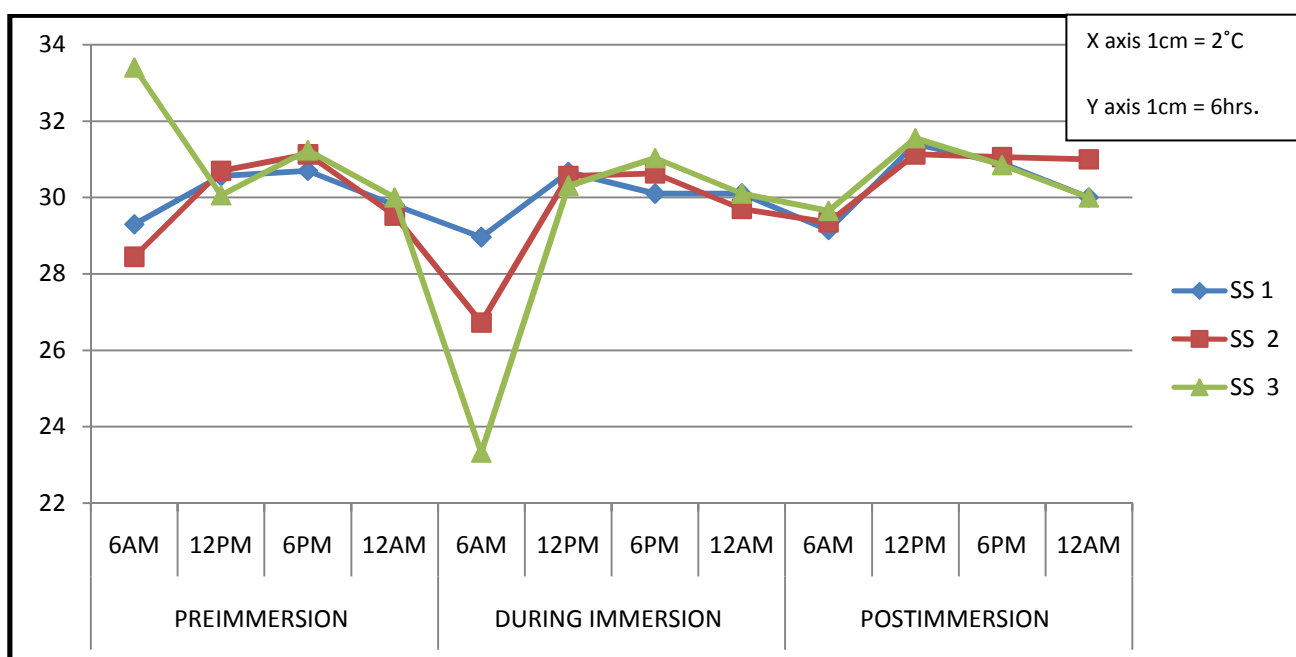
Group	PRE IMMERSION				DURING IMMERSION				POST IMMERSION			
	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM
Sample site - 1	7.35	7.5	7.83	7.66	7.66	7.16	7.66	7.5	7.5	7.6	7.7	7.4
Sample site - 2	7	7.16	7.8	7.5	7.3	7	7.5	7.5	7.5	7.3	7.4	7.2
Sample site - 3	6.4	6.73	7.6	6.83	6.5	6.83	6.76	7	6.1	7	7.3	7.2



PH Graph

TEMPERATURE: temperature is the degree of hotness. It is a major physical parameter sustaining the life of aquatic flora and fauna. The water temperature of Futala was in a ranges of 28- 31⁰C. During the study period maximum and minimum temperature observed is 33.4^c and 23.33[°] C respectively. The mean temperature during the immersion period has been slightly decreased from 30.45 to 29.35 and further it is increased to 30.50 in post immersion period.

