ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 1 , January 2020

Hydrochemical Analysis of Surface Water in the Tashkent Region and Assessment of Its Impact on Public Health

Tillyakhodjaeva Zukhrakhon;Myagkov Sergey,Dergacheva Irina, Egamberdiev Numon

Scientific research Hydrometeorological institute NIGMI at the Center of Hydrometeorological Service of the Republic of Uzbekistan (Uzhydromet), Tashkent, Republic of the Uzbekistan
Tashkent institute of irrigation and agricultural mechanization engineers Department of ecology and water resources management, Tashkent, Republic of the Uzbekistan

ABSTRACT: With climate change and the aridization of the territories of the Central Asian region, inevitably increasing the burden on surface waters. Especially both in terms of water scarcity, so reuse and saturation with various chemical elements, often of man-made origin. Ultimately, it will lead to unavoidable consequences for public health. At the moment, in connection with climate change and urbanization processes, population growth and increased processes of anthropogenic activities, the impact of the agricultural load on water resources, as well as its quality, is being considered. Studying the impact of water quality on public health is necessary to directly predict the real health effects of water pollution on human health over the near and distant future. The state of health of the population is a reflection of a complex set of phenomena in the environment. The process of its formation is influenced by a number of biological, socio-economic, man-made, natural-climatic and other factors. The most industrially developed in Uzbekistan is the Tashkent region and studies show that its territory has the highest levels of pollution due to man-made activities. Hydrochemical analysis of surface watercourses of the Tashkent region, basins of the Chirchik river has been carried out and apparent the territorial features of the spread of morbidity in the administrative regions of the Tashkent region. The statistical and multifactorial analysis was carried out to identify possible links of disease risk from hydrochemical characteristics of watercourses. The use of nozogeographical analysis and the identification of possible links between surface water chemistry and public health will allow monitoring and predicting the spread of certain types of diseases and applying preventive measures to reduce the risk of impact, and as a result, increase environmental safety. The results of the scientific analysis will allow applying the model of research to other areas of the republic.

KEYWORDS: water, chemical elements, disease, lack or excess, necessary elements in water, health.

I. INTRODUCTION

The problems of the human relationship with the environment have attracted attention since historical times. The relationship between humans and their environment was particularly deeply investigated due to the risk of various diseases. According to available data, the term "Medical Geography" (more MG) was proposed by the Italian physician Bernardino Ramazzini (1633-1714). However, as an independent science, it took shape in the mid-19th century. Among other scientists who worked in the field of MG, we can mention the names of S.M.Malkhazova (2005-2019)[1], S.A.Kurolap (2000-2017)[2], A.S.Saliyev (1994)[3], N.K. Komilova(2012)[4] and others. In particular, in 2012 N.K. Komilova[4] considered the territorial analysis of the medical conditions of Uzbekistan and the health problems of the population. Scientists geographers, ecologists, physicians, biologists, and hygienists confirm the heterogeneity of the natural environment, which necessitates comprehensive and systematic research, based on nozogeography and analysis of the ecological condition of the territories R.M.Razakov[5], A.A.Rafikov(1990)[6]; O.A.Ataniyazova(2007)[7], T.I.Iskandarov (2016)[8]). Geographical problems of public health, urban environmental research were highlighted in the works of H.T. Tursunov (1994)[9], I.R.Turdymambetova (2005)[10], M.O.Hamroev 2009[11]

In the arid climate of Central Asia, water resources are a key factor in maintaining a sustainable natural equilibrium of natural ecosystems of the socio-economic natural equilibrium of natural ecosystems of social-economic development in any part of the regions. One of the acute environmental problems is the problem of freshwater.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 1 , January 2020

Groundwater plays an important role in the water supply and ecology of arid and semi-arid areas. The quality of groundwater is essential to sustain life in the region, and the amount of available clean water in the region is gradually decreasing due to its extensive use. Groundwater is controlled by natural and anthropogenic factors, such as geological structure, composition of precipitation [12]. In recent years, the country has experienced severe water shortages, which in turn have a negative impact on food and public health[13]. The proportion of human pollutants entering water facilities is provided as follows[14].The largest share of pollutant inflows to surface waters is in agriculture, which is 93 percent, then other sectors of economy.Water resources are the main component of the sustainable development of Uzbekistan's economy, most of which is located in an arid climate. Observed global climate change can lead to changes in the current balance of the climate system - water resources, in general to changes in the characteristics of the hydrological cycle. In these circumstances, the assessment of the water resources emerging from the rivers of the Aral Sea basin and the changing characteristics of the hydrological cycle due to climatic and man-made factors are particularly relevant.[15] Changes in water formation and hydrological regimes have a strong impact on the pace of economic development, vitality, environmental management, environmental and food health and health, especially in rural areas.[16]

