The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
20(2): S.I (2): 136-143, 2025www.thebioscan.com

GROUNDWATER SUITABILITY FOR DRINKING PURPOSE IN AURANGABAD AREA, MAHARASHTRA, INDIA: A WATER QUALITY INDEX (WQI) APPROACH

Nisha M. Walde[1], Kavita S. Raipurkar[2], Mahendra G. Thakare[3]

[1]IHLRSS in Environmental Science, S. P. College, Chandrapur

[2]Department of Environmental Science, S. P. College, Chandrapur

[3]Department of Environmental Science, Dr. Khatri College, Tukum, Chandrapur

Corresponding Author: waldenisha20@gmail.com

DOI: 10.63001/tbs.2025.v20.i02.S.I(2).pp136-143

KEYWORDS
Aurangabad,
Groundwater,
Drinking,
Water Quality Index,
Suitability

Receivedon:

22-03-2025

Acceptedon:

25-04-2025

Published on

30-05-2025

ABSTRACT

The depleting groundwater quality poses major risks to human health, ecologies and the environment. This study was an effort to evaluate the potability of subterranean water in Aurangabad area, Maharashtra by the WQImethod, aninclusivetechnique for assessing and detecting the appropriateness of groundwater for human consumption. The total 60 samples of groundwater were collected from different selected locations and a comprehensive examination of groundwater quality was conducted, comprising a range of physical parameters (colour, odour, taste, TDS, turbidity, and EC), chemical parameters (TA, TH and pH) and inorganic parameters(sulfate, chloride, fluoride, nitrate, and iron). The ranged of WQI values obtained from excellent to unfit for drinking. The results showed that only 2% samples showing excellent water quality. The majority of samples that is about 47.5% showed poor to very poor water quality, while 12% samples were estimated unfit for drinking. The results underlined the need for effective groundwater management policies, including monitoring, protection, and justifiable use practices, to protect this crucial resource and ensure the health and well-being of societiesdependent on groundwater.

INTRODUCTION

Avital source of drinking water is groundwater has a remarkableinfluence on the life quality, as the consumed water quality consumed directly affects human well-being (Ali, etal., 2024). In several regions of the world, particularly in arid and semiarid provinces, the primary source of water supply are thegroundwater aquifers, supporting both rural and urban populations (Rao et al., 2020).The mounting demand for groundwater in many parts of the world, including India, is endorsed to population growth, development, industrialization, and intensive agricultural practices, which has caused an increased dependency on groundwater resources for multiple uses (Kumar, et al., 2024). Groundwater quality is being battered due to poor knowledge, inadequate management, and unjustifiable practices, thereby posing a significant risk to human health and well-being (Chakraborty et al., 2022). At different locations the various physico-chemical characteristics ofgroundwater systems are molded by climatic circumstances, precipitation, surface water interfaces, and recharge processes, as well as the geochemical and lithological features of the corerocks(Magesh and Chandrasekar, 2013).The geochemical characteristics of groundwater were modify by both the natural processes and human activities. (Gugulothu et al., 2022).The dispersed pollution sources, such assewerage, organic discarded,nitrate from agricultural activities and livestock excreta, pose significant health hazards to humans through groundwater contamination (Gupta et al., 2011).To maintain groundwater quality, the Central Groundwater Board (CGWB) highlights the importance of steady monitoring to identify currentand emergent issues, contamination levels, and obedience with drinking water standards (CGWB, 2020).Effective organization and assessment of groundwater resources need a detailedunderstanding of the aquifer's hydrogeochemical and hydrogeological features, which is essential for sustainable management practices (Azhar et al., 2015).Aninclusive evaluation of groundwater quality factors has been assumed to determine the appropriateness of water of Aurangabad Taluka, Maharashtra for drinking purposes by utilizingthe WQI.

Study area

In the Maharashtra state, as part of the Aurangabad district'snine talukas, the Aurangabad Taluka is a noticeable administrative division, consisting of 185 villages and 5 towns.The study area, is positioned in the state of Maharashtra, India, with topographical coordinates of around 19.90° N latitude and 75.35° E longitude.According to the 2011 Census,Aurangabad Taluka has a population of 1,590,374, contained of 828,971 males and 761,403 females. Notably, in this taluka, 82.3% of the inhabitantslivesin urban zones, while 17.7% reside in rural regions. Ausual literacy rate of Aurangabad taluka is about 85.03%, with 87.7% in urban parts while 72.3% in rural zones(Census India, 2025).Aurangabad Taluka has a semiarid environmentcategorized by three distinct seasons that is summers (March-June), a short-term monsoon season (July-September), and minor winters (October-February). The taluka's land use patterns are primarily agricultural, with a considerable portion of the area devoted to cultivation, complemented by forested areas, unfertile land, and water bodies (CGWB, 2013).

