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# Physico- chemical parameters of Narmada River Water: A review

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**Abstract**
Fresh water is necessary for healthy living. River water is used for various purposes such as drinking, bathing, irrigation etc. This natural resource is being polluted by indiscriminate disposal of sewage, industrial waste and human activities which affect quality of river water. Therefore, it is necessary for monitoring the water quality of river by analysis of various physicochemical parameters. The objective of this paper is to study various water pollutants available in Narmada River followed by literature review.

**Keywords:** Chemical characterisation of river, Surface water quality, Water pollution, River quality, Biochemical oxygen demand (BOD).

## 1. Introduction
Natural water bodies like rivers are subjected to pollution comprising of organic and inorganic constituent. Omkareshwar is the largest cities situated at the bank of river Narmada, which is also a holy place. The river Narmada drains the catchment between the Vindhyan Mountains to the north of the river stretching east-west in general, and the Satpura mountain ranges to the south. It flows through the undulating plains of Omkareshwar about 300m high, dotted with occasional low hills. It has a total course of 1312 km before joining the Gulf of Cambar in the Arabian Sea and total basin of 98,796,80 sq km. Its First 1,077 km length is in Madhya Pradesh and the last 161 km. is in Gujarat. Of the remaining length, 35 km forms a common boundary between Madhya Pradesh and Maharashtra. Biological oxygen demand (BOD) also indicates the amount of organic compounds in water as measured by the volume of oxygen required by bacteria to metabolise it under aerobic condition. These physico-chemical characteristics in many ways have significant influence and impact on aquatic life. Any alteration in these parameters may disturb the quality of water. Dissolved oxygen is of great importance to all the living organisms and is considered to be the sole parameter which to a large extent can reveal the nature of whole water body. Eutrophic water bodies have a wide range of dissolved oxygen and as such oligotrophic water bodies have narrow range of dissolved oxygen .

## 2. Sources of pollutants
Omkareshwar and Maheshwar town is situated along the river Narmada and city is famous for beautiful “Ghats”. The river is being polluted here by much city sewage along with industrial effluents from Mill as it provide a cheaper mode of waste disposal. It flows 1,300 km west through the states of Madhya Pradesh and Gujarat in terms of its catchment area. In Narmada river huge quantity of domestic waste, municipal sewage dumped daily in addition to industrial effluents and agricultural run-off.
Pollution of surface and ground water is largely a problem due to rapid urbanization and industrialization. The large scale urban growth due to increase in population or migration of people from rural areas to urban areas has increased domestic effluents while industrial development manifested either due to setting up of new industries or expansion of the existing industrial establishments resulting in generation copious volume of industrial effluents. Human activity and cattle grazing also add to the river pollution. Once the contaminants enter the water source it is a difficult and expensive to remove them. Unplanned and injudicious disposal of municipal waste, causing pollution of water bodies. The industries are also falling in the same line by not following regulation of establishing the effluent treatment plants.
Rivers are the main inland water resources for domestic, industrial and irrigation purposes and often carry large municipal sewage, industrial wastewater discharges and following regulation

Of establishing the effluent treatment plants.organisms and any alterations in water may lead to the issue of survival for these organisms. Water maintained by several physico-chemical factors and any decrease or increase cause the death of various important organisms. Water quality and the risk to waterborne diseases are critical public health concerns in many developing countries today. The increasing anthropogenic pressure influences in recent years in and around aquatic systems and their catchment areas have contributed to a large extent to deterioration of water quality and dwindling of water bodies leading to their accelerated eutrophication.

Good quality of water is essential for living organisms. The quality of water can be assessed by studying its physical and chemical characteristics as well as by plankton growing in it. Because of vast population and negligence of human being the quality of water is being deteriorated day by day. The limnology plays an important role in the decision making process for problems like dam construction, pollution control, fish and aqua culture practice. Changes in the water quality affect the biotic community of the aquatic ecosystem which ultimately reduces the primary productivity. Water quality index is defined as a rating reflecting the composite influence of different water quality parameters on the overall quality of water. The physico chemical characteristics like pH, BOD, dissolved oxygen, total alkalinity, total hardness, chloride contents etc. in one way or another has significant influence on aquatic life. Aquatic organisms are influenced by changing in water quality. The blocking of a river and the formation of a lake significantly alters the ecological conditions of the river, which have changes in its physico chemical features like pH, total alkalinity, total hardness, TDS, chloride, dissolved oxygen and BOD. Some of the parameters showed significant changes resulting into deterioration of water quality. It destroys the aquatic habitats for many organisms.