Changes in water resources and hydrological characteristics are determined by two main factors: changes in climatic characteristics and human economic activity. Widespread quantitative and qualitative changes in the formation of natural surface water in the runoff consumption zone due to their regulation and pollution predetermined anthropogenic metamorphosis or degradation of most water and associated terrestrial ecosystems.[17]

The ongoing climate change, combined with man-made stress, is causing additional negative trends in aquatic ecosystems, disrupting their unsustainable ecological balance, reducing or losing their biosphere and social functions. Pollution and water scarcity have a significant impact on public health. The quality of freshwater coming from mountainous areas is very high, they are virtually uncontaminated and their mineralization is very small.[18-23]

However, as the water goes down, the water quality deteriorates dramatically. Most rivers in the region have increased mineralization of water in the middle and lower currents- from 1-1.5 g/l in the average current to 2 g/l or more in the lower reaches.[24]

In some places in rural areas, sewage is still used, rather than tap water. People continue to use cesspool. In Chigirik, Tashkent, untreated sewage continues to be discharged into the river. In the area of sewage discharge from Bektemir wastewater treatment plants in the Chirchik River. It was noted that the drains descend into the river with a strong smell and very frothy, which indicates the presence of SPAV - synthetic surface-active substances. They are part of municipal and industrial wastewater. SPAV is considered one of the most harmful pollutants of the aquatic environment. Getting to the city treatment plants, makes it difficult for the sediments to work, reducing their efficiency. Similarly, at the “Salar Aeration Station”. Experts say that the reason is in those untreated drains, which are dumped by uncontrolled enterprises of small and medium-sized businesses[25].

Characteristically, all of the above studies in other countries indicate the need for in-depth studies of the impact of pesticide pollution on human health.Different types of agricultural production increase the risk of nitrogen compounds entering groundwater. The impact of water quality on human health is directly related to the effectiveness of existing preventive measures to protect water bodies from pollution and the way drinking water is cleaned. In our opinion, in the Tashkent region, which is characterized by a large man-made load (a large number of industrial enterprises, cities, farmland, livestock farms, capture fishery etc.), in addition to environmental factors that influence impact on the nozogeographical situation, the most important component of the natural environment - water resources - comes to the fore.[26]. Based on the above, we can see that the health of the population is very urgent and complex problem which was solved and investigated by scientists of different fields.

II. MATERIALS AND METHODS

Preliminary inventory. In the 1920s, after the state self-determination of the Central Asian republics, a unified system of observations, dissemination, and publication of data, as well as a system of Hydrometeorological forecasting, remained. The maximum number of Hydrometeorological stations and points was in the 1980s. Subsequently, the number of points and the volume of observations began to decrease. However, even during the period of greatest development, the observation network of Uzbekistan, as well as other republics of the region, was not dense enough.

Currently, in the research work we were monitored(inTable 1) Chirchik watershed where observed 12 hydrochemical points. The number means point of observation.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 1 , January 2020

Table 1. The name of observed posts in Chirchik watershed.

№	Chirchik river
I.	89. Chirchik river, Gazalkent
II.	90. Chirchik river, Gazalkent 3.5 below town
III.	91. 25 km above wastewater discharges of the Chirchik transformer plant
IV.	92. 3 km below the wastewater discharge "Electrokhimprom" plant
V.	93. Troitssky target 3 km below the sewage discharge "UzKTZhM" plant
VI.	94. Chirchik river, Tashkent cityis 1 km away
VII.	95. In the city, 3 km below the wastewater discharges of the Sergelian KSM
VIII.	97. Chirchik river, Novomihaylovka 1.6 km below of the village
IX.	98.,Chirchik river, city Chinaz
X.	101. Pskem river, village Mullala, point 01. 7 km below
XI.	106. channel. Salar, city Yangiyul (below City) point 02. 4 km to South-West
XII.	109. channel. Karasu (right-bank), city of Tashkent (station 01 km above the city

Points in the Chirchik Basin was selected for the hydrochemical study. We created a database on hydrochemical indicators, 12 posts of the Chirchik basin. Then, using a statistical method, the data on the anion and cation group, as well as mineralization, were summarized. The task was taken into account the values of changes in the amount of water mineralization, the content of the main ions, organic substances, dissolved gases and trace elements at observation posts. Data from the hydrochemical composition of surface watercourses (chlorine, calcium, magnesium, hydrocarbons, magnesium, sodium, sulfate and general mineralization) were compared with statistics of the total incidence of the rural population.

The salt composition of the natural waters was identified by the cations of Ca^2, Mg^2, Na^2, K and Anions of HCO^-, CL^-, SO_4^{-2}, NO^{-2}, NO^{-3}. According to these chemical elements and determined the chemical type of water[28]. The amount of chlorine-ion, sulfate ions, and hydrocarbon ions reach large values, so determine the chemical type of water. According to the prevailing anion, the Chirchik riveris divided into three classes: hydrocarbonate, sulphate, and chloride[29]. The waters of each class are divided into three groups, calcium, magnesium, and sodium. In terms of water severity.