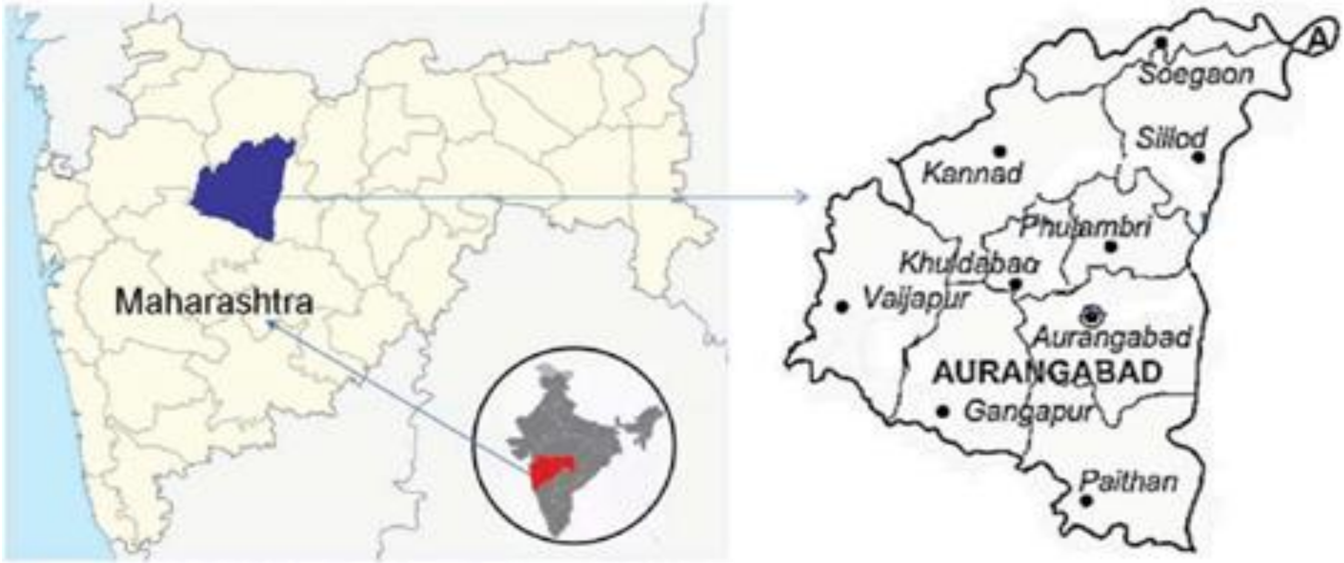

Figure 1: Location of Aurangabad district on the map of India (Nagwekar et. al., 2020)

Sample Collection

The sites was selected on the factors such as the different water uses, considering aspects such as location, scale, and significance.A total 60 water samples were precisely collected from several villages within Aurangabad Taluka, providing a brief appraisal of the area's groundwater quality. Each sample was cautiouslycollected in a hygienic, clean plastic bottle to avoidadulteration and ensure the reliability of the sample. The containers were carefullywashed and dried before being occupied with groundwater from the selected sampling points, which encompassed borewells, handpumps, and other groundwater sources. The samples were then wrapped and labeled with related information, such as date, time of collection, location before being conveyed to the laboratory for further examination.

Methodology

To determine the physical and chemical characteristics, the collected groundwater samples were subjected to a completeexamination. By using standardized methods described by the American Public Health Association, different physical factors such as colour, odour, taste, turbidity, TDS, and EC were assessed (APHA, 2012). The analysis showndistinctions in the physical properties of the water samples, providing understanding into their general quality. Moreover, chemical parameters such as pH, TH, Ca, Mg, TA, Cl, Fe, NO_3 and SO_4were also examined using APHA,2012 methods. These chemical parameters were cautiously measured to evaluate the occurrence of various ions and compounds, which can influence the water's potability and suitability for human consumption. The outcomes of this extensive analysis provided a thoroughcomprehension of the underground water quality in the studied region, underlining areas that require attention and enhancement.

