

A Preliminary Survey on the Status of Drinking Water Quality in the Lower Primary Schools in Bongaigaon Block of Bongaigaon District of Assam

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Abstract— The present study conducted during the months of January to July, 2019 had been aimed at assessing and comparing the drinking water quality with WHO (World Health Organisation) standards in the lower primary schools of different clusters of Bongaigaon block in Bongaigaon district of Assam. Out of 271 lower primary schools of this block; 50% of the schools were selected randomly for collection of water samples to assess eleven parameters – pH, Turbidity, Iron Content, Nitrate, Chloride, Hardness, Fluoride, Arsenic, Manganese, Residual Chlorine and Bacterial content. Out of the 136 schools selected at random; the primary water source for 33, 46, 47 and 10 number of schools is Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well respectively. In all these water samples pH, Chloride, Hardness, Fluoride and residual Chlorine were found within the permissible limit but the other parameters-Turbidity, Iron, Nitrate, Arsenic, Manganese and Bacterial content were found beyond the permissible limit in some water sample. The paper indulges in deep findings and analysis of these water samples and has attempted to display the results as appropriately as possible.

Keywords: Bongaigaon, Contamination, Drinking Water, Primary School

I. INTRODUCTION

Safe drinking water is the basic need for good health and is also the basic right of humans. Unfortunately in developing countries the quality of drinking water is continuously being contaminated due to high growth in population, expansion of industries, careless waste water and chemical effluents disposal into canals and other water sources (Mohsin et al., 2013). Safe water should be free from faecal contamination and conform to the limits of chemical contamination (Murugesan et al., 2004). Many waterborne diseases like typhoid, dysentery, cholera etc. are caused due to consumption of contaminated water.

Schools play an important role in ensuring free access to water and promoting a regular water intake throughout the day for promoting a healthy lifestyle and learning environment. If children do not drink enough water during the day, it might result in dehydration and may lead to severe health issues such as headaches, irritability, poor physical performance and difficulty learning. Therefore provision of safe drinking water in schools has become so important to boost positive outcomes both health-wise and academic-wise.

There is a Supreme Court direction to all the responsible state and central government bodies to provide basic infrastructure for safe drinking water, clean toilets and boundary walls in primary and secondary government – run schools. In Assam, the state's Public Health Engineering department, Education department and Sarba Shiksha

Abhijan has taken up the responsibility to provide these amenities in schools. According to a District Information System for Education (DISE) report, there are 47,792 lower primary and upper primary government and provincialized schools in Assam. Sadly, 5,445 schools out of all do not have any drinking water facility at all. Some 7,266 others had such facilities once, but gone defunct now (www.sentinelassam.com 2016).

Bongaigaon (26°28' N and 89°96' E), the District Headquarters of Bongaigaon district of Assam has a population of 732,639 (2011 census). Out of five, Bongaigaon is a large block covering both urban and village areas. It has 14 clusters with 271 numbers of primary schools. As safe drinking water is the most important and a very basic amenity for the schools to offer to its students so a field study was conducted during the period of January 2019 to July 2019 to see whether the students of primary schools of this block are getting sufficient safe drinking water.

II. MATERIALS AND METHODS

Out of 271 lower primary schools a total of 136 schools from Bongaigaon block had been selected randomly for the study. Two drinking water samples from each of these 136 schools (denoted by S1 to S136) were collected during the period of January 2019 to July 2019. Water samples were collected in clean plastic bottles and stored at 4°C for further analysis. Various physico-chemical parameters including heavy metals such as pH, Turbidity, Iron content, Nitrate, Chloride, Hardness, Fluoride, Arsenic (As), Manganese (Mn), Residual chlorine and Bacterial contents were studied following standard analytical methods (APHA 1995, NEERI 1986, 1988). For Bacterial analysis Most Probable Number (MPN) of both Coliforms and E.coli were determined by using MacConkey's broth using multiple tube fermentation technique at 37°C for 48 hours. MPN was expressed in terms of index/100ml by using standard tables (APHA 1995).

III. RESULTS AND DISCUSSION

Out of the 136 schools selected at random; the primary water sources were Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well and their numbers are 33, 46, 47 and 10 respectively. Table-1, table-2, table-3 and table-4 show the different physico-chemical properties and bacterial contamination of water samples collected from Deep Tube Well (DTW), Hand Tube Well (HTW), Tara Hand Pump (THP) and Ring Well (RW) respectively.