III.RESULTS AND DISCUSSION

According to National Standard (GOST 4151-72), the total water hardness should not exceed 7 mg/l. Very soft - until 1,5 mg/l, soft-1,5 mg/l, moderately hard-3-6 mg/l, hard- 6-9 mg/l, very hard-9 mg/l. According to National Standard Drinking water should contain a mineralization of 1000 mg/l, sulfates -100 mg/l, chlorides 300 mg/l, calcium 180 mg/l, sodium 120 mg/l. Have a hardness of 7 mg/l. [30] According to the assessment of polluted surface water according to Uzhydromet standards. Usually, the composition of water in the Tashkent region according to the anion is sulfate and chloride. Sulfate waters with a salinity of 5680 mg/l are scattered at certain points of the flat areas[31,32,33]

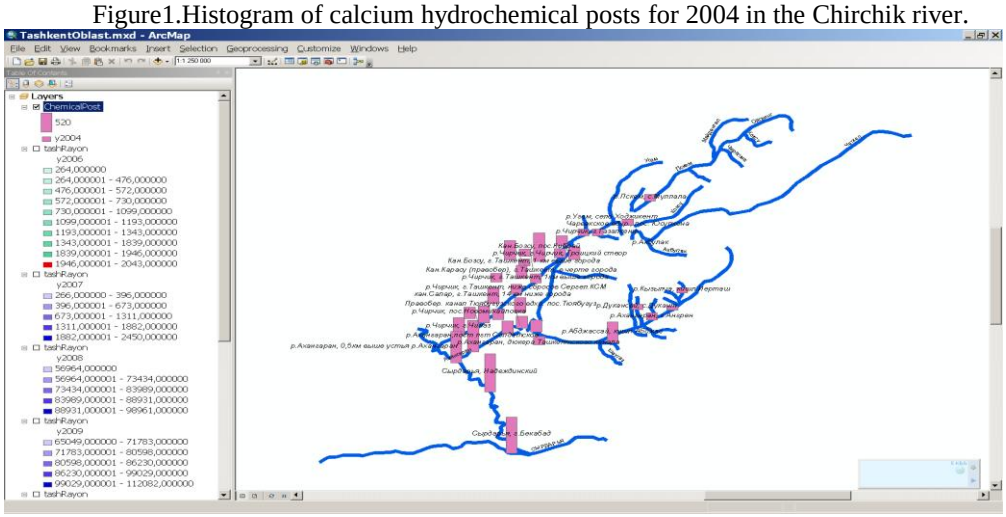
Based on the database on surface water mineralization of the Chirchik basins, a map was drawn using GIS tools for 2004(Figure.1). Using this method, histogramm were created for the entire period from 2004 to 2016 year as with mineralization and with other chemical elements as well,for instance with Ca^{+2}.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 1 , January 2020

Figure1.Histogram of calcium hydrochemical posts for 2004 in the Chirchik river.



To analyze the risks to public health (Figure.2), nosogeographicstudies were conducted based on statistical materials in the Tashkent region on each administration region. In this figure, we show the types of diseases for 2012. We also consider elements that may affect the occurrence of these diseases. For example, we compared the statistics of the types of diseases for 2012 and the data of chemical elements for the same period. Thus, exploring the relationship of chemical elements in water and the spatiotemporal distribution of diseases. To compare chemical elements with diseases, 7 types of diseases were selected. This is infectious parasitic, metabolism and endocrine glands, organs producing blood and affecting immune mechanisms, blood circulatory system, digestive system, genitourinary system, neoplasms. The distribution of the number of total morbidity by districts of the Tashkent region for the period 2004-2016 were loaded to data.

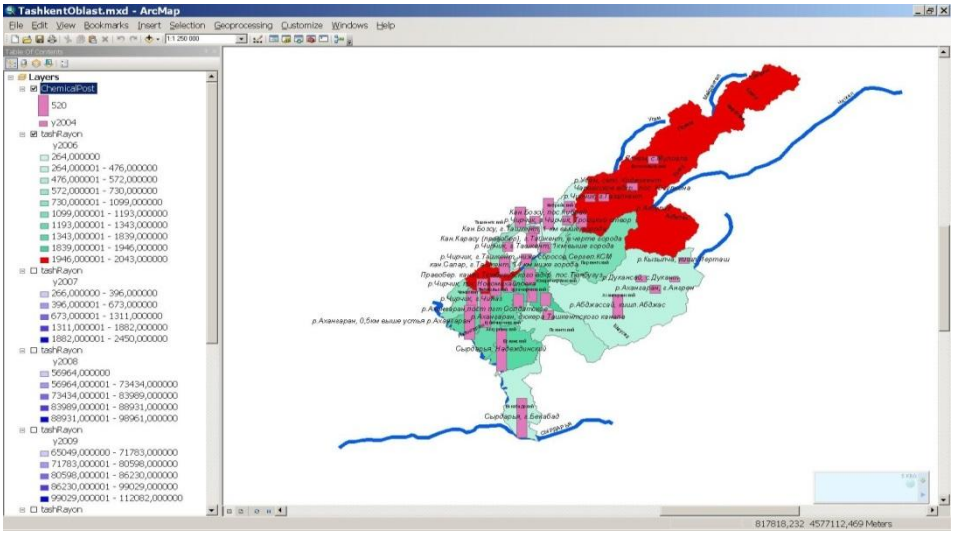
Figure2. Total morbidity of the Tashkent region for the period 2012.

