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WATER POLLUTION AND ASSOCIATED HEALTH PROBLEMS: A CASE STUDY OF ALIGARH CITY, U.P. INDIA

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ABSTRACT

The main purpose of the present paper is to study water pollution, one of the major threats to public health. In developing countries by and large, ill health are attributed to non availability of safe and drinking water. It has been observed that 80 per cent of all diseases in the world are associated with surface water. The present study is based on both primary and secondary sources of data of urban and peri-urban areas of Aligarh pertaining to the quality of water and the diseases associated with it. Drinking water quality is poorly managed and monitored. Water pollution is caused by the mixing the sewerage water, toxic chemicals and industrial effluents along with the drinking water. In developing countries by and large ill health is attributed to the non availability of safe drinking water. Some developed countries have the warp of coping up with the problem, but developing nations are still not able to solve it completely. Hence, water sources are concentrated with coli form, toxic metals or other harmful chemicals. The drinking water quality parameters set by the Indian agencies. Human activities like improper disposal of municipal, industrial effluents and indiscriminate application of chemicals in different in different economic activities, pertaining to lock and brass metal for which Aligarh is famous, led to various health problems like typhoid, Jaundice, Cholera, Dysentery etc. Strategies suggested earlier improving the water supply but all in vein. It is high time to take at least some necessary resources to control the pollution and pollutants by laying down a new supply lives to replace the rotten, rusted, decaying pipes line, removing the impurities at the sources.

KEYWORDS: coli form, toxic metals, pollutants, Jaundice, Cholera, Typhoid

INTRODUCTION

The earliest known writing concern with pollution goes back to the time of Hippocrates, also between 9th to 13th centuries Mohammad Zakaria Razi, Ibn Sina, etc. Who wrote about Air, Water and soil. But it was King Edward Ist. of England who noticed extreme cases of water pollution of river Tames in 1558 and the famous Cholera outbreak in Soho district, London (1854),which was thought to be by a 'miasma' in the atmosphere, but Dr.John Snow believed it to be water born and he proved it by pin pointing the culprit water pump, giving contaminated water. Which forced the administration to opt a proper sewerage system in London to save as problems of similar nature and since then a lot has been written about their impact at different level in different countries including India.

Water pollution is the introduction of contamination into the water that causes instability, disorder, harm and discomfort to the human body. It may take the form of chemical subsistence or might the foreign subsistence or natural when it exceeds the level. In developing countries, most of the health problems are related to poor sanitation, particularly the non – availability of safe drinking water, computed with lack of awareness to use open toilets or fields to answer their natural calls, and dumping extracted waste in the open which results in not only polluting the soil but also the ground water .The United Nations Congress of Environment and Development (UNCED) has indicated way back in 1992 that 70% of the water pollution and 80 percent of the diseases are water related and responsible for 33 percent of total deaths. World health report of 2002 also indicated that approximately 3.1 percent of deaths (1 million) and nearly 80 percent of all diseases worldwide are associated with the unsafe drinking water. In our country, the availability of safe drinking water is a severe problem, whereas Aligarh city is also facing deficiency in the water supply. Water contamination has been identified in many parts of the city. Urbanization is haphazard increasing due to influx of rural areas and small towns breed urban slums where living conditions are very bad. They do not have access to safe water and basic amenities together leads to water pollution.

The city is situated in the middle portion of the Doab, or the land between the Ganga and Yamuna rivers. Topographically, the city represents a shallow trough,

creating conducive conditions for frequent water logging during rainy season.

There are a total of 5006 industrial units in the city, of these there are 3500 small scale industries, 200 medical and 6 large industries (food processing, lock and household industries). There are 114 slums in the city; its population increased from 26 percent (2001) to 44 percent (2010). Chemicals like trichloroethylene used in electroplating unit to remove stains from brass products, therefore they go for final polishing (Down to earth 'Deadlock in Aligarh Nov, 30, 2003) but nobody cares how many different types of hazardous chemicals are used and dribbled in open drains in residential areas, causing health problems like breathlessness, headaches and nervous disorders are common among the residents of the Aligarh (Down to Earth, Crippling Effects of TCE, July 31, 2003).