The desirable limit of pH is 6.5-8.5 (WHO, 1997). Low pH causes corrosion and gives a metallic taste while high pH gives bitter/soda taste. In the studied water samples pH ranged from 6.9 to 7.26, 6.85 to 7.29, 6.89 to 7.66 and 6.91 to 7.22 in Deep Tube Well, Hand Tube Well, Tara Hand

Pump and Ring Well respectively. i.e., well within the permissible limit.

Turbidity is caused due to presence of colloidal and extremely fine dispersions in water. Suspended matter such as clay particles also contribute to turbidity. The turbidity of water samples were found in between 1 to 23 NTU in Deep Tube Well, 1 to 18 NTU in Hand Tube Well, 1 to 10 NTU in Tara Hand Pump and 2 to 7 NTU in Ring Well. In Deep Tube well though in 96.97% water samples, turbidity was observed to be within the permissible limit (5 NTU, WHO, 1997), 3.03% 17.39%, 14.89% and 20% water samples from Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well respectively, it was above the permissible limit.

Though the permissible limit of iron is 1.0mg/L but the desirable limit is 0.3mg/L (IS 10500-1991). Some water samples from all sources were found to be well above the permissible limit. Their percentages are 18.18, 47.82, 46.8 and 30 in Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well respectively. Excess of iron cause brackish coloration of water that gives rusty sediment and bitter or metallic test (IS 10500). Beyond the permissible concentration, iron alters the aesthetic quality of water (Sawant et al., 2000). Excess of iron cause haemosiderosis (Roy and Thakuria, 2007).

Excess of nitrate in drinking water causes Methemoglobinemia or blue baby disease in infants. The desirable limit of nitrate in drinking water is 45mg/L while permissible limit is 100mg/L (WHO). In all water samples presence of nitrate is well within the permissible limit, except 2.17% water samples from Hand Tube Well. The nitrate in water samples from all sources ranged from 0-10mg/L.

In all the water samples the chloride concentration were observed to be well within the permissible limit i.e., 250mg/L (WHO, 1997). In Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well it ranged from 20 to 60mg/L, 20 to 102 mg/L, 40 to 80mg/L and 40 to 62 mg/L respectively. Higher concentration of chloride is responsible for high blood pressure (IS 10500). It is also responsible for causing laxative effect in human beings (Veera Bhadram et al., 2004).

Hard water is characterized with high mineral contents that are usually not harmful for humans. It is often measured as Calcium carbonate (CaCO₃) because it consists mainly Calcium and Carbonates dissolved ions in the hard water. According to the World Health Organization (WHO)

the permissible limit of hardness of drinking water should be 500mg/L. In all the water samples hardness was well within the permissible limit. In Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well it ranged from 60 to 158mg/L, 0.23 to 252mg/L, 60 to 248mg/L and 60 to 120mg/L respectively.

Higher concentration of Fluoride is responsible for causing brownish discoloration of teeth and bone damages (IS 10500). Fluoride concentration in all the water samples was within the permissible limit (1.0mg/L). It ranges from 0.13 to 0.42 mg/L, 0.001 to 0.39mg/L, 0.15 to 0.38 mg/L and 0.15 to 0.27 mg/L in Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well respectively.

Heavy metals are dangerous because they tend to bio-accumulation. In all water sample except, 2.17% from Hand Tube Well the quantity of Arsenic (As) was found to be within the permissible limit (0.05 mg/L, WHO 1997). Presence of As greater than 0.05 mg/L are responsible for causing weight loss, depression, lack of energy, skin and nervous system toxicity (IS 10500).

Presence of excess of Manganese greater than 0.1mg/L is responsible for causing brownish colouration, blackish stains on laundry and fixtures. 0.2mg/L of arsenic cause bitter taste and altered taste of water-mixed beverages (IS 10500). In 84.84%, 86.95%, 80.85% and 80 % water samples from Deep Tube Well, Hand Tube Well, Tara Hand Pump and Ring Well the concentration Manganese was found above the permissible limit.

The maximum allowable WHO value for Residual chlorine in drinking water is 5 mg/L while the minimum recommended WHO value in treated drinking water is 0.2 mg/L (WHO 1997). In all water samples it was found nil.

