monsoon it ranged from 0.06 to 3.04mg/l. It was also observed in all the surface water (nalla) samples. In pre monsoon it ranged from 0.34 to 17.6mg/l and in post monsoon it ranged from 0.11 to 89.39mg/l.

However, in the second year (year 2), Fe concentration of groundwater in pre monsoon was observed minimum (BDL) in bore well sample (B3) and maximum (2.56mg/l) in a handpump water sample (H7). In post monsoon, minimum of BDL and maximum of 1.73mg/l (in H7) was observed. In surface water (nalla) samples, Fe concentration was found in the range of 1.08 to 42.3 mg/l in pre monsoon and in post monsoon it ranged from 0.24 to 90.9mg/l. Hence, it was found that most of the water samples had Fe concentration beyond the acceptable limit of 0.3mg/l [8].

f) Pb

Lead (Pb) is a serious body poison. Its presence in the body inhibits several key enzymes involved in the overall process of haemo-synthesis [17].Its adverse effects are mostly seen in children up to the age of 6 years and pregnant women[18]. In the first year (year 1), the lead in the ground water samples ranged from BDL to 0.1 mg/l in post monsoon season while it was BDL in the pre monsoon. However in surface water samples it was observed BDL to 0.67mg/l in pre monsoon, while in post monsoon it was found BDL to 1.62mg/l.

The study revealed that the concentration of lead was below the detectable level (BDL) in most of the ground water samples in the year2 during pre monsoon as well as post monsoon season. However in surface water, it ranged from BDL to 0.19mg/l during pre monsoon, while during post monsoon, it ranged from BDL to 0.01mg/l. However the concentration of lead in most of the water samples was observed within the safe limit of BIS (year 2), but few were found beyond acceptable limit 0.01 mg/l [8, 9]. Industrial effluents, old plumbing, household sewages, agricultural run-off containing phosphatic fertilizers and human and animal excreta are considered as prime sources of lead contamination in ground water[19].

g) Mn

In the year1, the values of Manganese (Mn) concentration in ground water samples ranged from BDL to 0.313 mg/l in pre monsoon season, for post monsoon it was from BDL to 0.24 mg/l. Infact, in most of the ground water samples it was found below detection limit (BDL). However, it was observed above acceptable limit (0.1mg/l) in all the surface water samples in post monsoon season (0.26 – 10.51mg/l), while in pre monsoon, minimum of 0.058 and maximum of 1.28mg/l Manganese was observed.

In the second year (year 2), the concentration of Mn was detected in most of the ground water samples, although the detected concentration was below acceptable limit (0.1mg/l). In premonsoon, it ranged from BDL to 1.12mg/l, while in post monsoon from BDL to 0.172mg/l. In surface water nalla samples, during pre monsoon it ranged from 0.47 to 1.7 mg/l while in post monsoon it ranged from 0.16 to 0.77mg/l.

Manganese pollution is mainly contributed by traffic and unsanitary deposits. Sometimes manganese containing water is not suitable for domestic purpose even [20].

h) Ni

Nickel (Ni) is associated with nickel alloys, electroplating, machinery parts, stainless steel, spark plugs and also as catalysts. It may cause dermatitis, which may results in itching of the fingers, hands and forearms.

In this study, during pre and post monsoon ofyear 1, the Nickel (Ni) content in the groundwater samples was estimated to be the below detection limit in all the samples, except three exceptions of D8 (0.08 mg/l), D9(0.011mg/l) in pre monsoon and D8 (0.28mg/l) in post monsoon. Out of them, sample from D8was found beyond acceptable limit of 0.02mg/l [8]. However, in surface water samples, during pre monsoon it ranged from 0.057 to 4.28 mg/l while in post monsoon it ranged from 0.025 to 0.136mg/l.

During second year (year 2), Ni followed the similar trend as observed in the case of Mn i.e. concentration of Ni was detected in most of the ground water samples, although the detected concentration was below acceptable limit (0.02mg/l). In pre monsoon of year 2, it was found with minimum of BDL and maximum of 0.27mg/l, while in post monsoon, minimum of BDL and maximum of 0.252mg/l. However, in surface water samples it was observed in the range of 0.03 to 2.79mg/l in pre monsoon, while in post monsoon it was found in the range of 0.03 to 0.23mg/l.

i) Zn

Zinc (Zn) is an essential nutrient which is necessary for growth and several physiological functions. It also plays an important role in protein synthesis. It can also be toxic to the organisms, if ingested above higher concentration. Due to its restricted mobility from the place of rock weathering or from the natural sources, it shows fairly low concentration in surface water.

During pre monsoon of year 1, the Zinc (Zn) content in the ground water samples recorded the highest value of 1.29 mg/l at B1 and minimum of BDL. During post monsoon of year 1, the highest level of Zn was found to be 0.797mg/l at H2 and with a minimum of 0.052mg/l at H6. However, in surface water samples during pre monsoon, minimum of 0.71mg/l at N3 and maximum of 2.27mg/l at N2 was observed. During post monsoon, all the samples were detected with BDL concentration except at N2, where it was found to be 81.11mg/l, which is quiet higher than the acceptable limit of Zn (5.0mg/l) given by BIS[8].

In pre monsoon of year 2, it was found with minimum of BDL and maximum of 3.36 mg/l (at H4), while in post monsoon, all the samples were detected with BDL concentration except one i.e. at H8 with 0.29mg/l concentration of Zn in ground water samples. However in surface water samples, it was observed BDL to 3.37mg/l in pre monsoon, while in post monsoon it was found BDL in all the samples except the sample of N2 which has 2.17 mg/l of Zn. Hence, it was observed that in year 2, the concentration of Zn got lowered at all the sampling locations as compared to the previous year.

4. Conclusions

The present study reveals the fact that most of the surface and ground water samples in the area were significantly contaminated by the heavy metals. The detected concentrations of most of the heavy metals were far beyond the acceptable limits mentioned by BIS. Among all these, high concentration of total Cr and Cr^{6+} in most of the water samples is of great concern, because hexavalent chromium is extremely toxic and is considered by the World Health Organization and the United States Environmental Protection Agency to be a human carcinogen. Detected concentration of heavy metals suggests that the surface water samples were comparatively more contaminated than the ground water samples. However, the intensity of contamination was found more in groundwater samples. Among all the ground water samples, water collected from handpumps were found to be more contaminated, as these samples had heavy metal content beyond the drinking water standards [8].

However, among all the heavy metals analysed, total Cr, Cr^{6+}, Fe and Zn were observed in most of the collected water samples. Iron was observed in all the samples in post monsoon season and some samples in pre monsoon which may occur due to the industrial and municipal discharge. Zinc was observed in both seasons in most of the samples but below the acceptable limit. High concentration of total Cr and Cr^{6+} in water was also of great concern. This was because chromium VI compounds are genotoxiccarcinogens Ingestion of chromium VI can also cause irritation or ulcers in the stomach and intestines. Presence of chromium VI in this area may be due to anthropogenic influences, plating industry, agrochemical industry and discharges of untreated waste. Hence, study clearly indicates that the aquifers of Ambad industrial area of Nashik district are getting contaminated due to increase in concentration of the metal ions at an alarming rate. This may be possibly due of discharge of untreated water from the industries to the land and water sources in their vicinity. Hence any delay in delay in awareness and response by government agencies may lead to the possibility of risk on human health. However, to rectify this problem many conventional and non-conventional sources are suggested now a days. Apart from conventional sources of effluent treatment, unconventional source like microorganisms producing biosurfactants is highly recommended. This technique is cost effective as well as environmental friendly [21].

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