Water Quality Index (WQI)

The WQI is auniquemeasureable process that detects the major factors contributing to variations in water quality (Kumar et al., 2024).TheWQI employs aggregation methods thatmanufacture large datasets into a singular, comprehensive value, providing a brief representation of water quality.

The WQI determination implicates three chronological steps:

- Firstly, to determine unit weight (W_n): $W_n = K/X_s$ ----- (Equation 1)
- Second step was rating groundwater quality(Q_n) according to BIS/ICMR guidelinesgiven in Table 1: $Q_n = 100 \times X_n - X_i / X_s - X_i$ ----- (Equation 2)

Table 1:BIS Standard (IS 10500:2012)/ ICMR, 1975 and WHO recommended standards for Drinking water

Parameter	BIS/ICMR	WHO
EC (µS/cm)	200	>2500
Turbidity (NTU)	5	5
TDS (mg/L)	500	1000
pH	6.50-8.5	8.5
TH (mg/L)	200	500
Ca (mg/L)	75	200
Mg (mg/L)	30	50
TA (mg/L)	200	500
Cl^- (mg/L)	250	250
Fe (mg/L)	0.3	0.3
F^- (mg/L)	1-1.5	1.5
NO_3^- (mg/L)	45	50
SO_4(mg/L)	200	250

And lastly to estimate the final WQI value :WQI = ΣQn*Wn/ ΣWn ----- (Equation 3),
where K = 1/ΣXs , K: Proportionality Constant, Xs: recommended standard for parameter, n = numeral of different water factors, Xn: definite amount of water parameters; Xi: ideal value of diverse water parameters (0 for all parameters except pH).
The concluding value of WQI classifiesdrinkable water into different group, as summarized in Table 2. (Ali et al., 2024).

Table 2: Drinking Water Categorization Using WQI Ranges

Sr. No.	Level of WQI	Water Quality Status
1	0 to 25	Excellent
2	26 to 50	Good
3	51 to 75	Poor
4	76 to 100	Very Poor
5	More than 100	Unsuitable for Drinking Purposes

Source: Ali et al., 2024

Resultsand Discussion

Physical Characteristics of groundwater from the selected sampling site.

1. Colour, Odour and Taste: The physical investigation of the groundwater samples shown that all samples were colourless, odourless and tasteless. It specifythe nonexistence of any visible or sensory impurities.The aesthetic properties of water, including its color, taste, and odor, can be revealing of primarypollutants that pose possible health hazards (Know your H_2O, 2025).

2. Turbidity: In this study,the turbidity of the groundwater samples analyzed obtained from 0.3 to 2.5 NTU, representing relatively clear water. Particularly, all samples showed turbidity values under the permissible limit of 5 NTU. This result is reliable with previous research convoyed by Meshram and Chahande (2018), who reported turbidity readings in the range of 0.22-3.06 NTU during their groundwater quality assessment in villages surrounding Nandgao coal mines, Chandrapur district. The detected turbidity levels proposed that in the study area,the groundwater is quite free from particulate matter and other suspended solids.

3.EC:Thevalues ofEC of groundwater samplesdisplayed a wide range from 76 to 8752 µS/cm. A noteworthybulk of the groundwater samples (59 out of 60) exhibited EC values beyond the acceptable limit, signifying high concentrations of ionic substances. This outcome is steady with the results of Aladimy et. al. (2017), who stated high conductivity values (759-4522µmhos/cm) in groundwater samples from Aurangabad city, surpassing the WHO and BIS recommended limit of 300 µmhos/cm.

4. TDS: Aprecariousfactor for evaluating groundwater qualityisTDS as it measures the amount of entirely dissolved minerals such as Ca, Mg, and Na (Anbazhagan and Nair, 2004). The concentration of TDS in groundwater samplesof the studyregion, varied widely from 49 to 5689 mg/L. This important variation is consistent with the results of Varadarajan and Purandara (2011), who reported a considerable range of TDS levels (175-4490 mg/L) in the groundwater of Ghataprabha reservoir, Karnataka, showingsubstantial heterogeneity in groundwater quality.