In the developing countries like India the optimum development, efficient utilization and effective management of their water resources should be dominant strategies for economic growth. But in recent years, unscientific management and use of the resources for various purposes almost invariably has created undesirable problems. Water logging and salinity in the case of agricultural use and environmental pollution of various limits as a result of mining, industries and municipal use.

Rivers are the main inland water resources for domestic, industrial and irrigation purposes and often carry large municipal sewage, industrial wastewater discharges and seasonal run-off from agricultural land to the coastal region. It is for this reason that the river water is mostly enriched in nutrients compared to other environments. The spatial heterogeneity within the river, however, is due to existing local environmental conditions such as light, temperature, water discharge and flow velocity that change with time.

Assessment of water quality conditions over an area with respect to time and space requires the sampling and monitoring activities to be carried out in a systematically. The location of a sampling point is probably the most critical factor for analysis of water quality. If the samples collected are not representative of the water mass, the frequency of the sampling as well as the mode of data interpretation and presentation becomes inconsequential.

Besides the economic considerations, there are three levels of criteria of selecting the sampling location. The macro-location deals with river reaches in the river basin, the micro-location deals with the location of outfalls or other specific features within a river reach and the third level deals with representative location points within a river's cross-section.

**3. Impact of water quality on health**

Apart from the considerations related to develop to the development of water resources there has been an increasing concern in all communities over the impact of water quality on public health and general environmental conditions. The largest area where environmental pollution appears is water resources. Water pollutions not only results in significant economic losses, but may also lead to life threatening levels depending on the type and intensity of pollutants.

Consequently, the society itself stresses the need for a better understanding of how water quality characteristics evolve in space and time under natural and manmade conditions.

**4. Method used for treatment of wastewater**

The present study was conducted at two selected sampling stations. Taking the samples with a view to assess the nature and degree of pollution. And samples were collected from just below the water surface. At each of the station, for all physico-chemical analysis. In the analysis of the physico- chemical properties of water, standard method prescribed in limnological literature were used. Temperature and pH were determined at the site while total hardness, chlorides, sulphates, BOD and T.D.S. were determined in the laboratory. The physico-chemical parameters were determined adopting methods given by APHA (2002).

**5. Literature review**

**Salahuddin *et al.* (2014)** [10]. Studied that the variations in physico-chemical parameters such as temperatures, pH, transparency, total alkalinity, total hardness, chloride content, dissolved oxygen, biochemical oxygen demand (BOD) and chemical oxygen demand (COD) were observed between 1100 and 0700 h.

**sanjay *et al.* (2009)** [6, 12]. mentioned that the pollution load increases due to mass bathing, physico-chemical analysis of water clearly indicates that water quality deteriorates and it take longer time to recover the previous water quality through self-purification process.The minimum and maximum pH was recorded in the range of 7.20 to 7.61 where the pH value of drinking water standard (6.5 to 8.5). The DO level was observed in the range of 8.20 to 10.2mg/L during the study. The values of BOD were found in the range of <1 mg/L to 20 mg/L and COD were found in the range of 6 mg/l to 48 mg/L. Total Coliform were found above the standard limit during and after mass bathing.

**pratiksha *et al.* (2013)** [13]. found that the pH of Wardha river water samples in pre-monsoon season was found to be in the range 7.5 to 8.0 for monsoon season in the range of 8.2 to 8.9 and for post monsoon 7.4 to8.3. The turbidity value of water sample of Wardha river in pre-monsoon monsoon and post monsoon were observed in the range of 20.2- 28.2, 35 - 69, 20 - 44, NTU respectively, along with an average value of 95%CL was found to be 124 +2.9, 51.75 +12.02, 30.5 +8.5 respectively. Standard for chloride is 250mg/l. The concentration of chloride in Wardha river water sample in pre monsoon, monsoon and post monsoon was found to be in the range of 248-255, 116-350, 155-182 mg/l respectively. The amount of total hardness in the Wardha river water samples in pre-monsoon, monsoon and post-monsoon season was found to be in the range of 230-360, 196-305, 348-400 mg/l. The

concentration of total solids in the Wardha river water sample in pre- monsoon, monsoon and post-monsoon was found to be in the range of 260- 360, 480- 510, 350- 431 mg/. The concentration of DO in Wardha river water sample in pre-monsoon, monsoon and post-monsoon was found to be in the range of 0.28-0.34,0.54-0.60,0.30- 0.45 mg/l.

