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Assessment of Ground Water Nitrate Pollution in Rural Area of Amravati

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Abstract

There are various physical, chemical and biological properties of water such as pH, turbidity, temperature, hardness, dissolved oxygen, total dissolved solids, microorganisms' contamination, and other chemical contaminants of heavy metals. Among this Nitrate and Nitrite is one of the contaminants in surface water as well as ground water. The widespread increases in nitrate concentrations in groundwater have been caused by an increase in the input of nitrogen into environment as a result of human activities. Surface waters are predominantly polluted by nitrate from surface run-off, sub-surface flow or groundwater exchange. Intensive agricultural production, domestic and industrial wastes, sewage and atmospheric nitrogen pollution are considered to be the main sources of nitrate contamination in water. Nitrate contamination of potable water sources is becoming one of the most important water quality concerns in our country. The maximum contaminant level for Nitrate is 45 mg/L as nitrate; it has becoming a special area of concern if concerned in drinking water supplies in excess of 45 ppm. The major health concern of nitrate exposure through drinking water is the risk of methemoglobinemia, or "blue baby syndrome," especially in infants and pregnant women and few other diseases. More than 60 percent of the population of our country uses ground water for their drinking and cooking needs. To understand the situation in Amravati district this study is conducted. It is observed that out of 13 Taluka in 7 Taluka are having Nitrate above permissible limit. In 54 % of Taluka Nitrate Pollution occurs in more than 40% sample. Out of 13 Taluka, 2 Taluka are having Nitrite above permissible limit. In 15% of Taluka are having Nitrite Pollution in more than 20% samples. Out of 100 samples, in 61 samples Nitrate is found below permissible limit 39 samples are above permissible limit. These 39 samples contain Nitrate So that it is dangerous for the public health in Raipur, Bhatkuli, Benoda, Rajura, Mandwa ,Nandgaon khandeshwar, Januna, Jawara, Jasapur, Mahulichor, Dhanora gurav, Sawanga gurav, Yenas, Dhamanagaon railway, Virul(Ronghe), Dhamangaon railway taluka, Daryapur, Kotegaon, Kokarda, Shendgaon, Pimpalgwhan, kapustalni Achalpur, Paratwada, Chandur bazaar, Shirala, Shirajgaon and Talawel from Chandur bazaar, Hiwarkhed, Chanduri, Akoli, Amravati, Badnera and Anjangaon bari. Similarly 100 samples is tested for Nitrite out of which 96 samples are below permissible limit where as 4 samples is above the permissible limit. So that most of the Taluka are safe from ill effect of Nitrate Pollution in Ground Water. The result of this investigation shows that there is nitrate pollution in some part of rural areas of Amravati district and hence require inclusive actions to prevent ill effects of nitrate pollution through ground water consumption by rural peoples.

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I. INTRODUCTION

Water is a common chemical substance that is essential for the survival of all known forms of life. About 97 % of earth's water is saline and is contained in oceans. Remaining 3% is fresh water. About 68.7 % of fresh water is trapped in the ice caps and glaciers, while 30.1 % of fresh water exists in the form of groundwater, 0.3 %in surface water and 0.9 % in other form. The groundwater available for human use contains various pollutants, particularly soluble chemical contaminants in different forms. Nitrate is a one of the chemical, like salt that may available in ground water. We get nitrate in food and in water also. Usually, water is a fairly minor source of nitrate. However, sometimes water has high levels of nitrate then it is a significant source. Nitrates are naturally present in many foods like carrots and spinach. Nitrate ($NO3^-$) is a water-soluble molecule made up of nitrogen and oxygen. It is formed when nitrogen from ammonia or other sources combines with oxygenated water. Nitrate is a natural constituent of plants and is found in vegetables at varying levels depending on amount of fertilizer applied and on other growing conditions. According to the World Health Organization, most adults ingest 20-70 milligrams of nitrate- nitrogen per day with most of this coming from foods like lettuce, celery, beets, and spinach. When foods containing nitrate are eaten as part of a balanced diet the nitrate exposure is not thought to be harmful. Nitrate is formed when nitrogen from ammonia or other sources combines with oxygenated water. Nitrate is a natural constituent of plants and is found in vegetables at varying levels depending on the amount of fertilizer applied and on other growing conditions.

Nitrate in water increases, particularly those caused either directly or indirectly by man's activities, have been a special area of concern if concerned in drinking water supplies in excess of 45 ppm. Nitrate and nitrite are naturally occurring ions that are part of the nitrogen cycle. The nitrate ion ($NO3^-$) is the stable form of combined nitrogen for oxygenated systems. The nitrite ion ($NO2^-$) contains nitrogen in a relatively unstable oxidation state. Nitrate is used mainly in inorganic fertilizers. It is also used as an oxidizing agent and in the production of explosives, and purified potassium nitrate is used for glass making. Sodium nitrite is used as a food preservative, especially in cured meats. Nitrate is sometimes also added to food to serve as a reservoir for nitrite. Nitrates occur naturally in plants, for which it is a key nutrient.

The widespread increases in nitrate concentrations in groundwater have been caused by an increase in the input of nitrogen into environment as a result of human activities. Surface waters are predominantly polluted by nitrate from surface run-off, sub-surface flow or groundwater exchange. Intensive agricultural production, domestic and industrial wastes, sewage and atmospheric nitrogen pollution are considered to be the main sources of nitrate contamination in water. Nitrate can reach both surface water and groundwater as a consequence of agricultural activity including excess application of inorganic nitrogenous fertilizers and manures, from wastewater treatment and from oxidation of nitrogenous waste products in human and animal excreta, including septic tanks. Nitrite can also be formed chemically in distribution pipes by Nitrosomonas bacteria during stagnation of nitrate-containing and oxygen-poor drinking-water in galvanized steel pipes or if chloramination is used to provide a residual disinfectant and the process is not sufficiently well controlled.