	A	B	C	D	E	F	G	H	M	N	O	P	R
1	oblast	district_nu	year	mont	deca	date_for_dail	Инфекции+паразит	Кровообращения	гипертоническая	ишемическая	стенокардия	острый инфаркт миокар	хроническая ишемич
2	1	99	2012	2	1	2012-02-10	1476	1129	294	272	103	16	126
3	1	99	2012	2	2	2012-02-20	1265	1015	251	233	90	16	111
4	1	99	2012	2	3	2012-02-29	1392	1113	273	257	99	16	118
5	1	99	2012	3	1	2012-03-10	1470	1329	315	327	119	25	154
6	1	99	2012	3	2	2012-03-20	1290	1119	263	256	102	14	118
7	1	99	2012	3	3	2012-03-31	1400	1108	191	234	56	8	113
8	1	99	2012	4	1	2012-04-10	1241	1260	223	245	78	10	81
9	1	99	2012	4	2	2012-04-20	1231	1239	154	189	56	7	65
10	1	99	2012	4	3	2012-04-30	1259	1356	184	204	74	7	71
11	1	99	2012	5	1	2012-05-10	896	1178	153	201	63	8	61
12	1	99	2012	5	2	2012-05-20	1243	1122	167	174	46	9	40
13	1	99	2012	5	3	2012-05-31	810	1143	186	193	49	12	56
14	1	99	2012	6	1	2012-06-10	892	1012	182	224	49	3	61
15	1	99	2012	6	2	2012-06-20	1026	1206	137	229	67	5	69
16	1	99	2012	6	3	2012-06-30	875	1083	187	176	26	4	49
17	1	99	2012	7	1	2012-07-10	1137	1005	181	146	33	7	58
18	1	99	2012	7	2	2012-07-20	737	798	147	144	28	4	69
19	1	99	2012	7	3	2012-07-31	735	900	187	218	28	6	72
20	1	99	2012	8	1	2012-08-10	833	870	159	214	33	2	62
21	1	99	2012	8	2	2012-08-20	873	912	167	156	29	6	44
22	1	99	2012	8	3	2012-08-31	816	1025	140	165	53	3	56
23	1	99	2012	9	1	2012-09-10	655	981	164	163	43	4	47
24	1	99	2012	9	2	2012-09-20	827	894	172	192	49	5	62
25	1	99	2012	9	3	2012-09-30	797	732	130	172	31	0	49
26	1	99	2012	10	1	2012-10-10	646	897	218	139	102	9	69
27	1	99	2012	10	2	2012-10-20	555	948	270	145	71	2	67
28	1	99	2012	10	3	2012-10-31	611	853	226	152	59	3	57
29	1	99	2012	11	1	2012-11-10	630	759	233	147	53	4	33
30	1	99	2012	11	2	2012-11-20	794	734	152	99	61	8	44
31	1	99	2012	11	3	2012-11-30	841	867	143	128	51	4	54
32	1	99	2012	12	1	2012-12-10	823	909	251	156	62	1	56

According to our observations,(Figure 3) in the upper sections in the formation zone of the Chirchik river, mineralization is low since this is meltwater and does not have any impurities of elements and mineralization is very small. In the lower sections of the Chirchik River, at the mouth it this situation is the opposite. In these areas, the river is very high mineralization. In the middle of the river, it was noted that the mineralization readings were average. We compared two sections of the river and the incidence of the population. That revealed there is a connection, both of these sites showed a higher incidence of the population than in the middle of the Chirchik river section. We can say that the rural population located in the upper parts of the mountains suffers from a lack of necessary elements in the water. As well as the population located in the lower sections of the river that suffer from an excess of mineralization in the water. The color brightness indicates areas with a high incidence across the territory corresponds to a larger number of recorded cases.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 1 , January 2020

Figure. 3. Comparison of mineralization and the total number of diseases along the Chirchik river. in the 2004 year.



