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Analytical Study on Quality of Drinking Water in Pen Taluka, District Raigad (Maharashtra-India)

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Abstract: *The present article provides a comprehensive review of the existing literature from 2003 to 2025 concerning the quality of drinking water in Pen Taluka, Raigad District. In addition, the study assesses the current physico-chemical characteristics of drinking water, including parameters such as colour, pH, total hardness (TH), chlorides, calcium, magnesium, and other relevant constituents. The objective of the study is to examine long-term variations in drinking water quality and to evaluate their potential implications for public health in Pen Taluka.*

Keywords: Drinking water quality; Physico-chemical parameters; Pen Taluka; Public health; Temporal variation.

I. INTRODUCTION

Water is among the essentials of life. Availability of pure drinking water to every individual is his/her right. Rapid industrialization and urban expansion have led to significant deterioration of this vital parameter. Different Physico-Chemical characterization[15,17] parameters of quality of drinking water[5] like color, pH, total hardness, different metals and other ions concentration, etc. and changes occurred over the period of time are analyzed. The Pen city and Pen Taluka region, as documented in various published studies and technical reports, have been systematically evaluated for the aforementioned drinking water quality parameters within the same geographical area. The survey is also made in the year 2025 for the same and data is analyzed for above said different parameters is also presented here.

II. PREVIOUS STUDIES

The physico-chemical and metallic characterization of industrial effluent and nearby well water[20] in Pen region, District Raigad (Maharashtra, India) were reported by *V. Y. SONAWANE* [21] & [22] in 2003. The total six samples and their analysis data is reported among which last three samples W4, W5 and W6 respectively were from the drinking water resources whose data is important in the context of present studies. He reported the Physico-chemical parameters along with concentration of different metals in the water samples. The Ph values were seen in the permissible limits i.e. 6.9 to 7.3[13]. The other parameters were also seen in acceptable limits. In case of COD and BOD, the report says that these large values of COD and BOD are due to percolation of organic pollutants in the water bodies.

The reports presented by CGWB[10] (Central Ground Water Board) under the Ministry of Water Resources, Government of India in 2013 titled "Ground Water Information Raigarh District Maharashtra" also shows that the potability drinking ground water in *Pen Taluka* is within the limits prescribed by Indian Standards for drinking water (IS-10500, Revised 2003)[4].Another survey in 2014 on the quality of drinking water by *Pravin Chavan* and *Sachin Bangale* reports on the Fluoride concentrationparameter[7]. Many people suffer from fluorosis and other diseases caused due to higher concentration level of fluoride than permissible limit[23] i.e. 1.5 mg/L of fluoride in the drinking water. The Ph and fluoride concentration values reported in this on Bore Well water in Pen area are found well in appreciable limits.

In the studies made on this topic were presented by *Dr. S.B.Dharap* and their Co-workers[16] in 2019 with special reference to the conservation of Wetland *Dolvi* in *Pen Taluka*. The study was restricted up to the analysis of samples from *Dolvi* Wetland with the parameter of Ph only. An another study on environmental stress indicators[6] reports that The Maharashtra Government Notification of 2019 assigned the Mumbai Metropolitan Region Development Authority

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(MMRDA) the role of Special Planning Authority for the entire Pen taluka area, overriding local planning powers in municipalities. This impacted badly the potability of river water as reported in this study report.

In the report "Water Quality Status of Maharashtra"[11,12 and 18] prepared by *The Energy and ResourcesInstitute* by compiling the water quality data of M.P.C.B. in the year 2021-2022, the sewage generation quantity (MLD) was 9.2 which increased over the year almost 1.5 times reported in the 2022-2023 report. This sewage generation deteriorates drinking water resources in Pen city and nearby area.

The present study was conducted through extensive sample collection and analysis encompassing a broader range of parameters during the year 2025. The methodological details and outcomes of the investigation are presented in the following sections.