Table 3: Physical Analysis of Groundwater sample of Aurangabad area, Maharashtra, India

Sample No.	Colour	Odour	Taste	Turbidity (NTU)	EC µs/cm	TDS mg/L
1.	colourless	odourless	not specific	0.9	2017	1311
2.	colourless	odourless	not specific	0.8	1675	1089
3.	colourless	odourless	not specific	0.4	840	546
4.	colourless	odourless	not specific	0.6	1999	1299
5.	colourless	odourless	not specific	0.5	1259	818
6.	colourless	odourless	not specific	0.7	2062	1340
7.	colourless	odourless	not specific	0.6	1710	1112
8.	colourless	odourless	not specific	0.8	1255	816
9.	colourless	odourless	not specific	0.7	2253	1464
10.	colourless	odourless	not specific	0.8	2695	1752
11.	colourless	odourless	not specific	0.7	2701	1756
12.	colourless	odourless	not specific	1	7607	4945
13.	colourless	odourless	not specific	2.5	1514	984
14.	colourless	odourless	not specific	0.7	970	631
15.	colourless	odourless	not specific	0.6	964	627
16.	colourless	odourless	not specific	0.7	1538	1000
17.	colourless	odourless	not specific	0.9	2724	1771

18.	colourless	odourless	not specific	0.8	1350	878
19.	colourless	odourless	not specific	0.6	535	348
20.	colourless	odourless	not specific	0.7	932	606
21.	colourless	odourless	not specific	0.9	1427	928
22.	colourless	odourless	not specific	0.8	1135	738
23.	colourless	odourless	not specific	0.6	1632	1061
24.	colourless	odourless	not specific	0.7	1172	762
25.	colourless	odourless	not specific	0.9	1570	1021
26.	colourless	odourless	not specific	1	2428	1578
27.	colourless	odourless	not specific	0.9	1395	907
28.	colourless	odourless	not specific	0.8	1203	782
29.	colourless	odourless	not specific	0.9	1108	720
30.	colourless	odourless	not specific	2.3	3435	2233
31.	colourless	odourless	not specific	0.8	1407	915
32.	colourless	odourless	not specific	0.6	2129	1384
33.	colourless	odourless	not specific	0.7	1317	856
34.	colourless	odourless	not specific	0.9	1215	790
35.	colourless	odourless	not specific	0.9	1975	1284
36.	colourless	odourless	not specific	0.7	1408	915
37.	colourless	odourless	not specific	0.5	1144	744
38.	colourless	odourless	not specific	0.9	1656	1076
39.	colourless	odourless	not specific	0.6	1685	1095
40.	colourless	odourless	not specific	0.7	2185	1420
41.	colourless	odourless	not specific	0.6	1408	915
42.	colourless	odourless	not specific	0.7	1411	917
43.	colourless	odourless	not specific	0.9	2307	1500
44.	colourless	odourless	not specific	0.8	1123	730
45.	colourless	odourless	not specific	0.9	8752	5689
46.	colourless	odourless	not specific	0.7	4106	2669
47.	colourless	odourless	not specific	0.9	1518	987
48.	colourless	odourless	not specific	0.6	1205	783
49.	colourless	odourless	not specific	0.4	874	568
50.	colourless	odourless	not specific	0.9	1651	1073
51.	colourless	odourless	not specific	0.4	1179	766
52.	colourless	odourless	not specific	0.6	1274	828
53.	colourless	odourless	not specific	0.6	1554	1010
54.	colourless	odourless	not specific	0.5	1057	687
55.	colourless	odourless	not specific	0.5	723	470
56.	colourless	odourless	not specific	0.4	1212	788
57.	colourless	odourless	not specific	0.6	1207	785
58.	colourless	odourless	not specific	0.3	76	49
59.	colourless	odourless	not specific	0.5	1283	834
60.	colourless	odourless	not specific	0.9	2813	1828

Chemical Characteristics of Groundwater from the selected sampling site.

1. pH: The pH values of the groundwater samples analyzed in this study ranged from 6.83 to 8.11, indicating a pH profile that spans from slightly acidic to alkaline conditions. Particularly, the observed pH range falls within the acceptable limits for drinking water, as stipulated by regulatory agencies. This finding is consistent with the results of Choudhary et al. (2016), who reported a similar pH range (6.2-8.3) in groundwater samples from Saraipali, Chhattisgarh state.