In Deep Tube Well, Hand Tube Well and Tara Hand pump the Bacterial content was found to be nil while in Ring well all the water samples were found to be contaminated with Bacterial content which ranged from 2 to 500/100ml in case of Coliforms and 0 to 80/100ml in E. coli exceeding the permissible limit (0/100 ml, WHO, 1997). Presence of E. coli is responsible for a number of widespread epidemics of diarrhoea and gastroenteritis in infants and children, and showed significant antibiotic resistance against used antibiotics (Patil and Tambekar 2003). The mechanism of enteric infection due to E. coli involves production and action of enterotoxin and colonization of the organism in small intestine (Moon et al., 1979).

Sampling station	PH	Turbidity (NTU)	Iron	NO ₃	Cl	Hardness	F	As	Mn	Residual Cl.	Bacteria
S1	7.08	2	0.14	Nil	40	72	0.42	0.001	0.1	Nil	Nil
S2	7.09	1	0.13	Nil	50	92	0.29	0.001	0.12	Nil	Nil
S3	6.9	2	0.27	Nil	40	62	0.26	0.001	0.14	Nil	Nil
S4	7.11	1	0.12	Nil	40	72	0.22	0.001	0.09	Nil	Nil
S5	7.1	2	0.28	Nil	40	78	0.23	Nil	0.19	Nil	Nil
S6	7.21	2	0.25	Nil	46	74	0.19	0.001	0.16	Nil	Nil
S7	7.15	2	0.19	Nil	40	68	0.13	Nil	0.12	Nil	Nil
S8	7.08	1	0.11	Nil	40	60	0.15	Nil	0.11	Nil	Nil
S9	7.17	3	0.46	5	52	104	0.25	Nil	0.19	Nil	Nil
S10	7.11	1	0.18	Nil	40	72	0.16	0.001	0.1	Nil	Nil
S11	7.18	2	0.18	Nil	48	74	0.24	Nil	0.12	Nil	Nil
S12	7.07	2	0.15	Nil	20	62	0.16	Nil	0.1	Nil	Nil
S13	7.13	2	0.15	Nil	54	72	0.22	Nil	0.12	Nil	Nil
S14	7.09	2	0.18	Nil	40	68	0.15	0.001	0.11	Nil	Nil
S15	6.9	2	0.16	Nil	44	66	0.27	0.001	0.13	Nil	Nil
S16	6.9	2	0.27	5	44	62	0.23	0.002	0.11	Nil	Nil

S17	7.19	2	0.26	5	46	90	0.24	0.001	0.12	Nil	Nil
S18	7.19	1	0.14	5	42	70	0.16	0.001	0.13	Nil	Nil
S19	7.1	2	0.21	Nil	40	102	0.23	Nil	0.16	Nil	Nil
S20	7.14	2	0.25	5	52	90	0.21	Nil	0.17	Nil	Nil
S21	6.91	4	1.53	5	58	124	0.28	0.003	0.39	Nil	Nil
S22	7.19	2	0.3	5	60	108	0.26	0.002	0.21	Nil	Nil
S23	7.26	7	2.14	10	58	150	0.27	0.003	0.41	Nil	Nil
S24	7.2	4	2.78	10	62	158	0.32	0.003	0.53	Nil	Nil
S25	7.1	1	0.13	5	52	90	0.26	0.001	0.12	Nil	Nil
S26	7.11	2	0.14	5	50	76	0.16	0.001	0.11	Nil	Nil
S27	6.97	3	0.57	5	46	120	0.18	0.002	0.26	Nil	Nil
S28	7.09	2	0.14	Nil	52	64	0.17	0.001	0.1	Nil	Nil
S29	7.18	4	0.68	5	52	120	0.31	0.002	0.3	Nil	Nil
S30	6.92	2	0.18	Nil	44	62	0.17	Nil	0.11	Nil	Nil
S31	7.08	2	0.2	Nil	42	78	0.18	Nil	0.12	Nil	Nil
S32	7.15	2	0.24	5	48	90	0.2	0.001	0.15	Nil	Nil
S33	7.17	2	0.16	Nil	40	90	0.16	Nil	0.12	Nil	Nil

Table 1: Physico-chemical parameters including heavy metals and bacterial contents of drinking water of some LP Schools of Bongaigaon block of Bongaigaon District during the period of January 2019 to June 2019 (source Deep Tube Well, values are in mg/L except Turbidity and bacteria).