Group	PRE IMMERSION				DURING IMMERSION				POST IMMERSION			
	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM
Sample site – 1	29.3	30.56	30.7	29.8	28.96	30.66	30.1	30.1	29.15	31.4	30.9	30
Sample site – 2	28.45	30.7	31.13	29.53	26.73	30.56	30.63	29.7	29.35	31.13	31.06	31
Sample site – 3	33.4	30.06	31.23	30	23.33	30.3	31.03	30.1	29.65	31.55	30.85	30

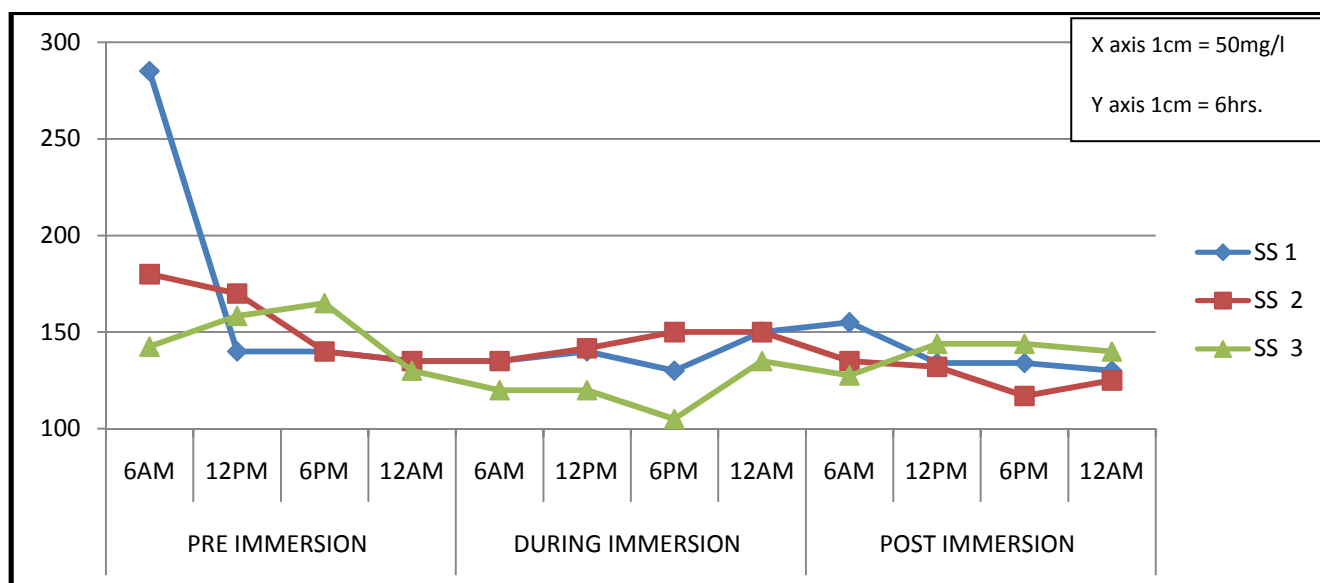


Temperature Graph

TOTAL HARDNESS: Hardness is a measure of divalent salts or positively charged ions particularly, calcium (Ca²⁺) and magnesium (Mg²⁺) in water. Total hardness is the sum of the concentration of Ca²⁺ and Mg²⁺, expressed in ppm in calcium carbonate. Total hardness is not a pollution indicator but it indicates water quality

Hardness level in the Futala Lake during the study period varied in a range of 105 mg/lit - 285 mg/lit. The average value in pre-immersion period was 160 mg/lit- and it is noticeably decreased up to average of value of 134 mg/lit during immersion.