Nitrate contamination of potable water sources is becoming one of the most important water quality concerns in our country. The maximum contaminant level for Nitrate is 45 mg/L as nitrate ($NO3^-$), which is approximately equivalent to 10 mg/L as nitrogen (N). The major health concern of nitrate exposure through drinking water is the risk of methemoglobinemia, or "blue baby syndrome," especially in infants and pregnant women. More than 60 percent of the population of our country uses

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ground water for their drinking and cooking needs. Nitrate concentrations in ground water are elevated in parts of the Amravati as a result of various land-use practices, including fertilizer application, dairy operations and ranching, and septic-system use. Shallow wells generally are more vulnerable to nitrate contamination than deeper wells. In order to protect public health, the Amravati District Department of Health requires that public water systems regularly measure nitrate in their wells. So that for protecting from nitrates exposure this research work entitled "Assessment of ground water nitrate pollution in rural area of Amravati District" is undertaken.

II. MATERIAL AND METHODOLOGY

For this research study sampling sites are selected in Amravati district based on the basic information and the characteristics of topography, size, shape, depth etc. Several investigators have studied groundwater quality parameters in selected points of Amravati. But none have exclusively studied the Amravati District, therefore various sample locations in rural areas are located for this study. Since the levels of certain Nitrate found in ground water determine its behavior as well as quality, it has been proposed to analyze ground water in the some areas separately so as to find reasons for the ground water problems in the study area.

Amravati District is one of the eleven Districts of Vidarbha regions of Maharashtra state. It is situated in the northern part of the state abutting Madhya Pradesh state and lies between north latitudes 20o32' and 21o46' and east longitude 76o37' and 78o27'. The total area of the district is 12210sq.km. Wardha River forms the eastern boundary of the district. The district headquarters is located at Amravati town. The Amravati District is divided in 13 talukas Amravati, Morshi, Tivasa, Chandur Railway, Dhamangaon Railway, Nandgaon Khandeshwar, Bhatkuli, Daryapur, Anjangaonsurji, Dharni, Chikhaldara, Achalpur, and Chandur Bazar. As per the Central ground water board ground water geology is as given below.

The district has 13 towns and 1698 villages. The important rivers flowing through the district are Tapi, Purna, Wardha, Pedhi and Chandrabhaga Central ground water board has taken up several studies in the district. In Deccan Trap Basalt 33 exploratory wells and 12 observation wells and 9 pyrometer were drilled and their depth ranges from 74.45-202.45 meters below ground level. The discharge from these wells varied from traces to 20.77 liters per second. Static water levels ranged from 0.05 to 40.44 m below ground level. Except for the exploratory wells at Dhaga and Nerpingali, water levels were shallow in other wells. Deeper aquifer zones have been encountered in almost all the wells beyond 100m depth, the deepest being at 167.0m at Mahuli Jahangir exploratory well. In Purna Alluvium 40 exploratory wells, 12 observation wells and 24 Peizometers were constructed. The alluvial area has been divided into fresh ground water belt in the north and saline area in the south, based on the ground water exploration findings. The northern most art of the fresh water zone is underlain by soft weathered boulders of Basalt and this is restricted to small patches of around 10 sqkm within Achalpur and Anjangaon talks. The southern saline area is distribute in parts of Daryapur, Bhatkuli and Amravati talukas and has been explored in detail by drilling Depth of the wells ranged from 15 to 300.10 m below ground level. Static water levels vary from 3.65 to 20.58 m below ground level. Granular zones have been encountered and screened at various depths. However, it is found that zones down to the depth of 70 m falling in younger alluvium have better yields and water is less saline. This zone can be used for agricultural purpose by means of shallow tube-wells constructed down to the depth of 65 m and yielding up to 10 LPs for 30 m lift. The Climate of the district is characterized by a hot summer and general dryness throughout the year except during the south west-monsoon season i.e. June to September. The mean minimum temperatures are 15.1oc and mean

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maximum temperature is 42.2oc. The normal annual rainfall over the district varies from 700 mm to about 1700mm.

Standard specific sample bottles are used to collect sample ground water for testing purpose. For sample collection it was decided to have the pre-monsoon, monsoon and post-monsoon periods. Manual sampling with a plastic container in compliance with established standard norms was adopted. Labels used to prevent sample misidentification. And for sample preservation in tune with Ground Water Board guidelines used with minimum possible time lapse between collection and analysis because the water samples are in a chemically dynamic state, and the moment they are removed from the sample site, chemical, biological, or physical processes that change their compositions may begin. Sample location station in all taluka places in Amravati district having open well or tube well were considered. 5 to 10 number of sample from located station at certain depth were taken. The sample is tested in the college laboratory. For finding out the nitrate present in the water sample we used photometric method Based on the sampling analysis, assessment of Ground water Nitrate pollution in Rural Areas of Amravati district is done.

For assessment of ground water parameter of various Taluka in Amravati District Water Analysis Kit, API Nitrate and Nitrite Analysis kit and Dissolved Oxygen kit were used. There are Thirteen Taluka in Amravati District divided distance wise for testing so that the villages will be easily accessible in line. In full day one taluka samples were collected. In early morning at 8 am we reach to villages via road by bikes or bus. After reaching at villages we take sample of water from hand pump or well or boar well. Water quality assessment studies carried out the percentage of nitrate present in groundwater for identifying the area with high nitrate concentration in groundwater in Amravati City.

III. TESTING AND ASSESSMENT OF WATER SAMPLE

Total 100 number of samples taken from all thirteen taluka from well, Handpump, Tab water and Bore well. Information regarding sample station such as Type of source, Depth in ft, Latitude and Longitude temperature is noted from all locations. From above study water samples are tested for various physicochemical parameters, physical parameters and turbidity is noted down. The chemical parameters pH is measured by pH meter, which gives direct values of pH, total dissolved solids, electrical conductivity, Nitrate, Nitrite Dissolved oxygen, Salinity, Temperature, by using water analysis kit. Similarly different taluka sample testing and analysis is completed. Various parameter for collected sample are analysed which are presented in graphs below. These graphs are given below in figure 1 to 14.

i) For Bhatkuli Taluka

From Bhatkuli taluka five hand pumps, one well and two Bore wells samples are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 1. The Nitrate concentration found maximum in Raipur village is 80 ppm, the minimum amount of Nitrate found in Lontek village is 10 ppm. In Raipur village the Nitrate is more than permissible limit which is 45 ppm, so it is hazard for human health in Raipur and Bhatkuli village.