S01 = AtugaonUjanpara LPS, S02 = 63 No. Atugaon LPS, S03 = 591 No. Tilpukhuri LPS, S04 = 177 No. Tengaigaon LPS, S05 = 214 No. Sawnagaon LPS, S06 = Hindi Vidyalaya LPS, S07 = Bidya Bhaban LPS, S08 = New Colony LPS, S09 = Dr. C.M Das Memorial School, S10 = North Bongaigaon LPS, S11 = Natunpara LPS, S12 = Bongaigaon RLY LPS, S13 = Salbari LPS, S14 = Netaji Vidyaniketan MES, S15 = 672 No. Ghilaguri LPS, S16 = 1050 BongaigaonBidyamandir LPS, S17 = 291 RastrabhasaBidyamandir LPS, S18 = 278

No. HarinamMaheswari Hindi LPS, S19 = 272 No. C Bongaigaon Town LPS, S20 = 53 No. Birjhora LPS, S21 = 1 No. Borpara LPS, S22 = 42 No. Bakhrapara LPS, S23 = PachimDolaigaon B.H.T.O LPS, S24 = New Bongaigaon LPS, S25 = Bibekananda Vidyapith LPS, S26 = KalibariVidyaniketan LPS, S27 = Kholabanda LPS, S28 = BhadrangaonPolashbari LPS, S29 = Madya Barpathar LPS, S30 = KholabandhaBarpathar LPS, S31 = 1 No. Chiponsila LPS, S32 = 7 No. Kamarpara LPS, S33 = 498 No. LPS.

Sampling station	PH	Turbidity (NTU)	Iron	NO ₃	Cl	Hardness	F	As	Mn	Residual Cl.	Bacteria
S34	7.09	1	0.19	Nil	42	72	0.17	Nil	0.14	Nil	Nil
S35	7.21	3	0.72	Nil	52	120	0.31	0.002	0.18	Nil	Nil
S36	7.1	2	0.28	Nil	40	78	0.23	Nil	0.19	Nil	Nil
S37	6.92	3	0.39	Nil	48	126	0.3	0.002	0.26	Nil	Nil
S38	6.87	5	0.74	10	46	142	0.31	0.003	0.35	Nil	Nil
S39	6.93	3	0.3	2	44	76	0.21	0.002	0.13	Nil	Nil
S40	7.1	3	0.3	Nil	40	76	0.18	0.002	0.14	Nil	Nil
S41	7.15	1	0.17	2	52	90	0.23	0.001	0.14	Nil	Nil
S42	6.85	18	4.82	15	86	224	0.37	0.005	1.29	Nil	Nil
S43	6.94	9	4.76	10	82	228	0.3	0.004	0.64	Nil	Nil
S44	7.19	2	0.29	Nil	42	90	0.28	0.002	0.22	Nil	Nil
S45	7.11	3	0.425	46	102	0.23	0.001	0.17	0.17	Nil	Nil
S46	7.12	2	0.62	Nil	52	120	0.18	0.002	0.25	Nil	Nil
S47	7.19	2	0.36	Nil	48	82	0.19	0.002	0.16	Nil	Nil
S48	7.11	2	0.15	Nil	20	60	0.16	0.001	0.12	Nil	Nil
S49	7.29	9	4.17	12	80	252	0.38	0.005	0.78	Nil	Nil
S50	6.92	2	0.22	Nil	52	90	0.21	Nil	0.15	Nil	Nil
S51	7.26	1	0.15	5	60	102	0.22	0.001	0.8	Nil	Nil
S52	7.13	1	0.18	Nil	44	86	0.19	Nil	0.13	Nil	Nil
S53	6.96	2	0.17	5	40	84	0.18	Nil	0.1	Nil	Nil
S54	7.08	1	0.14	Nil	40	68	0.18	Nil	0.1	Nil	Nil
S55	7.16	3	0.52	Nil	44	96	0.18	0.002	0.18	Nil	Nil
S56	6.93	3	0.42	Nil	42	104	0.22	Nil	0.18	Nil	Nil
S57	6.87	3	0.47	5	54	128	0.31	0.002	0.28	Nil	Nil
S58	7.1	2	0.3	5	42	90	0.21	Nil	0.2	Nil	Nil
S59	6.9	3	0.29	Nil	44	102	0.26	Nil	0.15	Nil	Nil
S60	7.2	7	4.67	10	60	152	0.29	0.003	0.44	Nil	Nil
S61	7.12	2	0.28	Nil	42	90	0.17	0.001	0.18	Nil	Nil
S62	7.21	3	0.3	10	62	82	0.26	0.002	0.28	Nil	Nil
S63	7.14	3	0.3	Nil	44	72	0.15	0.001	0.18	Nil	Nil
S64	7.14	2	0.21	Nil	42	84	0.2	0.001	0.13	Nil	Nil
S65	7.21	3	0.72	Nil	52	120	0.31	0.002	0.18	Nil	Nil
S66	7.14	3	0.38	Nil	42	94	0.27	0	0.18	Nil	Nil
S67	7.23	4	0.68	5	60	142	0.32	0.002	0.31	Nil	Nil
S68	6.91	8	3.65	10	60	192	0.39	0.004	0.72	Nil	Nil
S69	7.05	2	0.3	Nil	42	60	0.12	0.001	0.13	Nil	Nil