The territories most at risk of increasing the general morbidity of the population were identified: - maximum disease risk values in Tashkent, Zangiatinsky, Yangiyul, and Chinaz districts, the average risk of morbidity in Kibray, Yukarichirchik, Urtachirchik, Kuyichirchik, Akkurgan, Bukinskiy regions.This is due to the geographical location of the areas. Mountain and foothill areas are far from industrial zones and areas of dense agricultural use and are located in the upper reaches of rivers. In the middle and lower reaches of Chirchik, the population is forced to use water from sources already saturated with chemical elements, but not exceeding the threshold value (PDK)1. In areas close to the Tashkent metropolitan area and industrial centers, the risk of morbidity from the concentration of harmful substances increases.

Using this method, we were comparison of mineralization and the total number of diseases along the Chirchik river, also for the entire period from 2004 to 2016 year.

Conducting regular monitoring of the hydrochemical state of surface watercourses, it is possible to assess the risk of the health status of the population living in the Tashkent region.

Studies of the major ions have been used to identify the hydrochemical facies of the water. Several researchers have evaluated the groundwater chemistry and consider hydrogeochemical processes by developing geochemical modelling and adopting graphical methods for the interpretation of water quality indices [34, 35,36]. In recent years, we used to statistical data and Geographical Information Systems (GIS) [37,38] have been applied to detect important information from the hydrogeochemical data in complex systems. This multidisciplinary approach will be useful to identify and locate different physiochemical processes in the groundwater in complex aquifers. The combination of hydrogeochemical tools and statistical analysis is applied to investigate the properties of groundwater among the sampling sites. The application of GIS provides a unified way to represent the physiochemical characteristic in a specific area, as well as the presentation of spatial distribution of groundwater hydrochemistry parameters in the thematic maps. [39]

In connection with the observed climate changes, which directly lead to the risk of an increase in the number of diseases associated with hydrochemical changes in surface watercourses and a change in the hydrological regime, there are also high risks of an increase in the total incidence rate. The hydrochemical indicators of rivers and canals flowing through the territory have particular importance for the rural population. In the absence of a water supply system in rural areas, residents use water directly from rivers, canals, irrigation ditches, springs, open wells, and shallow wells. The hydrochemical composition of the consumed water has its own characteristics at each point in space and has some effect on the state of public health.

Medical research has established some facts on the effect of chemical elements on human health. Chemical models showed that thevital elements calcium, sodium, potassium, magnesium and sulfate ion are in chemical forms

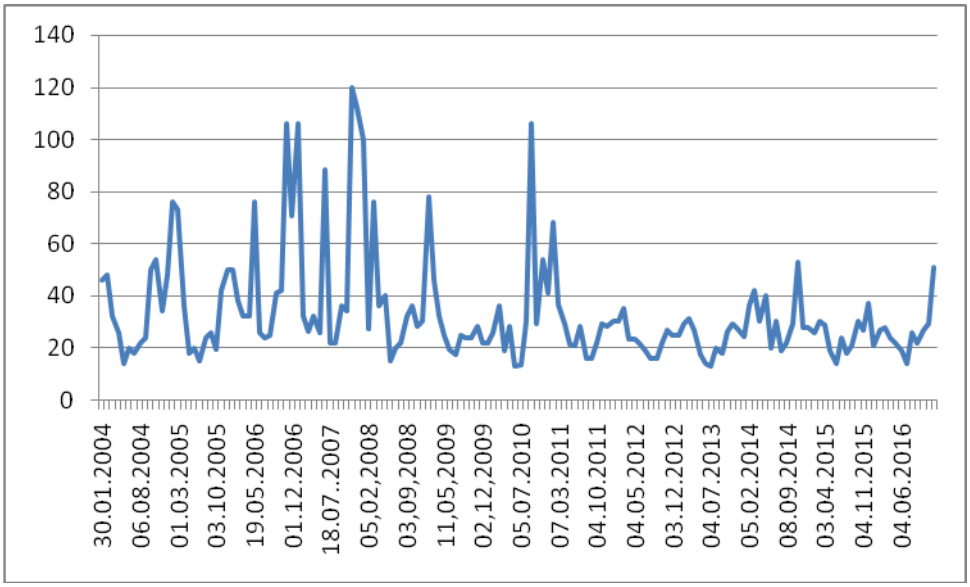
[1]Hygienic criteria and water quality control of the centralized systems of economic drinking water supply of the population of Uzbekistan, №0211-06, 01 june 2006.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 1 , January 2020

that are favorable for human health (Ca, Na, K, Mg, SO_4^{2-}) [40]. Having determined the territorial distribution of morbidity, it is possible toconduct special medical studies to identify the main causes of the occurrence and spread of certain types of diseases and determine the causes of their occurrence and develop methods for their elimination[41].Food requirements have a profound effect on the intake of both macro- and micronutrients, including trace elements, and therefore far-reaching consequences to health[42]. In future knowing the pathological level of carcinogenic loads coming through the water, air and food products, highlighting priority risk factors, taking into account the order of their significance in the occurrence of cancer, it is possible to build multi-component models for predicting the development of diseases on localization[43-46].