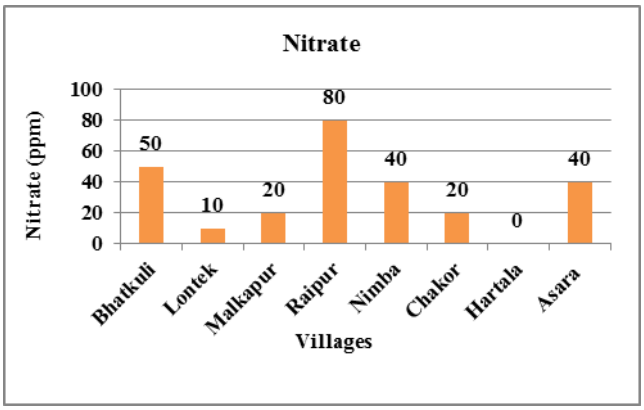

Figure 1 Test result of Nitrate in Bhatkuli Taluka

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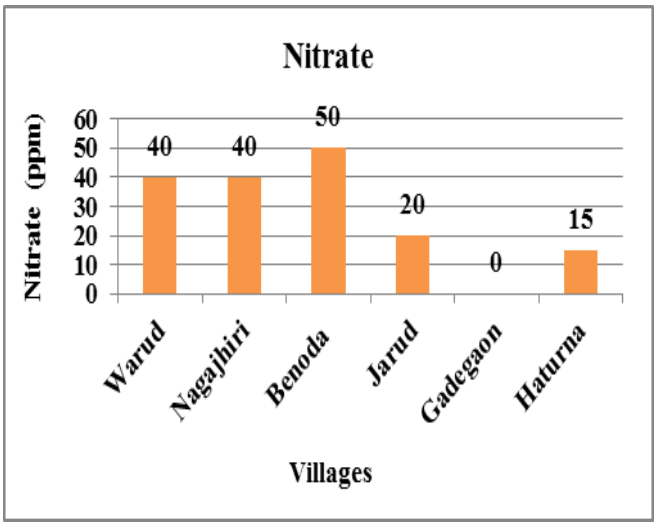

Figure 2 Test result of Nitrate in Warud Taluka

ii) For Warud Taluka

From Warud taluka five hand pumps and one well sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 2. The Nitrate concentration found maximum in Benoda village is 50 ppm and the minimum amount of Nitrate found in Haturna village is 15 ppm. Benoda village Nitrate is more than permissible limit which is 45 ppm in Benoda village.

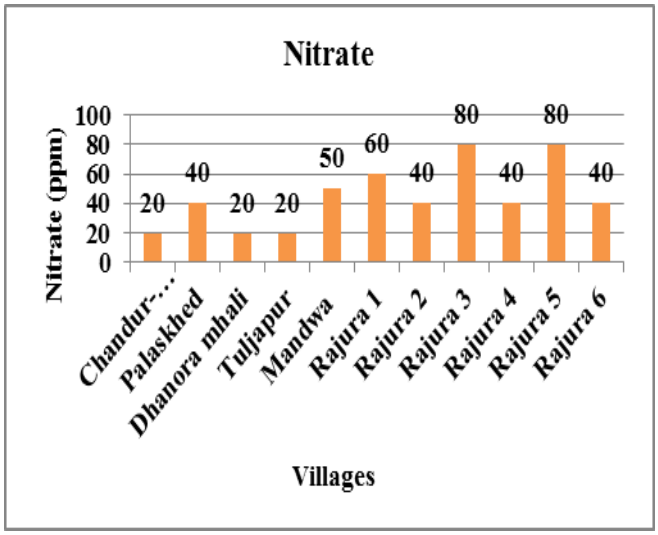

Figure 3 Test results of Nitrate in Chandur railway Taluka

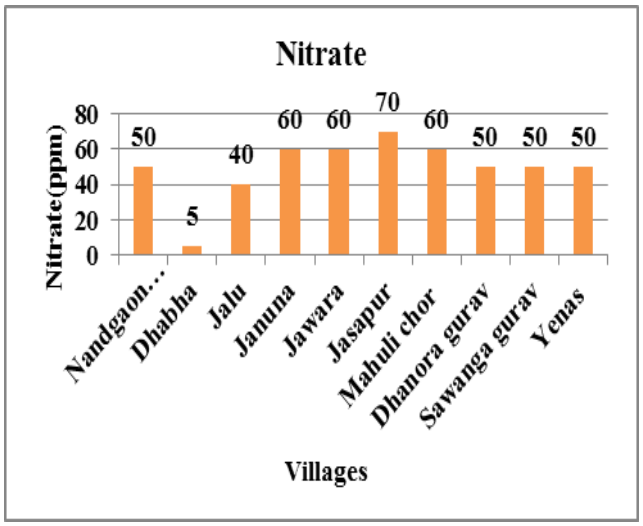

Figure 4 Test result of Nitrate in Nandgaon khandeshwar Taluka

iii) For Chandur railway Taluka

From Chandur Railway taluka eight hand pumps and four well samples are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 3. The Nitrate concentration found maximum in Rajura-3, Rajura-5 village 80 ppm, the minimum amount of Nitrate found in Chandur railway, Dhanoramhali, Tuljapur village. Rajura-1, Rajura-3, Rajura-5 village the Nitrate is more than permissible limit 45 ppm, so it is hazard for human health in that village.

iv) For Nandgaon khandeshwar Taluka

From Nandgaon Khandeshwar taluka nine hand pumps and one well sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 4. The Nitrate concentration found maximum in Jasapur village is 70 ppm, the minimum amount of Nitrate found in Dhabha village 5 ppm. And the average Nitrate concentration in Nandgaon Khandeshwar Taluka is 49.5 ppm Jasapur, Januna, Jawara, Mahulichor, Dhanora gurav, Sawanga gurav, Yenas villages the Nitrate is more than permissible limit 45 ppm ,so it is hazard for human health in that village.

v) For Dhamangaon railway Taluka

From Dhamangaon Railway taluka three hand

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pumps sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 5. The Nitrate concentration found maximum in viral village 60ppm and the minimum amount of Nitrate found in dhamangaon Railway village.