**Shailendra *et al.* (2009)** carried out the study at temperature varying from $20^0$C to $33^0$C. The minimum temperature was recorded in the month of January, maximum was recorded in the month of May. In present study concentration of DO in Narmada water samples varied from 6.3 mg/l to 9.0 mg/l with minimum in the month of May, and maximum in the month of January. the observed pH values ranging from 7.4 to 9.1 show that the present water samples are slightly alkaline, the BOD was ranged between 0.28 mg/l to 1.20 mg/l, with minimum in the month of January and maximum in the month of May. In the present study usually the BOD values were obtained maximum in summer months at all sampling stations, which might be due to high temperature. the values of chloride varied between 17 mg/l to 54 mg/l with minimum in December and Maximum in June. Seasonally, the values were highest in summer and lower in winter and intermediate values were recorded in rainy season. The observation of alkanity reveals that the monthly variation ranged from a minimum of 100 mg/l to a maximum of 230 mg/l. Seasonally the values were highest in the post monsoon season, gradually decreases n winter months and were recorded lowest in the summer season. The observation of total hardness reveals that the monthly variation in the water samples of Narmada river ranged between 73 mg/l to 210 mg/l with minimum in the month of October and Maximum in the month of June The lower values of hardness in the post monsoon might be due to settlement of anions and cations.

**minu *et al.* (2013)** [7]. **s**tudied that a period of one year from January 2012 to December 2012 to enumerate the various Physico-chemical parameters of Narmada River at Indra Sagar Dam and Omkareshwar Dam. Water samples were taken from sampling stations every month and were analyzed as per standard methods. At Punasa Dam Maxima of Chloride and Sulphate were observed during June, BOD and T.D.S in August, Total hardness in November, Temperature in May and PH was highest in March and April. At Omkareshwar Dam Maxima of BOD and Total hardness were recorded in October, Chloride in November, Sulphate in August, T.D.S and Temperature in July, Maxima of PH was recorded in February.

**gadekar *et al.* (2012)** [4]. observed that **t**he water quality of river is deteriorated due to domestic, industrial effluents direct discharge in to river and various human activities along the banks of the river. Instead of analysing the single parameter and predicting the quality of river does not define the actual quality of the river for serving required purpose. So, the seasonal river quality monitoring by analysing various physico-chemical parameters and by integrating them is very much necessary in order to determine and maintain the water quality of the rivers.

**ashutosh *et al.* (2010)** [8]. studied physico-chemical and biological parameters and their variability in relation to the pollution of river water. The chemical analysis showed that the polluted site contained high values of chloride, total hardness, total alkalinity, COD, heavy metals like as iron, zinc, copper, manganese and low value of dissolved oxygen, which indicates a high pollution load. It was carried out greater impact of urban activity on the ground and river water quality in Hoshangabad. It may be attributed to the fact that most of the river water Hoshangabad site are polluted through discharge of wastes at various land sites.

**bhalme *et al.* (2012)** [2]. summarized on water analysis and their treatment processes in different region, which is helpful to know the different treatment processes and parameters used in the study. From the above papers we have concluded that due to increase in industrialization water quality of drinking water get decreases, and hence there is a need of proper analysis of water and prior treatment.

**Jha *et al.* (2009)** [6]. studied physical, chemical and biological characteristics of surface water in and around Jabalpur city, M.P. to evaluate the suitability of water for irrigation and domestic uses. Samples of water were collected from various localities such as Narmada and Pariyat water supply system, various ghats of Narmada River, various tals and tanks, main drains of the city such as Omti nala and Moti nala and were analyzed for pH, electrical conductivity, temperature, dissolved oxygen, five days Biological oxygen demand, fecal coliform, turbidity, total solids, nitrates and phosphates. Water quality indices "WQI" developed in 1970 by the U.S. National sanitation foundation were calculated for these water samples. The results conclude that the water quality of water supply systems, various ghats of Narmada River is of medium quality and can be used for domestic use after suitable treatment. The water quality of various tanks and drains falls in the range of bad quality waters by index rating and can be used for irrigational purposes. This study is helpful to environmental planning and pollution control measures applicable to the area.

## 6. Conclusion

In the present study it is our efforts to evaluate many physico-chemical parameters and its characteristic behavior of a river water samples in different seasons and different sampling stations, the water quality of river is deteriorated due to domestic, industrial effluents direct discharge in to river and various human activities along the banks of the river. So, the seasonal river quality monitoring by analysing various physico-chemical parameters and by integrating them is very much necessary in order to determine and maintain the water quality of the rivers.

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