III. EXPERIMENTAL

Study Area and sampling: The samples were collected from four locations in Pen Taluka District Raigad (Konkan Region[1]), namely *Hetavne Dam* (HD_1, HD_2, HD_3 and HD_4,) *Bhogavati River* (BR_1, BR_2, BR_3 and BR_4), *Shahapada* Dam (SD_1 and SD_2) and *Karavi* Lake (KL_1, KL_2 and KL_3). These are the principal resource of drinking water for the local community in these areas and hence needed to be analyzed for the quality check with reference to the variation[14] in different parameters prescribed for potability of drinking water. These water resources are also used for irrigation and other domestic[3] purposes. Three to four samples were collected from each area under study in the month of April and May 2025 for the pre-monsoon analysis of drinking water. All the samples were collected in the standard sized plastic bottle and preserved until the testing was done according to standard methods[2]. The pH and Conductivity were measured by Equip-Tronics Model No. EQ-611, while other parameters like hardness, chlorides, calcium, magnesium, etc. were analyzed according to standard literature methods.[9] The pH meter was standardized using buffer tablets of pH 4.0 and 9.2 before measurements.

IV. RESULTS AND DISCUSSION

The results obtained in the present investigation are presented in the following Table 1 for different parameters and for different samples collected. Total 13 samples were analyzed from four locations for pH, Conductivity, Total Hardness, Concentration of Cl^-, Ca and Mg. The conductivity values are presented in mho cm^{-1} while values for Total Hardness, Concentration of Chloride, Calcium and Magnesium are represented in mg/L.

Table 1

Parameters	Sample No.												
	HD_1	HD_2	HD_3	HD_4	BR_1	BR_2	BR_3	BR_4	SD_1	SD_2	KL_1	KL_2	KL_3
pH	7.44	7.57	7.57	7.48	6.35	6.90	6.74	6.60	7.35	7.40	7.03	6.96	6.80
Conductivity (mho cm^{-1})	401	439	400	390	329	375	352	373	353	367	372	388	412
Hardness (mg/L)	380	405	366	388	277	301	301	297	350	357	401	399	393
Chlorides (mg/L)	396	402	404	401	330	322	317	313	400	389	412	426	429
Calcium (mg/L)	107	109	105	101	90	94	91	82	129	139	109	107	102
Magnesium (mg/L)	60	62	63	59	39	42	41	40	77	73	61	59	62

The most important physico-chemical factor for drinking water is pH. The values in the Table 1 show that samples from *Hetavne Dam* (HD_1 to HD_4), *Shahapada Dam* (SD_1 to SD_2) and *Karavi* Lake (KL_1 to KL_3) are comparatively alkaline while *Bhogavati River* samples (BR_1 to BR_4) are little bit acidic due to polution. The slight acidity of those samples may be due to dispersal of polluted water used for bathing and washing cloths and cattle. But still most samples are within the permissible limits for drinking water prescribed by BIS[2].

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The conductivity values are the indicator of presence of salts and other contaminants in the water body. The most of the samples except HD_1 to HD_4 are in the range 325 to 425 mho cm^{-1}.

The water with high hardness value needs at least some physical pretreatment before being used for drinking purpose. The hardness of all samples is found in the range 250 to 400 mg/L. The permissible limits prescribed by BIS[2] for TH ranges from 200 to 600 mg/L. This data shows that water samples from these locations are still suitable for drinking purpose.The water with low chloride concentration[19] is considered good for drinking. The limit for chloride concentration given by BIS[2] in 2012 is 250 to 1000 mg/L. All sample values falls within permissible limits.

Dispersal of sewage and waste water in the water bodies increases the concentration of Calcium in the water. As all values of this parameter fall in the limit prescribed, the water samples are found to be suitable for drinking and domestic purposes.[8] Magnesium concentration is also found in the required limits.

V. CONCLUSION AND SUGGESTION

All the samples are from the vicinity of Pen city. The values of all parameters for samples BR_1 to BR_4 are much more in agreement with those prescribed by BIS than other samples. This may be due to the facts that in the recent past some years, the use of water from *Bogavati River* for the purpose of washing and other domestic purposes is restricted. Also the activities like cloth washing, Cattle washing are strictly prohibited in the vicinity of Talav. Samples from the other three locations are having any such restrictions. Those three locations are open to the people for all type of purposes. Therefore, values of all parameters for these three location samples vary much more. But still almost all values falls in the prescribed limits and hence still; water from these resources can be used for drinking and other domestic purposes.

The samples analyzed in the present study were collected during April–May, corresponding to the pre-monsoon period. Further investigation during the post-monsoon season is warranted to enable a more comprehensive assessment and to derive more robust conclusions.

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