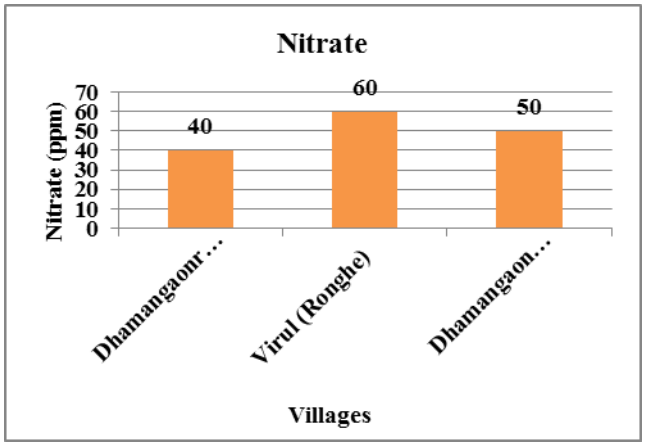

Figure 5 Test results of Nitrate in Dhamangaon railway Taluka

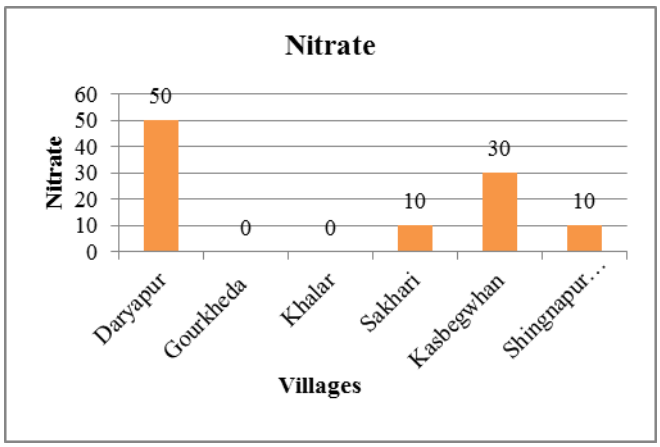

Figure 6 Test results of Nitrate in Daryapur Taluka

vi) For Daryapur Taluka

From Daryapur taluka Three Hand pumps and one bore wells sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 6. The Nitrate concentration found maximum in Daryapur village is 50 ppm and the minimum amount of Nitrate found in Sakhari village and Shingnapur village is 10 ppm. In Daryapur city the Nitrate is more than permissible limit 45 ppm.

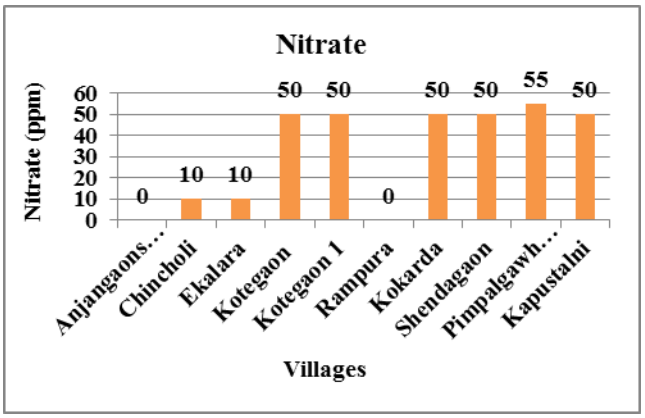

Figure 7 Test results of Nitrate in Anjangaon surji Taluka

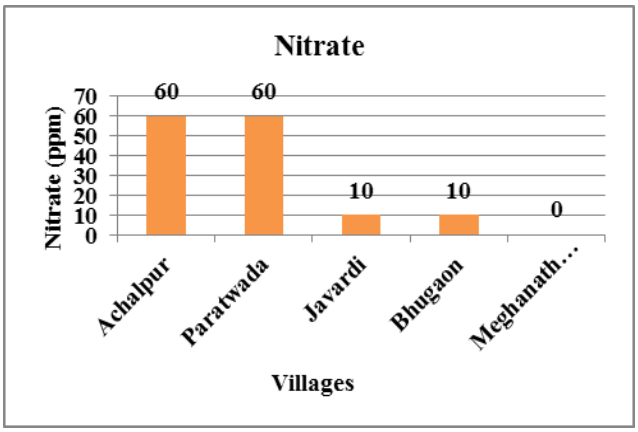

Figure 8 Test results of Nitrate in Achalpur Taluka

vii) For Anjangaon surji Taluka

From Anjangaon surji taluka three hand pumps sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 7. The Nitrate concentration found maximum in Pimpalgawhan village is 55ppm and the minimum amount of Nitrate found in Chincholi and Ekalara village is 10 ppm. Pimpalgawhan village the Nitrate is more than permissible limit is 45 ppm, so it is hazard for human health in that village.

viii) For Achalpur Taluka

From Achalpur taluka five hand pumps, sample is collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 8. The Nitrate concentration found maximum in Achalpur and Paratwada village is 60ppm and the

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minimum amount of Nitrate found in Jawardi and Bhugaon village is 10 ppm. Achalpur and Paratwada village the Nitrate is more than permissible limit.

ix) For Chandur bazar Taluka

From Chandur bazar taluka three hand pumps sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 9. The Nitrate concentration found maximum in Talawel village is 80ppm and the minimum amount of Nitrate found in Naya Akola village is 5 ppm. In Talawel, Shirajgaon, Shirala, Chandur bazar village the Nitrate is more than permissible limit is 45 ppm.