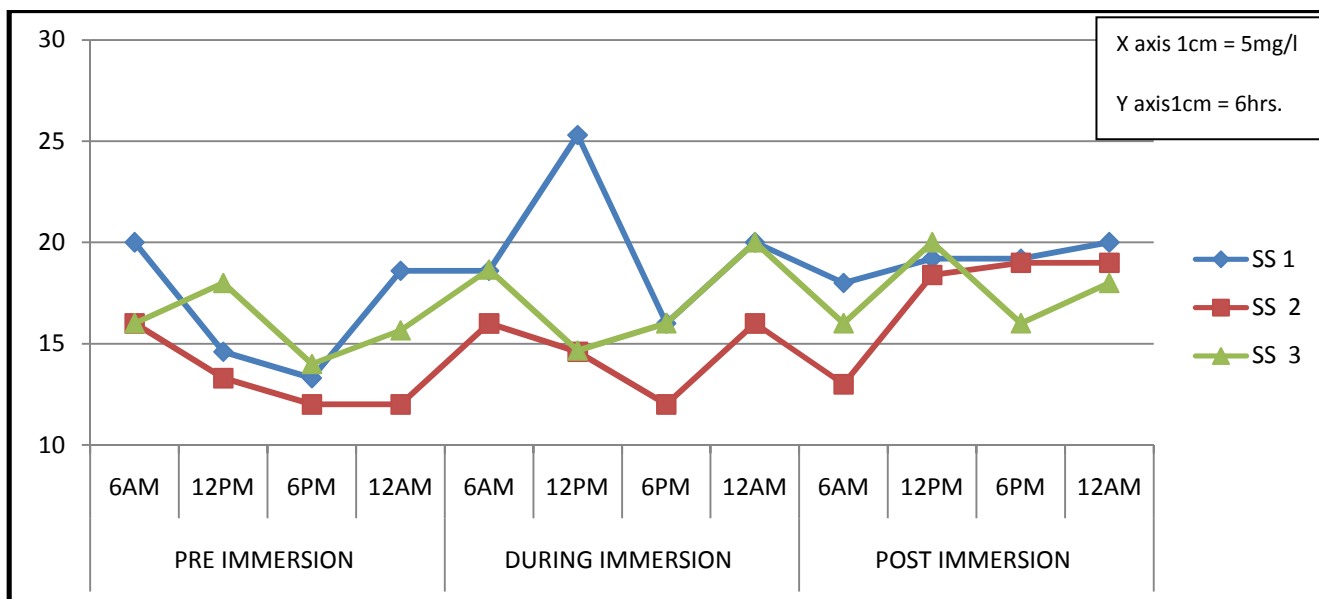
Group	PRE IMMERSION				DURING IMMERSION				POST IMMERSION			
	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM
Sample site – 1	285	140	140	135	135	140	130	150	155	134	134	130
Sample site – 2	180	170	140	135	135	141.66	150	150	135	132	117	125
Sample site – 3	142.5	158.33	165	130	120	120	105	135	127.5	144	144	140



Total Hardness Graph

FREE CO₂: There is an inverse relationship exist between dissolved oxygen level and free carbon dioxide level. As the level of DO decreases, CO₂ level in water increases. The result shows a clear increase of CO₂ level after immersion of idols. The CO₂ level stays between the range of 15 to 20 mg/lit in post-immersion period.

Group	PRE IMMERSION				DURING IMMERSION				POST IMMERSION			
	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM
Sample site – 1	20	14.6	13.3	18.6	18.6	25.3	16	20	18	19.2	19.2	20
Sample site – 2	16	13.3	12	12	16	14.6	12	16	13	18.4	19	19
Sample site – 3	16	18	14	15.66	18.66	14.66	16	20	16	20	16	18

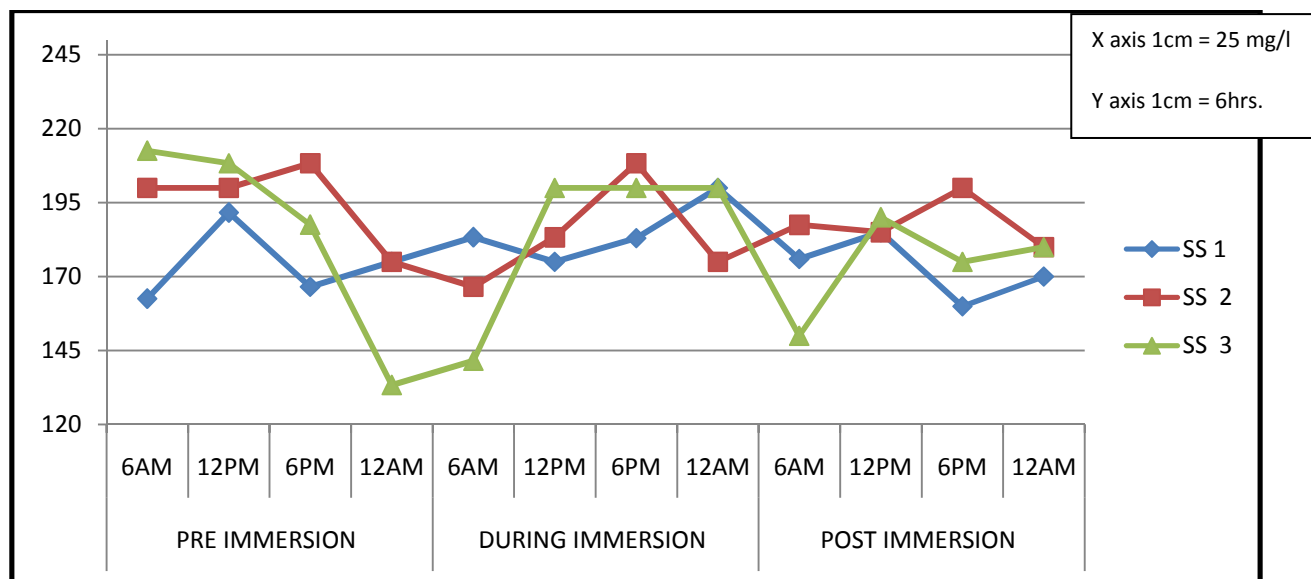


Free CO₂ Graph

ALKALINITY: Alkalinity of water is its acid neutralizing capacity. It is the sum of all the titratable bases. Alkalinity is primarily a function of carbonate, bicarbonate and hydroxide ion concentration of water. The higher the alkalinity, the lesser is the variation in pH of water.