In addition the villages which have been,merged into Aligarh municipal limits have become urban slums most of these do not have proper sanitation facilities and are the areas of open defecation, and manual scavenging is still common in the old part of the city and in Ghettos. The source of the water in Aligarh city is mainly ground water and the sources are power wells 72, hand pumps, 3996, and the total length of distribution network 612 kms., the average age of the of distribution pipes are 25-30 years.

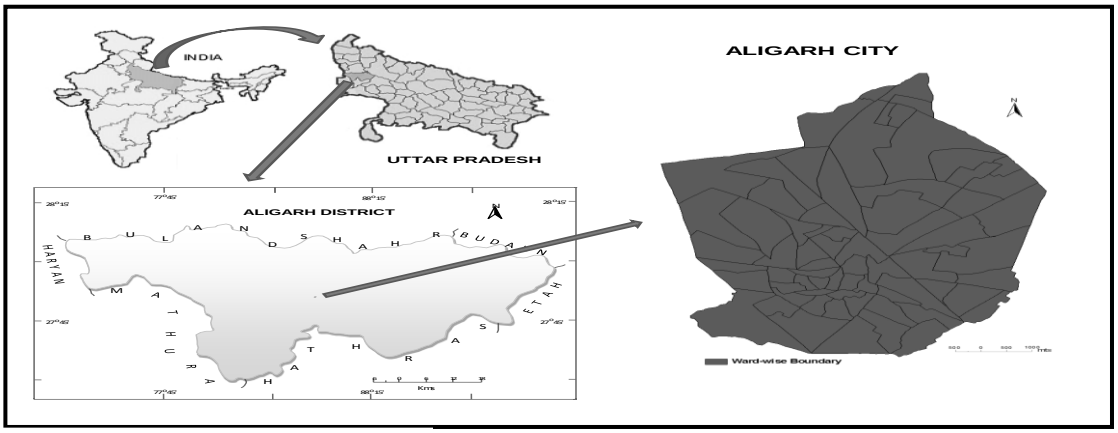
Depleting water table, particularly in summers, supply becomes sluggish and water tankers are pressed to meet minimum requirements. Sometimes even by and large water gets contaminated during supply and storage as in the case of municipal water supply gets contaminated because of corrosion/rusting of decades old pipes serve as entry points for waste, sewerage and raw sewage during the non supply hour and when the supply is not full, boosters attached to the pipelines by the individuals creates vacuum like conditions inside the pipes to avoid contamination, pipes should be replaced after every 15 years (Singh R.L. 2000) with the result proper carry a heavy burden of water related diseases, mostly diarrhoea, colitis, typhoid, caused by number of viral, bacterial, protozoa and helminths agents.

The present paper is based on a survey covering pre-monsoon and post monsoon season to evaluate the season impact also. Data for the study represents 2011; samples were taken from all the sources of water and were tested in laboratories with the time limit (6 hrs.) or 48 hours if kept in refrigerators. Samples were tested for physic-chemical and bacteriological analysis. Presumptive coli form or most probable number (MNP) test is used expensively for drinking water quality analysis. It can be used as indicator both for treatment efficiency and of the integrating of distribution supply. Water samples were classified into four categories i.2 excellent -0 (MNR/100ml), satisfactory 1 - -3, suspicious, 4 – 10 and unsatisfactory > 10 quality wise.

STUDY AREA

Aligarh city is one of the important towns of western utter Pradesh, it is located at $27^{O}53'$ N latitude and $78^{O}4'$ E longitude, situated along Delhi-Kolkata railway line and Grand Trunk road about 126 to the southeast of New Delhi.