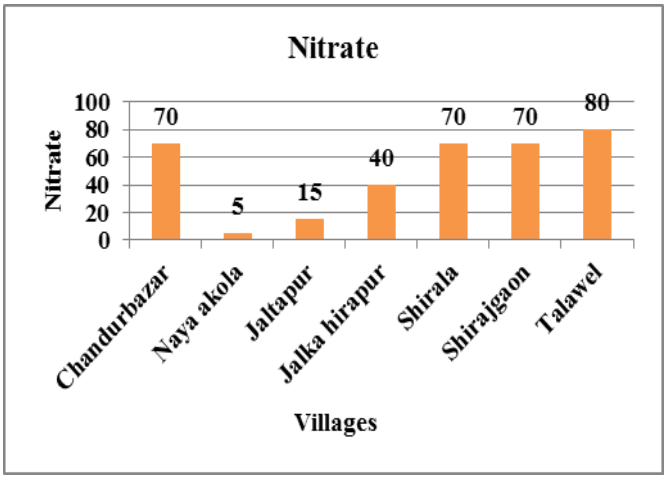

Figure 9 Test results of Nitrate in Chandur Bazar Taluka

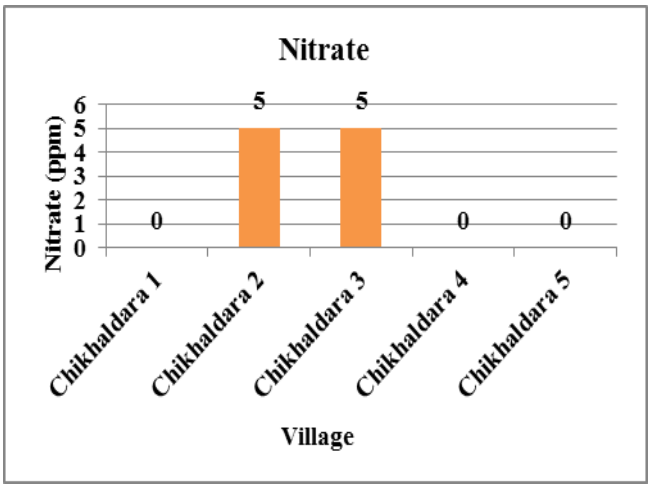

Figure 10 Test results of Nitrate in Chikhaldara Taluka

x) For Chikhaldara Taluka

From Chikhaldara taluka three well samples are collected from different wells. The graph of Nitrate vs. villages is prepared and given in Figure 10. The Nitrate concentration found maximum in Chikhaldara village is 5ppm. In Chikhaldhara is nitrate is less than permissible limit.

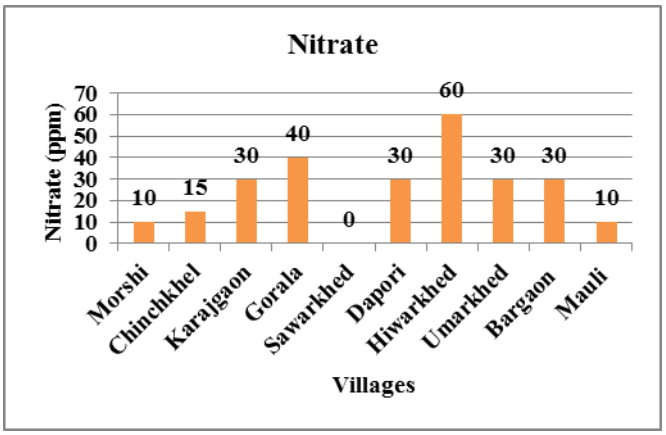

Figure 11 Test results of Nitrate in Morshi Taluka

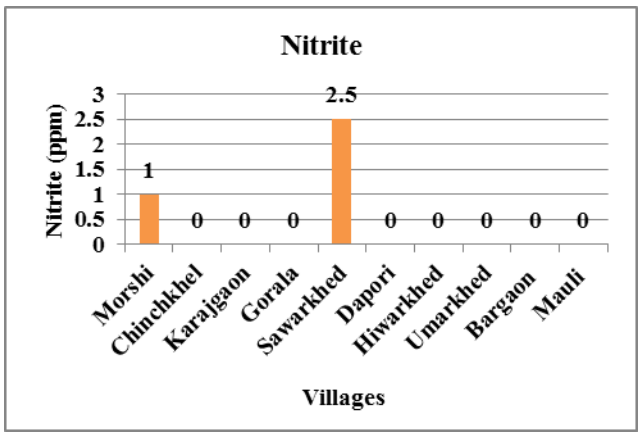

Figure 12 Test results of Nitrite in Morshi Taluka

xi) For Morshi Taluka

From Morshi taluka eight hand pumps, two bore wells sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 11. The Nitrate concentration found maximum in Hiwarkhed village is 60ppm and the minimum amount of Nitrate found in Morshi and Mauli village is 10 ppm. In Hiwarkhed village the Nitrate is more than permissible limit. The graph of Nitrite vs. villages is prepared and given in Figure

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12. The maximum Nitrite is found in Sawarkhed village is 2.5 ppm and the minimum amount of Nitrite found in Morshi village is 1 ppm. In Hiwarkhed and Sawarkhed village the Nitrite is more than permissible limit.