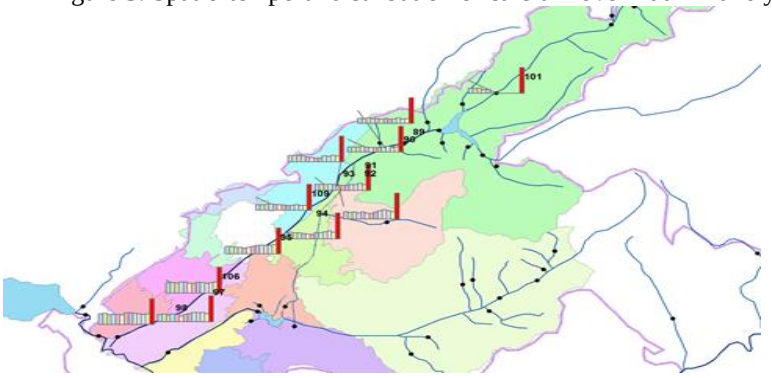
The study was also conducted with the chemical elements of the anion group and the cation group, using the example of calcium at the posts of the Chirchik Basin was made a statistical analysis of the amount of calcium in the water from 2004 to 2016, and then built a graph. On the graph, you can see that the amount of calcium in the water during this period fluctuated strongly. Figure. 4. It can be concluded that during this period the amount of calcium in the water was not enough, (threshold level value 180 mg/dm3). On the graph, the minimum indicator is 15 mg/dm3 in 2010 and the maximum indicator is 120 mg/dm3 in 2007 year. A graph was built and then was compared calcium with diseases.

Figure 4.The graph of calcium for 2004-2016 year.



A map with a calcium histogram has been built with the help of GIS tools. And analyzing it can be said that in the observed posts at the beginning of the river the amount of calcium in the water was very small, and in the lower part of flow the amount of calcium increased significantly (threshold level value 180 mg/dm3 marked in red columns). The most stable indicators in observation posts were in the middle of the riverbed. Figure. 5

Figure 5. Spatio-temporal distribution of calcium over 2004 -2016 year



ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 1 , January 2020

The most common mineral element in the human body is calcium. In the body of men and women, about 1200 and 1000 were found.[47] More than 99% of the calcium is in the bones. It plays an important role in many biochemical and physiological processes.[48-50] The climatic and geographical conditions of forming drinking water and its mineral composition affecting the occurrence of dental caries and periodontal diseases. Thus, at present, there is a need to study the relationship between the chemical composition of drinking water and the illness, in our situation -of caries. It is well known that a lack of calcium in water leads to an increased incidence of dental caries. Dental damage also depends on the presence of trace elements that contain synergists, as well as on antagonists: copper, zinc, vanadium, manganese, strontium, titanium, chromium, molybdenum, cobalt, nickel, aluminum [51-53].

Calcium deficiency can develop under the following conditions: a lack of calcium in the body (starvation, exclusion from the use of dairy products), profuse sweating, pregnancy and breastfeeding of women, as a result of impaired absorption of calcium during unbalanced nutrition, strict vegetarianism), impaired formation of active forms of calcium.[48,51]

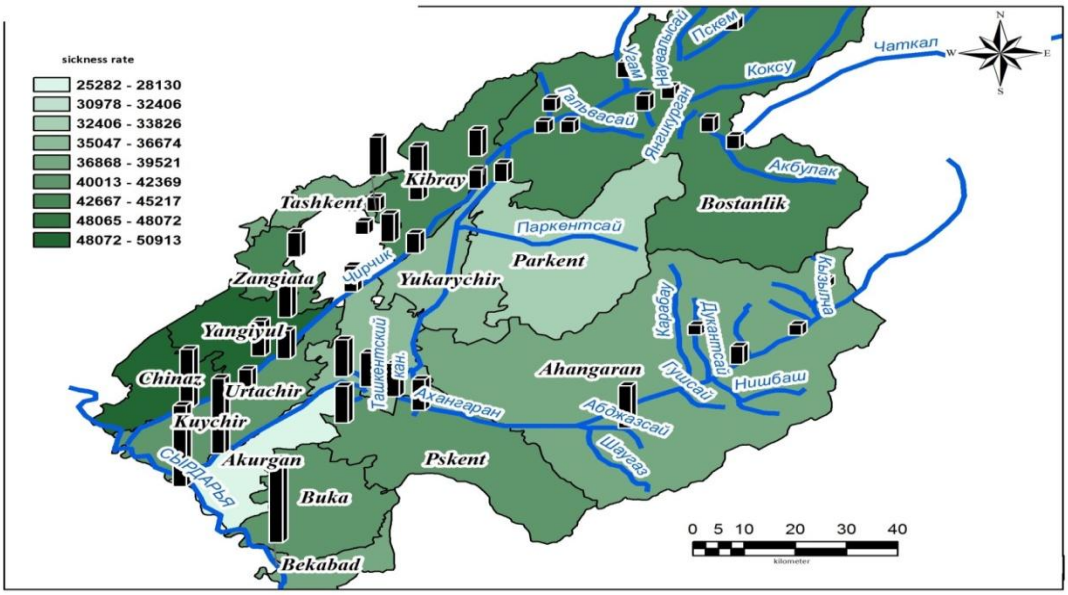
Hypocalcemia[50] is observed with insufficient absorption of calcium as a result of diseases of the digestive system (enteritis, impaired exocrine function in case of stomach damage, bile secretion in diseases of the biliary tract, etc.). With excessive consumption of calcium and calciferol, preparations or excess of calcium in drinking water can develop with hypercalcemia[50,54,-56], taking into account the following symptoms: loss of appetite, thirst, nausea, risk, weakness, cramps, azotemia. Possible deposition of calcium in the internal organs (especially the kidneys), muscles, blood vessels.[51-53,57]