The Aligarh city covers an area of 38.29 sq. km out of which 64.5 per cent area of the city is developed. Of the developed area 49.1 per cent is used for residential purposes, 28.1 per cent for transport, 9.4 per cent for industrial and commercial purposes, 7.1 percent of public utility, 2.1 per cent is under parks and open spaces and only 0.4 per cent is used for recreational purposes. The city is divided into 70 wards which spread over 158 Mohallas. The total population of the Aligarh city was estimated at 872,575 persons against 669087 persons in 2001 per 2011 census of India, in which males constitute 53.08 per cent and females 46.92 percent of the total population. Aligarh has high population rate, as the city grows by 2 per cent naturally and 4 per cent by the migrants coming from different villages



Sources: Census of India. 2011

Fig. 1

OBJECTIVES

The major objectives of the present study are:

- To examine the sources of water in Aligarh City
- To examine the status of water pollution in Aligarh city
- To examine the impact of water pollution on the health of the people in Aligarh city.
- To suggest measures to control to some extent

DATA BASE AND METHODOLOGY

For the present study, data have been collected from both the primary and secondary sources. Primary data has been collected through personal testing and secondary data has been collected from Nagar Nigam, and Pollution control board of Aligarh city. For quality of water testing, six wards have been selected from the city, i.e. two from the industrial area, one from residential areas (far from industry), two from a commercial, residential area from the old city, and one from urban – rural fringe area which have dominance of slums.

Further, intensity of water pollution has been examined using a Z- score technique or standard score technique. In this method each method has got standardized. The score measure the departure of individual observations expressed in a comparable form. It is a linear transformation of the original data based on the composite mean Z – score the index of the development of each component aerial unit has been estimated.

Further, the impact of different water born diseases has been analysis according to the income groups of the respondent and for that the result has been find out with z-score and composite z-score technique. The formula is:

$$Z_i = \frac{X_i - \overline{X}}{SD}$$

Where **Zi** = standard score for the th observation, Xi = original value of the ith observation, $\overline{X}$ = mean of all the value of X, SDx = standard deviation of X observation.

Further, the result of the standard score obtained for different diseases, were aggregated by composite standard score (CSS) so that regional disparities in the level of diseases among the wards may be obtained on a common sale. The composite standard score may be algebraically expressed as -

$$CSS = \frac{\sum Z_{ij}}{N}$$

DISCUSSION

The source of drinking water in Aligarh city is mainly ground water. The present work reveals the quantification to the extent of chemical and microbial contamination of drinking water in different wards of urban and peri-urban areas of Aligarh city.

Table: 1 Status Of Water Supply In Aligarh City In 2010

Total numbers of tube wells	61
Number of tube wells require	78
Total number of tube wells required by 2030	133
Total number of overhead tanks	18
Total number of underground tanks	05
Capacity of one overhead tanks	2000 to 2700
Distribution system one overhead tanks	500 km, 2" to 5"
Drinking water availability	53 mld
Water required in 2010	98 mld
Requirement of water by 2030	168.49 mld
Municipal household water connections	45, 000
Water supply hours	2 hrs in the morning and evening
Summer season	½ an hour or less any time
Total number of hand pumps by 2010	2025
Number of hand – pumps installed in 2010	371
Depth of boring	90 – 130 ft

This main source of water supply in the city through tube wells, a perusal of table 1, shows that presently there are 61 tube wells of which 1 is not functioning. So only 59 tube wells are working and providing either directly to the distribution lines or they are feeding water to the storage tank from where they distribute through the pipelines to the 8 active zones mostly in the old part of the city. There 18 overhead tanks and 5 underground storage tanks. The storage capacity of the overhead tanks is 19, 950 kls. So depending upon the capacity of the storage tanks the water is distributed to1 or 2 zones only. A recent report states that water supplied by the 54 tube well cannot fulfill the required demand of water. So by June 2010 and additional 78 tube wells were planned to be four bored to fulfill the accelerating demand of water by the city. It has been estimated that by 2029, 133 tube wells will be required by the water demanded by the increasing city population. At present the total length of the distribution line in the city is about 500 km. The present length of this distribution system is not sufficient to supply water throughout the city, because of its poor maintenance. The pipes are old and prone to leakages they often leak and submerged in slugged. Pores in pipe server are entry points for waste, slugged and raw sewage during the non supply hours, the use of boosters attached directly to the municipality supply lines by the consumers, creators, and vacuumed line conditions inside the pipes. Beside the municipalities ageing and rusting pipes, the consumer pipes also add

to the menace. To avoid contaminations the pipe should be replaced after every 15 years.