S70	6.98	7	3.18	10	52	182	0.34	0.004	0.49	Nil	Nil
S71	7.21	4	1.12	5	48	120	0.18	0.002	0.43	Nil	Nil
S72	7.12	2	0.28	Nil	44	92	0.17	Nil	0.16	Nil	Nil
S73	6.94	2	0.3	Nil	60	114	0.36	0.003	0.21	Nil	Nil
S74	6.98	1	0.8	10	65	75	0.35	0.002	0.22	Nil	Nil
S75	7.01	4	0.7	15	48	84	0.15	0.003	0.33	Nil	Nil
S76	7.05	2	0.5	15	101	63	0.32	0.002	0.14	Nil	Nil
S77	6.75	2	0.15	20	58	120	0.25	0.001	0.09	Nil	Nil
S78	7.25	6	0.22	5	72	85	0.55	0.003	0.08	Nil	Nil
S79	7.09	7	0.3	12	121	136	0.18	0.002	0.09	Nil	Nil

Table 2: Physico-chemical parameters including heavy metals and bacterial contents of drinking water of some LP Schools of Bongaigaon block of Bongaigaon District during the period of January 2019 to June 2019 (source Hand Tube Well, values are in mg/L except Turbidity and bacteria).

S34 = No. 1 Tengaigaon LPS, S35 = 487 No. Dhalapukhuri LPS, S36 = 214 No. Saonagaon LPS, S37 = FulkumariGasergaon LPS, S38 = BhitorChengmari LPS, S39 = Balaji Hindi LPS, S40 = ShantidhamKalibari LPS, S41 = Binapani LPS, S42 = Jagannath LPS, S43 = 2 No. Kakrangaon LPS, S44 = Bishnujyoti LPS, S45 = Kanaklata LPS, S46 = Uttarakrangaon LPS, S47 = Bhadrangaon Shivaji LPS, S48 = 254 No. Bhawrikata LPS, S49 = 36 No. Dhaligaon LPS, S50 = 57 No. Kashidoba LPS, S51 = ChiponsilaDhontola LPS, S52 = 847 No. ChiponsilaSutarpara LPS, S53 = 36 No. Chorapara LPS, S54 = 2 No. Jogdoba LPS, S55 = PachimBhadragaon LPS, S56 = 240 No. BidyapurBonolota Girls J.B.S, S57 = Pub Bhadrangaon LPS, S58 = 619 No.

PachimBhadragaon LPS, S59 = Chengmari Raja Thakur LPS, S60 = Dashimapara LPS, S61 = 39 JelkajharPatgiripara LPS, S62 = Ravapara LPS, S63 = Nagariagaon LPS, S64 = NimnaBuniadi LPS, S65 = 487 Dhalagaon LPS, S66 = Chennapara LPS, S67 = Barshangaon LPS, S68 = North Boitamari LPS, S69 = 12 No. Dewangaon LPS, S70 = DewangaonSutradhar Para LPS, S71 = 14 No. Deklimari LPS, S72 = BashbariUlubaripara LPS, S73 = 266 DholagaonMajparaParthamik Vidyalaya, S74 = PachimFulkumariGasergaon LPS, S75 = Ma Santoshi S. Vidyamandir LPS, S76 = Atunpanra LPS, S77 = 2 No. Nayapara LPS, S78 = DankinamariJilana LPS, S79 = ChaprakataRangjuli LPS.