Geographic differences in the structure of morbidity. Figure 7. and life expectancy at the global, regional and national levels are also due to the territorial variability of the impact of natural and socio-economic factors on public health.

Based on the work done, a map was created to compare the data with mineralization and the number of common diseases. The gradation of color starts from light to dark, which means that with the increase in the number of diseases in administrative areas, the color becomes darker. In the formation zone, the upper parts of the river mineralization are very small than in other parts along the length of the river. There are Pskem and Bostanlik districts, where the total number of diseases is much higher than in other areas. This shows that in this mountainous area small mineralization can also be the cause of an increase in the incidence of disease due to the lack of necessary elements in the water consumed.

In the middle channel of the river, the Kibray, Parkent, Yukorichirchisk districts are stable and are stable in terms of mineralization and general indicators of the number of diseases. In the lower reaches of the river in the Yangiyul and Chinaz regions, one can see greater mineralization and again an increase in the number of general morbidities.

Figure.7 Comparing water mineralization and thenumber of general morbidities.



ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 1 , January 2020

Concluding, it can be said that in the upper parts of the river mineralization is very small, and in the lower parts of the rivers mineralization is very increased. Therefore, a lack or lack of necessary elements in the water leads to an increase in the number of diseases.

IV.CONCLUSION

Based on the work carried out, it can be said that the health of the population is affected by both the excess of mineralization and chemical elements and the lack of them in the water. The most comfortable location of settlements in the Tashkent region is in the middle of the river, where the state of settlements and the risks of disease growth are stable. In the middle of the river, the chemical elements in the water are quite stable, so the increase in the number of diseases is also proportional to this.

In the Tashkent region, the observed points that are located in the upper reaches of the rivers are also prone to disease risks. Human settlements are vulnerable to an increase in the number of diseases due to the lack of chemical elements in the water in the river formation zone. To prevent an increase in the number of diseases associated with the lack of trace elements in the upper parts of the river in the area of the formation of the river, additional nutritional supplements including micro and macronutrients are needed for the full activity of the human body.

Observed posts that are located at the mouth of the river are more prone to disease risks due to excess mineralization and chemical elements in the water. Increased mineralization and chemical elements in river waters have an impact on the human body and lead to poor health. Agglomeration of the Tashkent region with intensive production, transport, and agricultural land and the accumulation of settlements, is a combined complex multicomponent dynamic system. Industrial production is confined to surface waters (rivers, large canals), which are the source of their existence. With the growth of agglomerations and the development of production, water demand increases, which leads to an increase in the discharge of used water into rivers and canals. Mineral salts washed out from irrigated lands, often uncontrolled chemicals, phosphorus and nitrogen fertilizers pollute water bodies. Excess chemicals poison the flora and fauna of water bodies. Chemical substances that can accumulate in crops and livestock products pose a threat to the health status of the person who consumes these products. Significant anthropogenic impact on the environment has invariably led to a deterioration in the health status of the population living in this territory. Also, most agricultural products are sold directly within the Tashkent region, which has a significant impact on the health status of the region's population as a whole.

The property of watercourses self-cleaning due to the biological processes taking place in them allows self-cleaning, but still, it is not enough. Accumulation or exceeding the maximum allowable concentrations of pollutants in water affect the food chain, the end link of which is the human body.