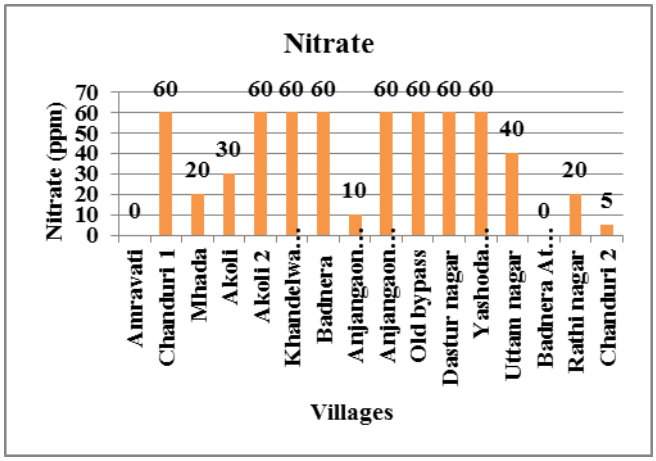

Figure 13 Test results of Nitrate in Amravati Taluka

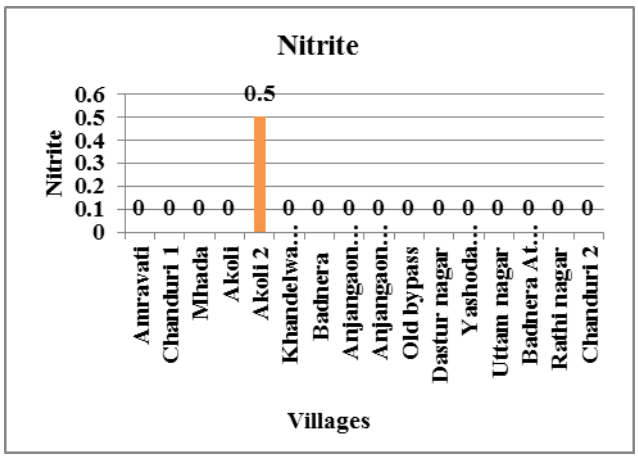

Figure 14 Test results of Nitrite in Amravati Taluka

xii) For Amravati Taluka

From Amravati taluka eleven hand pumps, three well and Two Bore wells sample are collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 13. The Nitrate concentration found maximum in Chanduri-1, Akoli and Amravati village is 60 ppm and the minimum amount of Nitrate found in Chanduri-2 village is 5 ppm. In Chanduri-1, Akoli-2, Khandelwal nagar, Badnera, Anjangaon bari, Old bypass, Dastur nagar, Yashoda nagar, village the Nitrate is more than permissible limit is 45 ppm. The graph of Nitrite vs. villages is prepared and given in Figure 14. The maximum Nitrite found in Akoli-2 village is 0.5 ppm and remaining villages presence of Nitrite is Nil.

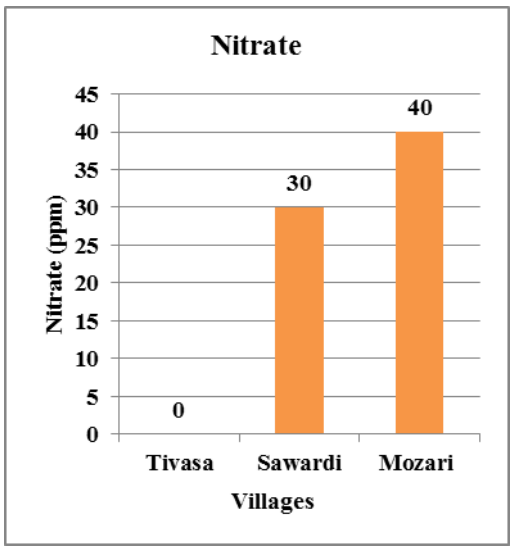

Figure 15 Test results of Nitrate in Tivasa Taluka

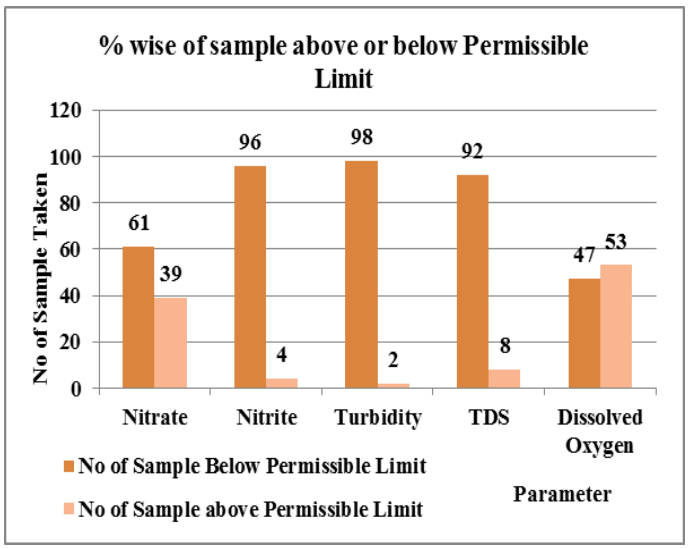

Figure 16 Percentage wise samples above or below permissible limit.

xiii) For Tivasa Taluka

From Tivsa taluka three hand pumps sample is collected from different villages. The graph of Nitrate vs. villages is prepared and given in Figure 15. The Nitrate concentration found maximum in Mozari village is 40ppm and the minimum amount

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of Nitrate found in Sawardi village is 30 ppm.

IV. RESULT AND DISCUSSION

As per data from Assessment of test result parameter wise percentage analysis is carried out for Nitrate, Nitrite, Turbidity, Total Dissolved Solids and Dissolved oxygen. Out of total 100 samples percentage of sample above and below permissible limit is calculated which are given in Table 1. From these observations one can easily understand the summary of Ground Water contamination and Nitrate Pollution in Rural areas of Amravati.

Table 1 parameter wise percentage of samples above and below permissible limit.