2. Total Hardness:The groundwater samples showed a broad range of Total Hardness (TH) values, spanning from 20 to 3076 mg/L. However, a significant majority of the samples (58 out of 60) exceeded the recommended limit of 200 mg/L, indicating high levels of hardness. Only a small fraction (2 samples) had TH values within the acceptable range. This finding is corroborated by the study of Dasari et al. (2024), which reported a similarly wide range of TH levels (150-6050 mg/L) in groundwater samples from Godavari district, Andhra Pradesh, with 83% of samples classified as extremely hard and unsuitable for drinking.

3. Calcium and Magnesium: The groundwater samples displayed a considerable variability in calcium (5-526 mg/L) and magnesium (2-513 mg/L) levels. A substantial number of samples (31) exceeded the permissible limit of 75 mg/L for calcium, whereas an even larger proportion (57 samples) surpassed the recommended threshold of 30 mg/L for magnesium, indicating a pervasive presence of elevated magnesium concentrations. This observation aligns with the findings of Arabi et al. (2013), who detected substantial amounts of calcium (3.1-1524 mg/L) and magnesium (21-1375 mg/L) in groundwater samples, suggesting a potentially abundant source of these vital minerals for local communities.

4. Iron: The iron concentrations in the groundwater samples ranged from 0.013 to 1.46 mg/L, with only one sample out of 60 exceeding the recommended limit of 0.3 mg/L. This suggests that iron contamination is not a widespread issue in the studied groundwater sources. Correspondingly, in Patil et al. (2022) study the groundwater quality of rural areas in Nashik district, Maharashtra and found that the concentration of iron found in range between 0.30 to 0.63 mg/L.

5. Total Alkalinity: The total alkalinity of groundwater in the study area exhibited significant variability. Notably, 8 samples showed exceptionally high alkalinity levels, surpassing 1000 mg/L. In contrast, the remaining samples displayed a relatively wider range of alkalinity, fluctuating between 24 mg/L and 952 mg/L. While, only 13 samples fell within the recommended limit of 200 mg/L. In 2017, Aladimy et al, found in their investigation that the concentration of Total Alkalinity of all the groundwater samples from Aurangabad city shows the exceeding value.

6. Chloride: The chloride concentrations in the groundwater samples ranged from 20 to 900 mg/L, with 45 samples out of 60 falling within the recommended limit of 250 mg/L. However, 15 samples exceeded this threshold, indicating potential chloride contamination in a significant proportion of the sampled locations. Similarly, in 2025 Pochana and Sreenu study of chloride contamination of groundwater in Warangal, Telangana revealed that nearly 12% of the groundwater samples tested were deemed unfit for human consumption, primarily due to excessive chloride levels.

7. Fluoride: The fluoride levels in the groundwater samples varied widely, ranging from 0.07 to 2.43 mg/L. However, a notable proportion of samples (44 out of 60) exceeded the recommended limit of 1 mg/L, while only 16 samples fell within the acceptable range. While in the study of Murkute and Badhan (2011)it was observed that thefluoride levels in the groundwater samples of Bhadravati tehsil in Chandrapur district varied significantly with depth, ranging from 1-4.4 mg/L in shallow aquifers and 0.5-2.9 mg/L in deeper aquifers.

8. Nitrate: The nitrate concentrations in the groundwater samples ranged from 3 to 284 mg/L, with 34 samples out of 60 falling within the recommended limit of 45 mg/L. However, 26 samples exceeded this threshold, indicating potential nitrate contamination in a significant proportion of the sampled locations.In Deshpande et al., 2020, groundwater analysis it was observed that nearly 34% of the groundwater samples (29 out of total) of Aurangabad Urban city contained excessive levels of a particular parameter, surpassing the safe limit of 45 mg/L set by the Bureau of Indian Standards (BIS) in 2012.

9. Sulphate: The sulphate levels in the groundwater samples were found to be well within the acceptable range, with concentrations ranging from 44 to 155 mg/L. Particularly, all 60 samples were below the recommended limit of 200 mg/L, indicating a low risk of sulphate-related water quality issues in the studied area. Similar result was obtained in Aher et al., 2022 study of groundwater samples collected along the cross-section of Pravara river basin, Maharashtrawhere the concentration of sulphate is in range between 17 to 118 mg/L, i.e. in permissible limit.