Normally the municipality supplies water twice in a day about 2 hours in morning and 2 hours in the evening. But during the summer, the water table fall and there are frequent power failure, which generate water crisis. Apart from this, by and large the newly developed settlements depend on their own means for water, i.e. Hand pumps, Jet pumps and Submersible pumps to cater their needs.

The awareness about the quality of drinking water is increasing in several parts of the world. The heavy metals are probably the most harmful and insidious pollutants because of their non bio-degradable nature and their potential to cause adverse effects on human being at certain levels of exposure and absorption. The harmful effects are linked to accumulate in biological system even in their lowest form of development. The table 2 gives the impact of various chemicals or non degradable metals on the human body

Table 2: Results of physical-chemical analysis of drinking water in sampled wards of Aligarh city and desired Indian /WHO standards

Constituents	Indian Standard Institution IS (10500) & W.H.O.Standard		Average Concentration in the sampled wards of Aligarh city	
	I.S. Desired level mg/1lit	W.H.O.Standard level mg/1lit	Average Concentration in HP water	Average Concentration in MS water
PH (value)	6.5-8.5	7-8	7.7	7.95
Turbidity(NTU)	10	5	7.5	6.1
Conductivity(u simen/cm)		.300	.682	.735
Total Hardness	300	100	260	180
Total Solids		500	950	530
Total dissolved solids		500	810	580
Chlorides	250	200	128.4	100.5
Fluoride (F)	1	1	0.23	0.21
Copper	0.05	-	0.015	0.021
Chromium	0.05	-	0.079	0.16
Nickel	0.020	0.0	0.074	0.006
Zinc	5	-	0.930	0.710
Sulphates	150	-	180.5	68
Calcium	75	100	74.7	28
Magnesium	30	30	94	133
Mercury	.001	0.1	-	.007
Cadmium	0.01	-	0.12	.035
Arsenic	0.05		0.07	0.15
Lead	0.1			.12

HP: stands for hand pumps, jet and submersible pumps
PH Hydrogen in concern ,CT-Conductivity, TH-Total hardness, TS-Total solids, TDS-Total solids dissolved, CI-Chloride, CU-Copper, CR-Chromium, NI-Nickel, ZN-Zink, SO$-Sulphate, MH-Magnesium, CL-Calcium, MC-Mercury, CD-Cadmium, AR-Arsenic, LD-Lead, MS-Municipal Supply

To assess the quality of water 300 water samples were collected from different sources of water, municipal water 145, Hand pumps (Shallow) 120, Hand pump (deep) 19, Jet pumps 6 and from submersible 11, for its physical, chemical and bacterial analysis, the taps or pumps were operated for a few minutes to flush out the stagnant water and its mouthpiece being flamed by candle to fall any external micro-organism. The sampled were collected in the sterilized bottles and immediately transferred into a laboratory for testing.

Table.2, Shows the value of physical (PH, TB, TS, TSS, TDS, DO, BOD, CP, CH, MH) and, chemical (F, SO4, Cr, Ni, Cu, Zn,) analysis. An acceptable PH value of water ranges from 6.5 to 8.5, but from table2, it is observed that in hand pump PH average range is 7.7 while the municipal piped water stands at 7.95. Hence the pH value of the water in Aligarh city is within the permissible limit. It can be controlled by minimizing the corrosion and incrustation in the distribution system. Ph levels of less than 7 may cause severe corrosion of metals in the distribution pipes. At pH levels of above 8 there is a progressive decrease in the efficiency of the chlorine disinfection process. Beyond this range the water will affect the mucous membrane in human.