Parameter	No. of sample taken	No. of sample below permissible limit	%	No. of sample above permissible limit	%
Nitrate	100	61	61	39	39
Nitrite	100	96	96	4	4
Turbidity	100	98	98	2	2
TDS	100	92	92	8	8
Dissolved Oxygen	100	47	47	53	53

From above table graph between parameter vs. percentage of sample above permissible limit or below permissible limit is given in Figure 17 and 18. For this graph the percentage of Nitrate found in all taluka having 61% samples are below permissible limit and 39% samples are above permissible limit. 96% of samples for Nitrite are below permissible limit and 4% of samples for Nitrite are above permissible limit. 98% of samples for Turbidity are below permissible limit and 2% of samples for Turbidity are above permissible limit. 92% of samples for TDS are below permissible limit and 8% of samples for TDS are above permissible limit. 47% of samples for Dissolved oxygen are below permissible limit and 53% of samples for Dissolved oxygen are above permissible limit. The maximum percentage of Nitrate above permissible limit is found in Nandgaon khandeshwar, Dhamangaon railway, Anjangaonsurji, Chandur bazar, Amravati Taluka and minimum percentage of Nitrate is found in Morshi, Daryapur and Warud Taluka.. Also Chikhaldara and Tivasa taluka having zero percentage of Nitrates above permissible limit. The maximum percentage of Nitrite above permissible limit is found in Morshi taluka and minimum percentage of Nitrite is found in Amravati and Chandur Railway Taluka in Remaining taluka, zero percentage of Nitrite is found. The maximum percentage of Total Dissolved Solids is found in Chandur bazar Taluka. Also the minimum percentage of TDS is found in Chandur Railway, Morshi, Daryapur, Bhatkuli and Achalpur taluka in Remaining Taluka, zero percentage of TDS is found.

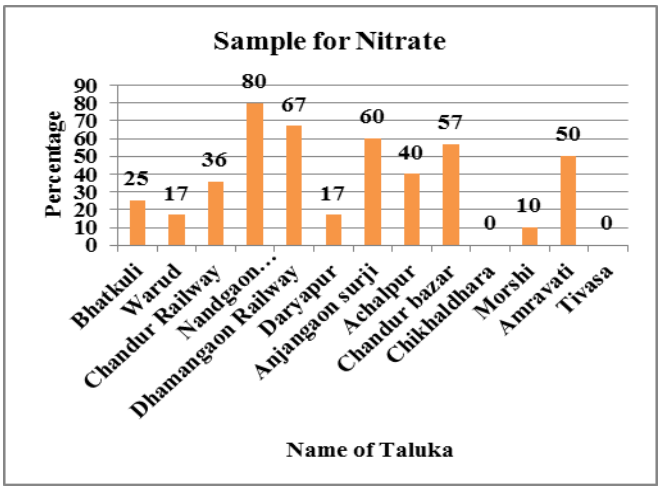

Figure 17 Percentage of Nitrate above Permissible limit.

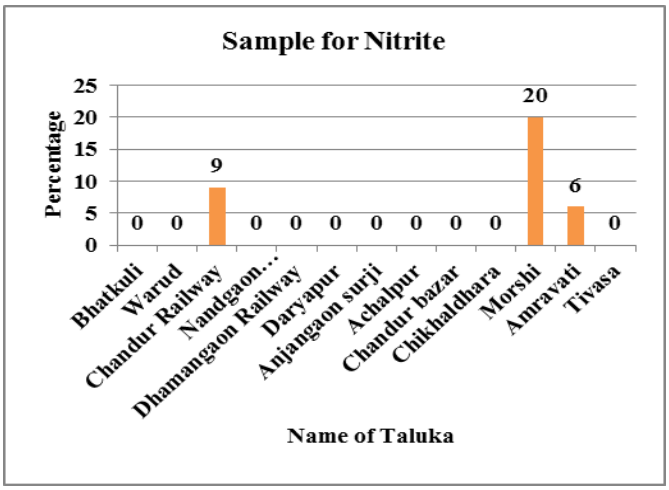

Figure 18 Percentage of Nitrite above Permissible limit.

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As per this research study for Amravati District samples from 13 Talukas are considered where from total 100 samples are collected from various villages in each Taluka from bore well, hand pump, well etc. From these samples Assessment of Ground Water Nitrate pollution is done. The result shows that out of 13 Taluka in 7 Taluka are having Nitrate above permissible limit. In 54 % of Taluka Nitrate Pollution in more than 40% sample. Therefore there is more chance of ill effects of Nitrate pollution such as in these Talukas namely Chandur railway, Dhamangaon railway, Anjangaon surji, Chandur bazar and Amravati. These Taluka are in alarming situation

Out of 13 Taluka, 2 Taluka are having Nitrite above permissible limit. In 15% of Taluka are having Nitrite Pollution in more than 20% samples. Out of 13 Taluka, 3 Taluka are having TDS above permissible limit. In 23 % of Taluka are having TDS in more than 40% samples. Due to presence of various metals and other solids in excess can cause various health issues in their further locality. Out of 13 Taluka, 1 Taluka is having Turbidity above permissible limit. In 15% of Taluka are having Turbidity in more than 30% samples. These Taluka are alarming situation. Out of 13 Taluka, 7 Taluka are having Dissolved oxygen above permissible limit. In 54 % of Taluka are having Dissolved oxygen in more than 40% of samples. Due to which there is chance of algae growth in Drinking Water when stored for long time. These Taluka are alarming situation. Due to which there is chance of algae growth in Drinking Water when stored for long time. These are alarming situation.

Among all samples Bhatkuli, Raipur, Benoda, Mandwa, Nandgaon Khandeshwar, Januna, Jawara, Jasapur, Mahulichor, Dhanora gurav, Sawanga gurav, Yenas, Virul (Ronghe), Dhamangaon (shahapur), Daryapur, Kotegaon, Kokarda, Shendagaon, Pimpalgawhan, Kapustalni, Achalpur, Paratwada, Chandurbazar, Shirala, Shirajgaon, Talawel, Hiwarkhed, Chanduri, Akoli, Khandelwar Nagar, Badnera, Anjangaon bari, Old bypass, Dastur nagar, Yashoda nagar and Rajura water samples having Nitrate more than 45 mg/l. Water samples from Raipur, Talwel and Rajura village had high content of Nitrate about 80 mg/l. Also, Nitrate content was low in water samples of Lontek, Dhabha, Sakhari, Daryapur, Javardi, Bhugaon, Naya Akola, Chikhaldara, Morshi, Mauli , Anjangaon Bari village is about 10 mg/l. Among the most collected of water samples the highest content of Nitrite was showed 2.5 mg/l in only one samples of Sawarkhed village and the lowest Nitrite content was showed in Akoli village.