Sampling station	PH	Turbidity (NTU)	Iron	NO ₃	Cl	Hardness	F	As	Mn	Residual Cl.	Bacteria
S80	7.08	2	0.15	Nil	46	74	0.23	0.002	0.17	Nil	Nil
S81	7.14	3	0.39	5	46	104	0.23	0.001	0.2	Nil	Nil
S82	7.35	9	4.17	10	72	248	0.38	0.005	0.63	Nil	Nil
S83	7.18	2	0.26	5	50	90	0.28	0.002	0.14	Nil	Nil
S84	6.98	4	0.67	5	48	120	0.17	0.002	0.3	Nil	Nil
S85	7.18	3	0.36	5	40	92	0.19	Nil	0.27	Nil	Nil
S86	6.98	3	0.62	5	58	128	0.26	0.002	0.26	Nil	Nil
S87	7.15	2	0.43	5	60	102	0.27	0.002	0.24	Nil	Nil
S88	7.1	1	0.12	Nil	44	72	0.22	0.001	0.1	Nil	Nil
S89	7.11	2	0.16	Nil	40	68	0.18	Nil	0.12	Nil	Nil
S90	7.12	2	0.17	Nil	42	74	0.21	Nil	0.13	Nil	Nil
S91	7.15	3	0.29	Nil	48	90	0.18	Nil	0.18	Nil	Nil
S92	6.98	2	0.39	Nil	46	106	0.17	Nil	0.19	Nil	Nil
S93	7.14	2	0.25	5	46	104	0.24	0.002	0.2	Nil	Nil
S94	7.16	3	0.73	5	56	118	0.21	0.003	0.22	Nil	Nil
S95	6.92	7	2.76	10	66	168	0.33	0.003	0.42	Nil	Nil
S96	7.14	2	0.17	Nil	42	94	0.18	0.001	0.11	Nil	Nil
S97	7.06	2	0.16	Nil	46	84	0.28	0.001	0.13	Nil	Nil
S98	7.07	2	0.11	Nil	40	62	0.2	0.001	0.12	Nil	Nil
S99	7.08	2	0.18	Nil	42	90	0.15	0.001	0.11	Nil	Nil
S100	7.66	6	3.92	10	68	198	0.32	0.003	0.44	Nil	Nil
S101	7.24	5	0.94	10	46	98	0.22	0.004	0.29	Nil	Nil
S102	7.25	7	3.53	10	72	198	0.36	0.003	0.39	Nil	Nil
S103	7.11	2	0.21	Nil	48	68	0.17	0.001	0.15	Nil	Nil
S104	6.95	2	0.17	Nil	52	78	0.24	0.001	0.11	Nil	Nil
S105	7.08	1	0.14	Nil	40	60	0.21	Nil	0.12	Nil	Nil
S106	7.09	2	0.17	Nil	40	74	0.17	0.001	0.12	Nil	Nil
S107	7.39	10	0.96	10	40	102	0.19	0.002	0.28	Nil	Nil
S108	7.11	2	0.12	Nil	40	68	0.18	0.001	0.1	Nil	Nil
S109	7.22	3	0.35	Nil	46	84	0.29	0.001	0.16	Nil	Nil
S110	7.22	3	0.74	Nil	46	120	0.25	0.001	0.24	Nil	Nil
S111	7.1	2	0.23	Nil	40	76	0.18	0.002	0.147	Nil	Nil
S112	6.89	5	2.91	10	80	186	0.37	0.004	0.61	Nil	Nil
S113	7.14	3	0.48	5	54	96	0.27	0.003	0.18	Nil	Nil
S114	6.96	3	0.47	Nil	60	110	0.19	0.002	0.21	Nil	Nil
S115	7.16	3	0.51	10	60	120	0.26	Nil	0.25	Nil	Nil
S116	7.11	1	0.1	Nil	48	72	0.2	Nil	0.12	Nil	Nil
S117	7.13	7	0.53	10	44	80	0.34	0.001	0.1	Nil	Nil
S118	7.6	9	0.88	5	35	75	0.25	0.003	0.05	Nil	Nil