The required limit of the hardness is 300 mg/1. It may be extended up to 600 in the absence of other sources. The table shows that the average hardness of hand pump water is 260. It was observed that hardness of Aligarh city water is also within permissible limits, but often crosses 600 marks in deep borings.

Desired limit of Magnesium is 30 ml/1. But in Aligarh city, it ranges from 94-133 mg/l, while.

Similarly required limit of the calcium content is 75 mg/l, but it ranges from 28 –74.7 mg/l in municipal water and hand pump. The presence of copper in water may interfere with the intended domestic use of water. The maximum permissible limit is 1.5, but it is 0.21 in municipal water and 0.015mg/l in hand pumps.

The level of fluoride is less than the desired level in both the waters. Low fluoride levels are linked with detail problems and above 1.5 may cause flouriest. If the level is below 0.6 the water source should reject and suitable public health measures should be taken. The standard prescribed for chloride, sulphate is within acceptable limits.

Zinc imparts an undesirable astringent taste of water. It is permissible up to 4 mg/l, which is permissible in all the surveyed wards of Aligarh city. The guideline value of chromium is 0.5 mg/l which is considered to be unlikely to give rise to significant health risk, but it is also in limits in all the selected wards but the excess of alkalinity, mercury. Lead and chromium and other trace elements like terachloroethene posses a definite health problem.

Table: 3 Pathological effects of heavy metal water pollution on man

Metal	Pathological Effects on Man
Mercury	Abdominal pain, headache, diarrhoea, hemolytic, chest pain.
Lead	Anaemia, vomiting, loss of appetite, convulsions, damage of brain, liver and kidney
Arsenic	Disturbed peripheral, circulation, mental disturbances, liver cirrhosis, hyperkeratosis, lung cancer, gastrointestinal.
Cadmium	Diarrhoea, growth retardation, bone deformation, kidney damage, testicular atrophy, anaemia, injury of central nervous system and liver hypertension
Copper	Hypertension, coma, sporadic fever
Barium	Excessive salivation, vomiting, diarrhoea, paralysis, colic pain.
Zinc	Vomiting, renal damage, cramps.
Selenium	Damage of liver, kidney and spleen, fever, nervousness, vomiting, low blood pressure, blindness and even death
Cobalt	Diarrhoea, low blood pressure, lung irritation, bone deformation, paralysis

Source: Safia Khanam "Impact of Environmental Pollution on the Habitat of Aligarh City" unpublished Ph.D.thesis 2010.

Table: 4 Qualities of water samples according to average number of coliform organisms

S.N	Quality of Water	Average no. of Coli form Organism/100ml
1	Excellent (n=82)	0.0
2	Satisfactory(n=45)	1.9
3	Suspicious(n=15)	6.3
4	Unsatisfactory(n=151)	124.4
	Total(n=300)	58.9

Source: UNHCR

Water pollution caused by faecal contamination is a serious problem due to the potential for contracting diseases from pathogens (disease causing agents) Coli forms come from the same sources as pathogenic organisms, but coli forms are easy to identify, are usually present in large numbers than the most dangerous pathogens. The coli forms organisms are present in great abundance in Human intestine. The organisms are foreign to potable water and hence their presence in the water looked upon as fecal concentration. Safe water supplies of water, whether running water or HP must have zero coli form organisms, should not be detectable in any 100 ml of sample water. But the survey shows that it is detected largely in all the surveyed wards.