Nitrate contain in ground water sources for drinking water supply in Amravati District is higher than standard level in some villages and it can be a public health concern for people who consume contaminated water. Water resources control management is important at these areas and it needs to apply some actions to reduce or remove Nitrate from drinking water. It is necessary to monitor Nitrate and Nitrite in water. All these negative effects can be minimized by proper groundwater management and good governance to mitigate the risks for Nitrate contamination. However, in order to better manage Nitrate contamination in ground water systems, researchers, water resources specialists and policy makers do need information on the scope, distribution and severity of groundwater nitrate contamination. Therefore, domestic wells near potential point sources of contamination, such as livestock facilities or sewage disposal areas, should be tested at least once a year to monitor changes in Nitrate concentration. Also, all drinking water supplies should be checked at least every two or three years to assure that significant increases in Nitrate and Nitrite are not occurring. Three methods such as distillation, reverse osmosis, and ion exchange are can be applied for removing nitrate from drinking water. There is more research result required for Nitrate removal from Ground water.

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V. CONCLUSIONS

Out of 13 Taluka, 7 Taluka are having Nitrate above permissible limit. In 54 % of Taluka Nitrate Pollution in more than 40% samples. Therefore there are more chances of ill effects of Nitrate pollution such as in these Talukas namely Chandur railway, Dhamangaon railway, Anjangaon surji, Chandur bazar and Amravati. These Taluka are in alarming situation. Out of 13 Taluka, 2 Taluka are having Nitrite above permissible limit. In 15% of Taluka are having Nitrite Pollution in more than 20% samples.

Out of 100 samples, in 61 samples Nitrate is found below permissible limit 39 samples are above permissible limit. These 39 samples contain Nitrate So that it is dangerous for the public health in Raipur, Bhatkuli, Benoda, Rajura, Mandwa ,Nandgaon khandeshwar, Januna, Jawara, Jasapur, Mahulichor, Dhanora gurav, Sawanga gurav, Yenas, Dhamanagaon railway, Virul(Ronghe), Dhamangaon railway taluka, Daryapur, Kotegaon, Kokarda, Shendgaon, Pimpalgwhan, kapustalni Achalpur, Paratwada, Chandur bazaar, Shirala, Shirajgaon and Talawel from Chandur bazaar, Hiwarkhed, Chanduri, Akoli, Amravati, Badnera and Anjangaon bari. Similarly 100 samples is tested for Nitrite out of which 96 samples are below permissible limit where as 4 samples is above the permissible limit. So that most of the Taluka are safe from ill effect of Nitrate Pollution in Ground Water.

From Bhatkuli Taluka out of 8 numbers of samples 2 samples are Nitrate above Permissible limit. In Bhatkuli taluka at 25% places Nitrate contamination is found. From Nandgaon khandeshwar Taluka out of 10 numbers of samples 8 samples are Nitrate above Permissible limit. In this Taluka, at 80% places more amount of Nitrate contamination is found. So that these taluka are in alarming situation. From Dhamangaon Railway Taluka out of 3 numbers of samples 2 samples are Nitrate above Permissible limit. In this taluka, at 67% places having more amount of Nitrate contamination. So that this taluka are in critical situation.

From Anjangaon surji Taluka out of 10 numbers of samples 6 samples are Nitrate above Permissible limit and from Chandur bazar Taluka out of 7 number of samples 4 samples are Nitrate above Permissible limit also From Amravati Taluka out of 16 numbers of samples out of which 8 samples are Nitrate above Permissible limit. In Anjangaon surji at 60% places, Chandur bazar at 57% places and Amravati taluka at 50% places amount of Nitrate contamination is more. So that this taluka are in alarming situation and there is more chances of ill effect due to Nitrate. From Chandur railway Taluka out of 11 numbers of samples 4 samples are Nitrate above permissible limit and from Morshi Taluka out of 10 number of samples 1 samples are Nitrate above Permissible limit. In Chandur railway and Morshi Taluka at 36 % and 10 % places having less amount of Nitrate contamination. So that this Taluka are in safe condition.

From above conclusion some recommendation can be drawn. Most farmers are using chemical pesticides which can impact health, pollute water supplies through runoff. Due to large amount of pesticides use in agricultural, the pesticides percolate into ground with water and it mixed with the Ground Water. Due to that reason large amount of Ground Water is getting contaminated. Therefore it is Recommended to control use of large amount of pesticides for agriculture in Chandur railway, Nandgaon khandeshwar, Dhamangaon Railway, Anjangaon surji, Achalpur, Chandur bazar and Amravati Talukas. Organic Farming should be promoted to minimized uses of large amount of fertilizers, pesticides etc. in rural area of Amravati district

In various Taluka like Bhatkuli, Nandgaon khandeshwar, Chandur Bazar and Achalpur Taluka defecate in open space nearby to river so that water is contaminated. Therefore open defecation should be stopped by providing public urinals and lavatories in rural areas of Amravati district. In

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Industrial area of MIDC in Reutilization, Recycling, Renovation and recharge of the industrial Effluent should be done strictly. In all rural area of Amravati district Rain Water Harvesting should be use on large scale it helps us for dilution of contaminated Ground water. So that the Ground water contamination will get reduce.

In Nandgaon khandeshwar taluka having large amount of agricultural area. For Farming, spray large amount of pesticides and insecticides on crop. Also more than 90% households in these areas defecate in the open. Due to that reason in this taluka the Ground Water is contaminated. Therefore in this Taluka, Intensive Rain water Harvesting Program is very important. Also it helps us to control the Ground Water contamination. In Bhatkuli, Shirala, Yenas, Dhanora gurav, Jalu, Hartala, Raipur, Kotegaon, Gaurkheda and Dhabha villages "Sulabh Shauchalay" Public urinals and lavatories should be constructed near all the bathing Ghats. These should be provided with adequate arrangements for proper disposal of waste water. Public should be educated to use them properly and not to pollute the Ground water. In all Talukas the drains discharging waste water, agriculture waste and industrial effluents should be diverted into main sewage system and sludge released by municipal bodies must be chemically and biologically treated before final disposal.

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