S119	7.45	2	0.47	5	76	64	0.29	0.004	0.02	Nil	Nil
S120	7.44	3	0.76	5	54	102	0.54	0.002	0.07	Nil	Nil
S121	6.89	2	0.11	10	60	98	0.81	0.002	0.06	Nil	Nil
S122	6.9	4	0.25	5	75	112	0.22	0.002	0.1	Nil	Nil
S123	7.05	5	0.29	8	25	85	0.45	0.001	0.5	Nil	Nil
S124	7.5	1	0.05	2	32	94	0.5	0.001	0.22	Nil	Nil
S125	7.07	1	0.15	4	44	110	0.11	0.001	0.35	Nil	Nil
S126	6.8	3	0.25	3	67	140	0.3	0.003	0.52	Nil	Nil

Table 3: Physico-chemical parameters including heavy metals and bacterial contents of drinking water of some LP Schools of Bongaigaon block of Bongaigaon District during the period of January 2019 to June 2019 (source Tara Hand Pump, values are in mg/L except Turbidity and bacteria).

S80 = SawanagaonNatunpara LPS, S81 = 765 Kachugaon LPS, S82 = Nowagaon LPS, S83 = 227 Nowagaon LPS, S84 = BhitorChengmari LPS, S85 = Bahir Chengmari M.E.M, S86 = 1 No. BamunitilaSibir Janata LPS, S87 = Rajathakur LPS, S88 = 767 Ghogpara LPS, S89 = 14 No. Nankargaon JB School, S89 = 14 No. Nankargaon JB School, S90 = 699 No. Bamunitila LPS, S91 = Akhrabari LPS, S92 = 618 No. Lingdoba LPS, S93 = 275 No. BagariguriRavapara LPS, S94 = 7 No. Popragaon LPS, S95 = 760 No. Korebari LPS, S96 = 686 No. Popragaon LPS, S97 = 1 No. Popragaon LPS, S99 = 281 No. DeulguriRavapara LPS, S99 = 48 No. Chitkagaon LPS, S100 = 283 No Bhawriakata S101 = Garopara LPS, S102 = 839 No. Barpathar LPS, S103 = 1004 No

DolaigaonBhaulaguri LPS, S104 = 58 No. Dolaigaon LPS, S105 = Adarsha BidyaMandir LPS, S106 = Bholanath Adarsha LPS, S107 = Kinder Garden LPS, S108 = SrimantaShankardev LPS, S109 = Rajendra Bidyapith LPS, S110 = Bhaulaguri LPS, S111 = 503 No. Bagulamari LPS, S112 = Bilashpur LPS, S113 = 579 No. Takuamari LPS, S114 = DakhinTakuamari LPS, S115 = Barchara LPS, S116 = 473 No. Bhdragaon LPS, S117 = ChikibikiGhonapara LPS, S118 = Bir Chilaray LPS, S119 = Malipara LPS, S120 = Milanpur LPS, S121 = Nankargaon H.K. LPS, S122 = Sonapur LPS, S123 = 1084 No. Niligarh LPS, S124 = 6 Rashigaon Bahir Chengmari LPS, S125 = 828 No. BhitarChengmari LPS, S126 = Mamugaon LPS.

Sampling station	PH	Turbidity (NTU)	Iron	NO ₃	Cl	Hardness	F	As	Mn	Residual Cl.	BACTERIA	
											Coliforms	E-coli
S127	6.92	7	2.63	10	62	120	0.27	0.001	0.39	Nil	2	Nil
S128	7.11	2	0.17	Nil	40	62	0.16	Nil	0.14	Nil	<2	Nil
S129	6.91	3	0.47	10	60	120	0.27	0.002	0.25	Nil	2	Nil
S130	7.15	3	0.29	5	44	86	0.15	0.001	0.17	Nil	<2	Nil
S131	7.13	2	0.12	Nil	40	60	0.18	0.001	0.1	Nil	500	80
S132	7.22	2	0.17	5	40	84	0.18	Nil	0.11	Nil	170	21
S133	7.33	8	0.5	10	45	100	0.22	0.001	0.1	Nil	500	80
S134	6.9	2	1.15	5	76	120	0.25	0.002	0.22	Nil	300	22
S135	7.34	4	0.15	5	65	85	0.15	0.001	0.15	Nil	80	15
S136	7.55	5	0.12	10	50	65	0.18	0.003	0.22	Nil	2	Nil

Table 4: Physico-chemical parameters including heavy metals and bacterial contents of drinking water of some LP Schools of Bongaigaon Block of Bongaigaon District during the period of January 2019 to June 2019 (source Ring Well, values are in mg/L except Turbidity and bacteria).