In the present study it is clearly observed that there is decreasing trend in average alkalinity values in comparison with pre and post immersion period. The maximum and minimum alkalinity obtained is 212.5 mg/lit and 133.3mg/lit respectively in the pre- immersion period.

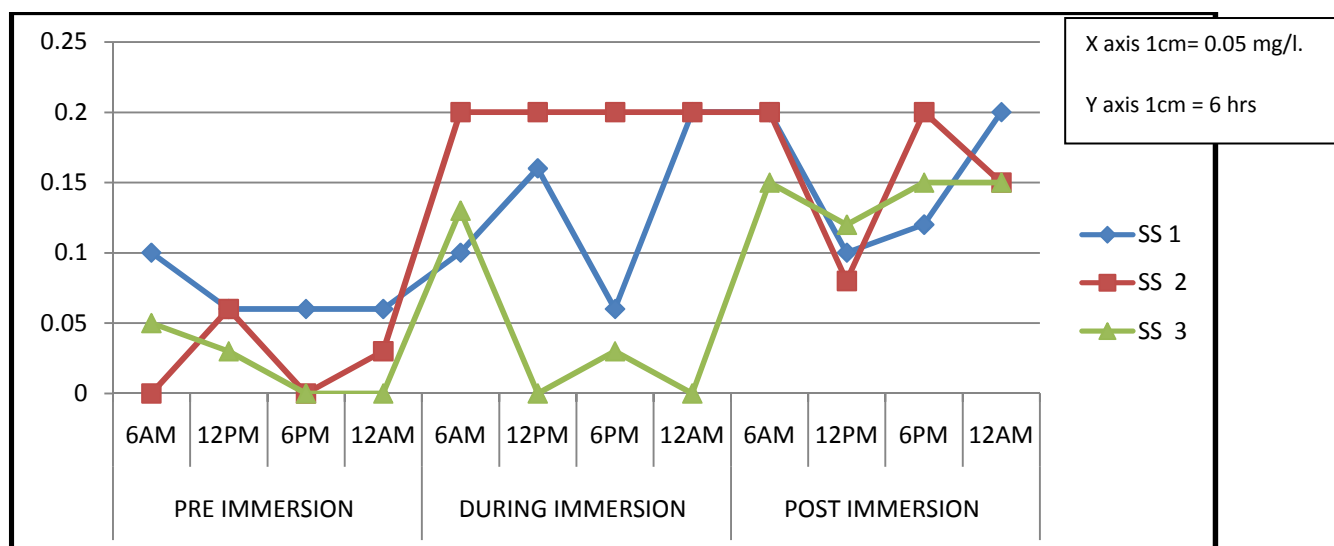
Group	PRE IMMERSION				IMMERSION				POST IMMERSION			
	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM
Sample site – 1	162.5	191.6	166.6	175	183.3	175	183	200	176	185	160	170
Sample site – 2	200	200	208.3	175	166.6	183.3	208.3	175	187.5	185	200	180
Sample site – 3	212.5	208.3	187.5	133.3	141.6	200	200	200	150	190	175	180



Alkalinity Graph

AMMONIA: Ammonia is a form of nitrogen found in organic materials and many fertilizers. It is the first form of nitrogen released, when organic matter decays and is the main nitrogenous waste excreted by most fish and freshwater invertebrates. The ammonia level during the study period varied in the range of 0 mg/lit – 0.2 mg/lit. The ammonia graph analysis shows that, there is a considerable increase in the level of ammonia in the water body, after the idol immersion. A slight increase in ammonia level can disturb the balance of aquatic eco- system.

