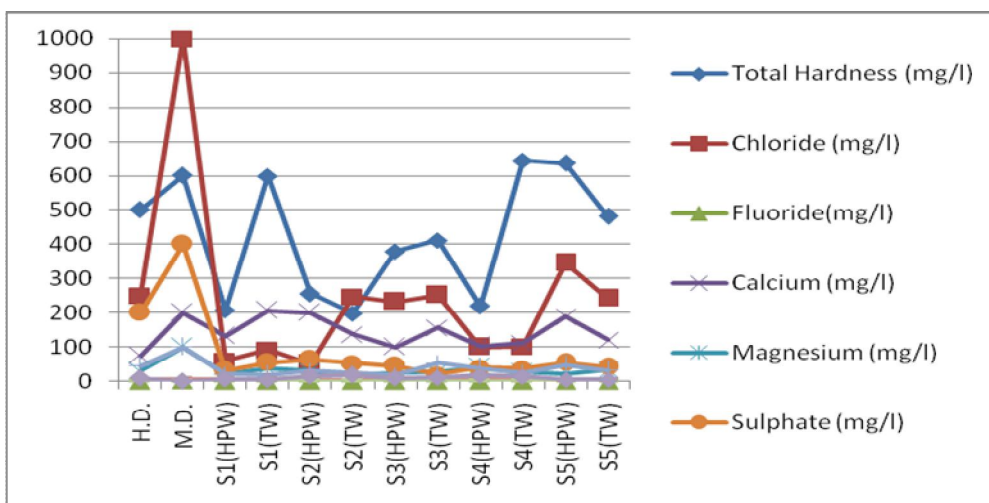


**Fig. 2:** Graph showing variations in TDS (mg/l) of water samples collected from different sources.



**Fig. 3:** Graph showing variations in different parameters of water samples collected from different sources (H. D. = Highest Desirable, M. P. = Maximum Permissible, HPW = Hand Pump Water, TW = Tap Water).

The results have been compared with BIS-10500, New Delhi as shown in tables 2 & 3. From the results, the colour, odour, taste and turbidity of all samples collected, were found according to BIS-10500, New Delhi. The pH value of drinking water is an important index to acidity. This was observed in the range of 6.5-7.9. The minimum pH was found at S2 in HPW (6.5) and maximum at S5 in TW (7.9) samples. It was observed that the pH of all the samples lied within the range as recommended by Bureau of Indian Standards. If the pH values are higher than the permissible limits, this would affect adversely alkalinity of soil, microbial life and corrosion rate [4].

The Electrical conductivity is a measure of water capability to transmit electric current and also a tool to measure the purity of water. From the results, the Electrical conductivity values are in the range of 0.233-0.821  $\text{Scm}^{-1}$ . The minimum electrical conductivity was found at S1 in HPW and maximum at S2 in TW samples. Almost values were found to be satisfactory but the Electrical conductivity values in TW of S2, HPW and TW at S3 and HPW at S5 are greater than BSI-10500. The electrical conductivity value is an index to represent the total dissolved salts which is due to bicarbonates, carbonates, sulphates, nitrates and chlorides of calcium, magnesium, sodium and potassium.

The TDS were observed in the ranging from 139.66-512.12. The results showed that all the samples are within permissible limit except in TW of S2. The hardness in water is due to natural accumulation of salts from contact with soil or geological formations or it may add to water directly from pollution made by human activities. Generally surface water is softer than ground water especially TDS values.

Total hardness was found in ranging from 199-637 mg/L. Total hardness of 80% samples was in permissible limits but in TW of S4 (645 mg/L) and HPW of S5 (637 mg/L) was observed higher than the permissible limits. The minimum total hardness was observed in HPW of S1 and maximum in TW of S4. Chloride is a common anion found in the ground water and usually occurs as NaCl, CaCl<sub>2</sub>, and MgCl<sub>2</sub> and in widely varying concentrations in all natural waters. When Cl<sup>-</sup> anions are present above 250 mg/L, water gives unacceptable odour. In our observations all the water samples had Chloride anions in permissible range except for HPW of S5 (345.61 mg/L). The minimum concentration of Chloride anions was observed in HPW of S1 (59.60) and maximum in HPW of S5 (345.61 mg/L). Chloride anions in drinking water are generally not harmful to human beings. But if the accumulation of chlorides is at higher concentrations, it may affect some persons who already suffer from diseases of heart and kidney [3].

Ca<sup>++</sup> cations are the main contributor to the hardness of water. The high value of Ca<sup>++</sup> (207.33 mg/L) was observed in TW of S1 and the lowest value (99.33 mg/L) was observed in HPW of S3. These values are lower than permissible range as prescribed by BIS-10500 and hinting towards the suitability of HPW and TW for drinking purpose. According to Trivedy and Goel, (1986) calcium may not impair in physiological reaction in man upto the level of 1800 mg/L. However, magnesium concentration was slightly higher than the permissible standard of BIS-10500 at three locations in TW of S1 (38.81 mg/L), HPW of S4 (42.21 mg/L) and TW of S5 (33.98 mg/L). The maximum concentration of Mg<sup>++</sup> was observed in HPW of S4 (42.21 mg/L) and minimum in HPW of S1 (21.14 mg/L). Higher concentration of magnesium may be cathartic and diuretic for initial user but tolerance may be developed in short time [2].

The fluoride was observed maximum (0.59 mg/L) in TW of S3 and minimum (0.17mg/L) in HPW of S4. The values obtained from Table 3 showed that all sampling sites were having less fluoride contents and was within permissible limit of highest desirable 0.60 mg/L as per BIS-10500 standard.

The sulphate was observed maximum (63.85 mg/L) in HPW of S2 and minimum (21.52mg/L) in TW of S3. The values obtained from analysis of water samples (Table 3) depict that all sampling sites were having less sulphate contents and was within

permissible limit of highest desirable 200 mg/L as per BIS-10500 standard. These ions directly contribute to the acidity of water and their high concentration may disturb the potability of drinking water. The nitrate was observed maximum (53.55 mg/L) in TW of S3 and minimum (19.05mg/L) in TW of S1. The values obtained from Table 3 depict that all sampling sites were having less nitrate contents and was within maximum permissible limit of highest desirable 45 mg/L as per BIS-10500 standard except in TW of S3. High concentration of nitrate in drinking water causes blue baby disease and very harmful to the health of infants and adults and sometime may cause even death [5]. Clear surface water is normally saturated with 7.6 mg/L of dissolved oxygen at 30°C. In our study DO values were ranging from 3.9-6.8 mg/L maximum (6.8 mg/L) in TW of S1 and minimum (3.9 mg/L) in TW of S2. The TW sample of S2 for which DO is minimum, gives the BOD value 0.51 mg/L. Since TW of S2 alone shows the presence of BOD where as other samples have zero value of BOD, it is sure that high BOD is responsible the low value of DO.

The presence of coliforms in water indicates that water has been contaminated with faecal matter. In present study the coliform count was done by Most Probable Number (MPN) Method. This method is used as an indicator of potability for the water [6]. It is clear from Table 3 that all the water samples had faecal contamination and maximum number of coliform was in TW of S2 (19.00 MPN/100 ml) and minimum in TW of S1 (4.66 MPN/100ml). It showed that the contamination in HPW may be due to improper sanitation, washing of clothes and disposal of contaminated substances in the near by of the hand pump area and this further percolate in ground water. The contamination in TW may be most probably due to old, damaged pipelines crossing at different places with open sewage drainage system.

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