S127 = Majhigaon LPS, S128 = 150 No. Majhigaon LPS, S129 = KachuagaonMajpara LPS, S130 = RashigaonPrathamik Vidyalaya, S131 =KahiparaMonakosa LPS, S132 = 5 No. Dakuapara LPS, S133 = 16 No. DholagaonUjanpara LPS, S134 = 30 No. Bashbari LPS, S135 = Dr. Radhakrishna LPS, S136 = Gosaipara LPS.

organization of awareness campaign on waterborne diseases and importance of safe water for human health.

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REFERENCES

- [1] APHA Standard Methods for Examination of Water and Waste Water. 19th Ed., American Public Health Association, American Water Works Association and Water Pollution Control Federation, Washington, DC, 1995.
- [2] C.P. Sawant, G.C. Saxena and V.S. Shrivastav, "Trace metals in and around the industrial belt," Ecology Environment and Conservation, 6(6): 135-137, 2000.

IV. CONCLUSION

High turbidity, presence of iron and manganese, arsenic contamination as well as presence of bacterial organisms makes the water unsuitable for drinking. Most of the diseases and deaths in the developing countries are caused due to consumption of contaminated water. Diarrhoea and gastroenteritis are very common among children and is caused due to consumption of microbial contaminated water. Drinking water plays an important role in students' health as they spend a large part of their day in school. Therefore, in order to protect them from getting these diseases due to consumption of contaminated water the current study suggests; regular monitoring of ground water quality; installation of more numbers of water filtration plants to provide safe drinking water by District government; an urgent improvement in the sanitary conditions of the area and regular

- [3] G. F. Nordberg, "Health Hazards of Environmental Cadmium Pollution," Royal Swedish Academy of Sciences, Vol. 3, No. 2, pp. 55-56, *Ambio* © 1974.
- [4] H.W. Moon, R.E. Issaeson and J. Pohlenz, "Mechanism of association of enteropathogenic *E. coli* with intestinal epithelium," *Am. J. Clin. Nutr.*, 22: 119-127, 1979.
- [5] IS 10500: 1991; Water quality standards, Indian Standard for drinking water – specification IS 10500: 1991.
- [6] K. Veera Bhadram, M. Ravindra and M. Pradhanthi, "Evaluation of water quality index at Visakhapatnam city, Andhra Pradesh," *Nature Environment and Pollution Technology*, 3(1): 65-68, 2004.
- [7] M. Mohsin, F. Safdar, F. Asghar, & F. Jamal, (2013). Assessment of Drinking Water Quality and its Impact on Residents Health in Bahawalpur City. *International Journal of Humanities and Social Science*, Vol. 3 No. 15.
- [8] NEERI, 1986, 1988. Manual of Water and Waste Water Analysis, National Environmental Engineering Research Institute, NeheruMarg, Nagpur.
- [9] R. Roy and M. Thakuria, "Status of the drinking water quality in schools of Bongaigaon area of Bongaigaon district of Assam," *Nature Environment and Pollution Technology*, 6(3): 485-489, 2007.
- [10] S. Murugesan, D.S. Kumar, S. Rajan and D. Chandrica, "Comparative study of the ground water resources of east and west region of Chennai, Tamilnadu," *Nature Environment and Pollution Technology*, 3(4): 495-499, 2004.
- [11] WHO Regional Publication, South East Asia Series No. 14, WHO, New Delhi, 1997.
- [12] WHO. (2002), *Global Strategy for Food Safety; Safer food for better Health*, Geneva: World Health Organization (WHO).
- [13] WHO, (2004), *Guidelines for Drinking-Water Quality (3rd Ed., Vol.1)*. Geneva: World Health Organization (WHO).
- [14] www.sentinelassam.com. 2016. No Drinking water in 26% LP-UP schools.
- [15] Y.S. Patil and D.H. Tambekar, "Exploration of biodiversity of *E. coli* in water sample of saline belt of Akola and Buldhana district," 44th Annual conference of Association of Microbiologists of India, Dharwad, 2003.