Table: 5 Coliform presence in different sources of water

S.N	Sources of Water	COLIFORM CONTAMINATION				TOTAL	
		PRESENT		ABSENT			
		No	%	No	%	No	%
1	Running water	115	80	30	20	145	40.3
2	Hand-Pumps (Shallow)	85	65.5	35	34.5	120	40
3	Hand Pump (Deep)	10	45	8	55	80	6
4	Jet Pump	3	35	3	65	06	2
5	Submersible pump	4	25	6	75	11	3
	Total	218	72.7	82	27.3	300	100

Out of the total 300 water samples taken from municipal water (running water), Hand pumps (Shallow and Deep), Jet pumps and Submersible pumps, it is evident from the table that the least polluted water in terms of coli forms contamination is water that comes from submersible pumps, followed by Jet and deep hand pumps. Whereas the running water or water that comes from shallow hand pumps, particularly without cement platform around are more or highly polluted.

In terms of percentage, 300 samples collected and tested for bacteria 218 were found to be contaminated with maximum in running water 79.3 per cent, followed by samples of shallow pumps 65.5 percent, deep hand pumps, Jet pumps and submersibles are less polluting.

Table: 6 Distributions of water sources, according to mpn/100ml

S.N	Source of Water	MPN =0		MPN=1 to 10		MPN=4 to 10		MPN >10		Total	
		No	%	No	%	No	%	No	%	No	%
1	Running water	30	20.7	13	9	10	6.9	92	63.4	145	48.3
2	Hand-Pumps (Shallow)	35	34.5	26	21.7	11	9.2	48	40	120	40
3	Hand Pump (Deep)	8	55	03	16.7	01	5.5	6	33.3	18	6
4	Jet Pump	3	65	2	33.3	00	00	01	0116.7	6	2
5	Submersible pump	6	75	1	9.1	00	00	4	36.4	11	3.7
	Total	82	27.3	45	15	22	7.3	151	50.4	300	100

On the basis of MNP/100ML, 82 or 27.3% samples were found to be in excellent category of water quality and 45 or 15% falls under the category "satisfactory". Suspicious or unsatisfactory accounts for 15 or 22% and finally151 or 50.4% is found to be highly polluted. Which together again reflect that more than 60% of water is unfit for drinking.

Seasonal variations were also noticed as 50% of the pre-monsoon samples were polluted with (MNP-3 level) and 45% with MNP>3/100ML, contrary to the general conception due to the oval shape topography of the city with no natural slope or outlet for water. Hence water logging is a year round phenomenon. During the monsoon and the post monsoon period, 50% of the samples from shallow pumps, particularly without platform are polluted. However, there is no significant difference in the level of contamination in deep hand pump, jet and submersible samples.

Table: 7 Distribution of diseases in different income groups of the sampled wards

Z- Score

Income Group	Diseases												
	Malaria	Fileriasis	Dengue ever	Typhoid	Cholera	Diarrhoea	Dysentery	Ameobiasis	Hepatitis	Jaundice	Gastroenteritis	Roundworm Infection	CSS
V. High (< 40000)	**0.749**	**-0.155**	**-0.608**	**2.995**	**-0.001**	**0.223**	**-0.814**	**-0.814**	**-0.565**	**-0.177**	**-0.497**	**-0.331**	**0.0004**
High (30000-40000)	**0.547**	**0.105**	**0.942**	**2.345**	**-0.096**	**0.540**	**-1.370**	**-0.688**	**-1.069**	**-0.802**	**-0.800**	**0.347**	**0.00008**
Medium (20000 – 30000)	**0.274**	**0.768**	**-0.323**	**0.704**	**0.260**	**2.448**	**-0.874**	**-0.933**	**-1.377**	**-0.074**	**-1.054**	**0.181**	**-0.0868**
Low (10000-20000 0	**0.030**	**-0.386**	**-0.384**	**-0.313**	**-0.082**	**1.843**	**-0.641**	**-1.466**	**1.323**	**1.269**	**-1.480**	**0.290**	**0.00025**
V. Low (>10000)	**0.593**	**-0.32**	**-0.820**	**-0.89**	**1.461**	**1.683**	**-0.925**	**-1.257**	**0.550**	**0.674**	**-0.73**	**1.175**	**0.098**