Table 4: Chemical Analysis of Groundwater sample of Aurangabad area, Maharashtra, India

Sample No.	pH	TH mg/L	Ca mg/L	Mg mg/L	Fe mg/L	TA mg/L	Cl mg/L	F mg/l	No_3 mg/L	So_4 mg/L
1.	7.39	588	64	104	0.42	592	296	0.09	61	53
2.	7.67	412	40	76	0.27	480	274	0.09	42	55
3.	7.63	384	40	69	0.38	304	108	0.07	36	56
4.	7.68	784	85	139	0.09	700	250	0.09	65	53
5.	7.18	608	128	70	0.23	356	168	0.07	31	56
6.	7.28	708	173	67	0.04	668	204	0.09	63	45
7.	7.41	616	32	130	0.09	380	292	0.7	50	47
8.	7.66	268	48	36	0.09	180	306	1.6	45	48
9.	7.53	696	64	130	0.07	1048	194	1.29	68	48
10.	7.47	696	67	128	0.267	1192	190	1.18	67	50
11.	7.65	836	59	167	0.013	1064	232	0.93	68	49
12.	7.05	3076	464	466	0.151	2600	900	1.108	284	49
13.	7.63	372	61	53	0.183	256	200	1.41	48	53
14.	7.73	400	72	53	0.162	188	160	1.24	36	48
15.	7.63	296	46	44	0.257	176	170	1.64	35	51
16.	7.57	264	38	41	1.46	472	284	1.64	50	47

17.	7.36	1120	133	191	0.197	1180	344	1.45	60	47
18.	7.3	344	69	42	0.194	296	200	0.83	38	48
19.	7.72	260	58	28	0.162	80	140	1.64	25	46
20.	7.51	564	106	73	0.194	236	126	1.64	36	48
21.	7.54	728	120	104	0.278	360	180	2.14	44	48
22.	7.61	412	70	57	0.267	192	220	2.23	31	54
23.	7.22	660	147	71	0.162	464	240	2.43	50	53
24.	7.86	576	110	73	0.141	360	188	2.22	41	53
25.	7.75	548	94	76	0.246	496	242	1.13	46	49
26.	7.67	1016	102	185	0.278	700	288	1.3	60	46
27.	8.11	240	38	35	0.141	332	148	1.3	40	54
28.	7.61	392	48	66	0.173	180	208	0.85	38	53
29.	7.35	584	67	101	0.162	220	270	1.31	35	47
30.	6.92	1444	333	149	0.141	1628	380	1.3	85	46
31.	7.52	400	48	68	0.173	312	134	0.81	43	48
32.	7.33	640	86	103	0.162	644	208	0.82	52	48
33.	7.02	684	147	77	0.151	372	170	0.94	44	47
34.	7.05	612	157	53	0.173	348	144	1.29	37	46
35.	7.23	928	149	135	0.162	584	372	1.45	47	48
36.	7.42	640	117	85	0.162	468	152	0.93	42	155
37.	7.07	588	112	75	0.173	268	128	1.1	38	51
38.	6.94	736	176	72	0.183	560	148	1.48	53	48
39.	7.05	700	134	88	0.151	400	136	1.23	56	47
40.	6.96	920	224	87	0.183	512	190	1.17	64	47
41.	7.04	704	168	69	0.141	416	132	1.17	40	48
42.	7.15	544	117	61	0.162	436	140	1.17	40	48
43.	7.13	1248	278	134	0.246	952	324	1.44	81	48
44.	6.91	572	139	54	0.257	268	132	0.83	34	47
45.	7.09	3428	526	513	0.141	3700	642	1.43	301	46
46.	6.95	1824	206	318	0.288	2340	570	1.43	150	50
47.	7.05	528	43	102	0.267	552	236	1.44	47	50
48.	7.45	636	152	62	0.151	292	160	1.38	30	48
49.	7.1	380	72	49	0.181	200	118	1.29	24	47
50.	7.13	672	67	122	0.162	400	172	1.3	46	49
51.	7.31	464	40	88	0.257	324	170	2.22	38	45
52.	7.17	612	99	88	0.267	316	158	0.93	42	45
53.	7.62	540	80	83	0.194	396	122	1.43	45	44
54.	7.75	136	19	21	0.162	180	190	1.23	39	49
55.	7.56	280	48	39	0.278	88	128	1.29	17	46
56.	7.65	216	29	35	0.141	148	214	1.29	44	143
57.	8.04	480	11	110	0.246	104	124	1.3	44	138
58.	6.83	20	5	2	0.141	24	20	1.29	3	44
59.	7.44	420	24	87	0.151	92	92	1.44	38	51
60.	6.94	1160	174	176	0.141	696	346	1.43	67	47