Group	PRE IMMERSION				DURING IMMERSION				POST IMMERSION			
	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM
Sample site – 1	0.1	0.06	0.06	0.06	0.1	0.16	0.06	0.2	0.2	0.1	0.12	0.2
Sample site – 2	0	0.06	0	0.03	0.2	0.2	0.2	0.2	0.2	0.08	0.2	0.15
Sample site – 3	0.05	0.03	0	0	0.13	0	0.03	0	0.15	0.12	0.15	0.15

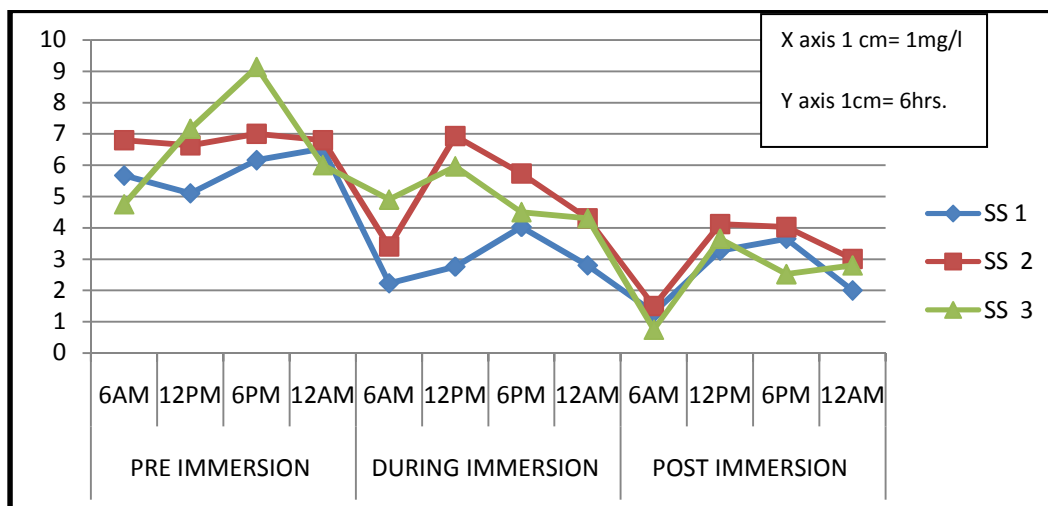


Ammonia Graph

DISSOLVED OXYGEN (DO): DO is the amount of oxygen dissolved in a water body. It is an important indicator of the health of the health of aquatic eco system. Dissolved oxygen is of having great importance in water quality monitoring and it is considered as an important factor which reflects physical & biological processes in water body. Dissolved oxygen is one of the important parameter for the assessment of the solubility of water for flora & Fauna. (D.K. Billore, M. Dandawate 2015)

The DO graph shows a decreasing trend in the level of oxygen. A maximum DO of 9.13mg/lit is obtained in pre immersion period and drastically it decreases up to a very low level of 0.75mg/lit in post immersion period. The low level of DO indicating high decomposition of organic matter. The idol immersion adversely affects the dissolved oxygen in water body and during this investigation it is observed in Futala lake decrease in (DO) was due to cumulative effect of various religious activities.

Group	PRE IMMERSION				DURING IMMERSION				POST IMMERSION			
	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM	6AM	12PM	6PM	12AM
Sample site – 1	5.67	5.1	6.16	6.53	2.23	2.76	4.03	2.8	1.3	3.27	3.65	2
Sample site – 2	6.8	6.63	7	6.8	3.4	6.93	5.73	4.3	1.5	4.12	4.02	3
Sample site – 3	4.75	7.16	9.13	6	4.9	5.96	4.5	4.3	0.75	3.65	2.52	2.8



DO Graph

CONCLUSION

The study about water parameters in Futala Lake suggests that, idol immersion has major impact on water quality and aquatic flora and fauna of the lake. The water quality parameters like Ph, hardness and temperature have significantly decreased during the immersion period and then increased in the post immersion period. As compared to pre immersion period, parameters like ammonia and free CO₂ shows an increasing pattern in during and post immersion period. The present study indicates, large decrease of DO in during and post immersion samples. The current research indicates that the pollution load on water bodies has increased significantly during idol immersion period. It is also recommended that the idols should be used which are made up of natural biodegradable materials instead of organic pollutant materials in natural water bodies for eco-friendly customs. Henceforth, this reduces the chances of spoiling the aquatic ecosystem and also public health.

The governmental bodies should be strictly deal with this issue for the safety of the environment and public health by promoting the use of eco-friendly biodegradable materials to create idols and also establish artificial plastic pond at major sites of idol immersion.

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