Water born diseases are the result of bacteria, both present in water and food, particularly leafy vegetables grown in infected soil. The table 6 is showing Z- score of all the diseases according to the income level of the people in surveyed wards. It is clear from the table that Malaria shows positive Z-score among all the income groups, which mean that this disease has its higher impact than that of another in the study wards. Though malaria/Dengue has nothing to do with the drinking water contamination, but it breeds in water, particularly in stagnant water, which is seen here and there throughout the city due to the ineffective drainage system. While the dengue flourishes in clean water left unattended in pots/coolers, etc. All the income groups are infected by malaria highly. In case of fileriasis, only high income groups (0.105) and medium income groups (0.768) have their positive z-score, while all the other income groups showed a negative z-score which shows the very negligible impact of this disease on the people of these income groups.

Dengue too found to be Z-positive in the high income group (0.942) shows its positive z-score in Dengue, but on the other hand, the households of very high income groups (2.995), high income groups (2.345), and medium income groups (0.704), shows their positive z-score in typhoid and the people of low (-0.313) and very low (-0.894) income groups have their negative z-score of typhoid. Z-score of cholera is positive in income groups of medium (0.260) and very low (1.461), but diarrhoea shows its positive z-score ranging from 0.223 to 2.448 in all the income groups. Dysentery and Ameobiasis show negative z-score among all the income groups, while Hepatitis and Jaundice have their positive z-score among low (1.323 and 1.269) and very low (0.550 and 0.674) income groups. All the income groups have their negative z-score of Gastroenteritis ranging from -0.730 to -0.497., but except in very high income groups (-0.331), all the income groups have their positive z-score in roundworm infection in the score ranges from 0.181 to 1.175.

The composite z-score of all the variables is highest in very low income groups (0.098), followed by very high (0.0004), low (0.00025) and high income group (0.00008) of the people, while the medium income

group shoes negative (-0.0868) composite z-score of all diseases, which indicated that medium income group people are more cautious about their health, while the intensity of waterborne diseases is highest among the people of very low and low income group.

CONCLUSION

Thus, it can be concluded that Aligarh water is not fit for drinking, it contains not only harmful bacteria and carcinogenic metals (Pradeep Saxena:, "Hindustan Times", July 2, 2012).Water supplied by Jal Nigam (Municipal water Works) or shallow hand pumps are highly contaminated apart from physical and chemical impurities more than 70% of the water in its present form are polluted with harmful bacteria like Coliform bacilli E- coli and streptococci. Deep hand pumps, Jet and Submersible pumps are least contaminate (4.5, 3.5 and 2.5%, respectively). By and large the scenario is the same in terms of coli form level, it should be 00 per 100ml but it is much more. According to MNP/100ml, the highest being MNP>10 (63.4%) in running water and the total stands at 50.4 per cent, here too deep hand pump, Jet and Submersible are in a much better position. At present 65 million litres water is being pumped and this water after domestic use is let into open drains or laid into pumping stations. Since water has carcinogenic metals like cadmium, hydrocarbons being treated with chlorine. Fluctuations in the number of bacteria in sewage may attribute to the irregular influx of domestic and industrial effluents into sewage. Apart from the water born diseases discussed above. Many hazardous, toxic chemicals in ground water, gets in food crop and results in diseases like cancer, liver, kidney and skin ailments. Seasonal variations further intensify the gravity of the level of pollution. Thus, it can be concluded that drinking water from public water supply and shallow hand pumps is highly contaminated and not safe for drinking at all. This calls for the needs to have adequate treatment plants and periodical bacteriological analysis of water samples from all sources so as to avoid potential hazards of water borne diseases of faecal origin.

Simultaneously, the water logging, or drainage lines should be improved and the rusted, porous, decaying supply lines which generally run parallel to sewage lines of municipal water should be replaced every 15 years to avoid pollution running water, followed by peoples' awareness regarding the health consequences of contaminated water. If we are able to provide safe drinking water to our population, we can get rid of many deadly diseases and help them to lead healthy lives. The people will enjoy a more stimulating environment and healthy life forever.

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