Water Quality Index and the Status

The WQI scores of the 60 groundwater samples was obtained in between the ranged from 18 to 137.93, indicating a wide variation in water quality. WQI classification revealed that only a small fraction of samples (2%) exhibited excellent water quality, while 5% showed good quality with slight pollution. However, a significant proportion of the samples (47%) had poor water quality, indicating moderate pollution, and 35% had very poor quality, indicating significant pollution. Alarmingly, 12% of the samples were deemed unfit for drinking purposes. These outcomes underscore the necessity for effective groundwater management strategies to ensure safe and potable water for consumption. Similar in qualitative assessment of groundwater for Achhnera block, Agra conducted by Ali et al, 2024 revealed that the value of WQI mostly obtained in ranged of 105 to 185, hence unsuitable for drinking purpose category. In 2024, Kumar et al, evaluate the groundwater quality of Anantapur district, Andhra Pradesh by WQI and found that the 69 % of the sample was very poor quality while 31% groundwater sample was unsuitable for drinking purposes.

Table 5: WQI of Samples

Sample No.	WQI	Status
1	107.19	Unfit for consumption
2	70.77	Poor
3	95.11	Very Poor
4	30.73	Good
5	60.67	Poor
6	17.66	Excellent
7	42.7	Good
8	59.23	Poor
9	51.34	Poor
10	95.39	Very Poor
11	31.49	Good
12	82.33	Very Poor
13	79.03	Very Poor
14	68.73	Poor
15	98.94	Very Poor
16	381.13	unfit for consumption
17	89.73	Very Poor
18	67.57	Poor
19	76.05	Very Poor
20	85.33	Very Poor
21	116.89	unfit for consumption
22	114.39	unfit for consumption
23	95.09	Very Poor
24	85.38	Very Poor
25	87.43	Very Poor
26	101.94	unfit for consumption
27	64.85	Poor
28	63.49	Poor
29	71.68	Poor
30	72.29	Poor
31	62.84	Poor
32	61.91	Poor
33	61.11	Poor
34	73.11	Poor
35	76.53	Very Poor
36	63.63	Poor
37	69.05	Poor
38	80.45	Very Poor
39	67.58	Poor
40	74.64	Poor
41	63.42	Poor
42	67.97	Poor
43	97.24	Very Poor
44	82.83	Very Poor
45	89.16	Very Poor
46	113.14	unfit for consumption
47	99.31	Very Poor
48	69.71	Poor
49	73.7	Poor
50	72.32	Poor
51	112.26	unfit for consumption
52	87.94	Very Poor
53	81.3	Very Poor
54	67.33	Poor
55	95.95	Very Poor
56	64.14	Poor
57	90.86	Very Poor
58	62.12	Poor
59	70.85	Poor
60	72.87	Poor

CONCLUSION

The comprehensive groundwater quality assessment revealed varying levels of chemical parameters, with iron and sulphate levels within acceptable limits. However, excessive concentrations of total alkalinity, chloride, fluoride, and nitrate were detected in a significant number of samples, while elevated magnesium levels were observed in more than half of the samples. These resultsshow that the groundwater quality is compromised, posing possible health hazards to humans. Similarly, the WQI scores displayeddistressing levels of contamination, with the majority of samples revealing poor to very poor quality. Overall, the study highlights the crucial need for effective groundwater management strategies, comprisingimproved monitoring, pollution extenuation, and treatment methods, to safeguard community health and guarantee access to safe drinking water. Execution of processes to diminishimpurities, steady monitoring, and improvement of strategies for supportable groundwater management are crucial to protect this vital resource.

ACKNOWLEDGMENT

The authors are grateful to Dr. BabsahebAmbedkar National Research Fellowship (BANRF), Pune for providing financial care.

CONFLICT OF INTEREST

The authors states that there are no conflicts of interest regarding the publication of this paper.

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