REFERENCES

1. S.M.Malkhazova "Relationship between zoonotic cutaneous leishmaniasis morbidity in the Murgab oasis and hydrometeorological ", Medicinskaya parazetalogiya I parazitarniye bolezni, 1999, vol 4 pp.22-26
2. S.A.Kurolap "Regional geographic information systems of health and environmental monitoring", *Geographical Bulletin*,2016, vol. 8. № 4, pp. 108—124
3. A.S.Saliyev "Interaction of society and nature as a field of researches in modern public geography" *Geographical Bulletin, History and archeology*, 2014, no 1, pp 16-19
4. N.K. Komilova, Kornilova, Mukhammedova et all "Territorial definitions of population mortality in Uzbekistan" *ASTRA Salvensis*, Supplement, 2019, no. 1, pp.619-641
5. R.M.Razakov "Ecological measurement in the Aral region investigation and action programm"*Meliorasiya I Vodnoe hozyastvo*, 1990, no.1, pp 6-8
6. A.A.Rafikov "Past, Present and Future of the Aral sea"Mekhnat, Tashkent, 1990, pp 143
7. O.A.Ataniyazova, et all "Levels of certain metals, organochlorine pesticides and dioxins in cord blood, maternal blood, human milk and some commonly used nutrients in the surroundings of the Aral Sea (Karakalpakstan, Republic of Uzbekistan)" *Asta Pediatrica*, 2007, vol 90, no. 7, pp 801-808.
8. T.I.Iskandarov, et all "Environmental protection and health of the population at using of a new cotton defoliant «uzdef-k» in agriculture " *Gigiena i sanitariia*, 2016, vol.95, no.8, pp 721-724
9. H.T. Tursunov "Study of the Dynamics of Cotton Seeds Movement under the Influence of Air Flow". J Textile Sci Eng, 2017,
10. I.R.Turdymambetova, Kaliev B.Sh. " Problems and ways to improve the nosogeographic situation in the Aral Sea region" *Bulletin*, Vol. 4. Paris, 2013, pp. 73-76
11. M.O.Hamroev S.A.Avezov, I.A. Atajanov, et all "" Now, today and in future" ", Department:Geography, Urgench State University (UrSU), 2017, no 1, pp 3-6
12N. M. Isa, A. Z. Aris, and A. W. Sulaiman, "Extent and severity of groundwater contamination based on hydrochemistrymechanism of sandy tropical coastal aquifer," *Science of the Total Environment*, 2012, vol. 438, pp. 414–425
13.M. Jalali, "Salinization of groundwater in arid and semi-arid zones: an example from Tajarak, Western Iran," *Environmental Geology*, 2007, vol. 52, no. 6, pp. 1133–1149

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 1 , January 2020

14. A.V. Ivanov, E.A. Tafeeva, N.Kh. Davletova "Modern views on the impact of drinking water quality on the health status of the population" Water: chemistry and ecology, 2012, no. 3., pp.48-53

15. National Report Assessing the Impact of Climate Change on Health, Vulnerability and Adaptation of the Health System in Uzbekistan, 2011, pp 41,

16. I.R.Turdymambetov, K.Utarbaeva, M. Matkurbanov "Nosogeographic situation in the Republic of Karakalpakstan", Nukus, 2008, pp.123-125

17. I.R. Turdymambetov "The current state and assessment of the use of land - water resources in an unfavorable environmental situation in the South Aral" kus, 2008, pp.93,

18 UNFCCC "Third National Communication" Tashkent, 2016, pp 102-103,

19. A.V. Ivanov, E.A. Tafeeva, N.Kh. Davletova, "Modern views on the impact of drinking water quality on the health status of the population", Water: chemistry and ecology, 2012, no. 3. pp.48-53

20 N.V. Guseva, Yu.A. Atakulova "Groundwater geochemistry of the Tashkent artesian basin (Republic of Uzbekistan)" Tomsk Polytechnic University News, 2014, T.325, no.1

21.V.E Chub, S.V. Myagkov, S. Klimov "Climate change and public health" *Ecological Bulletin*, no. 11 Tashkent, 2010, no 11, pp13-14

22. N.A. Agaltseva, L.N. Borovikova "Assessment of the vulnerability of water resources from climate change" *Bulletin* no. 3, Tashkent: SANIGMI, 1999, pp. 36-45

23. N.A. Agaltseva, L.N. Borovikova " Assessment of climate change in the territory of the Republic of Uzbekistan, development of methodological provisions for assessing the vulnerability of the natural environment", *Bulletin* no. 5, Tashkent: SANIGMI, 2002, pp. 26-35

24. N.V.Guseva, Yu.A.Atakulova "Groundwater geochemistry of the Tashkent artesian basin (Republic of Uzbekistan)" Tomsk Polytechnic University News, 2014, no.1

25. V.V. Ivanov , V.A. Ado , B.A. Somov "Action of synthetic surface-active substances on the skin" no 39(2), 1976

26. Ia. Kostovetski,I, G.M. Rakhov, E.U. Shteinberg "Synthetic surface-active substances in municipal discharges and the effectiveness of purifying them at a biological station" Gig Sanit. (2), 1975

27. P. K. Tripathi and A. Singh, "Toxic effect of alphamethrin (synthetic pyrethroid) on oxidative metabolism of the freshwater snail, Lymnaea acuminata," in Proceedings of the International Congress of Chemistry and Environment, Indore, India, 2001, pp. 238–243,

28. A.M. Nikanorov, "Hydrochemistry", Textbook. –no.2 ed., Revised. and add. - St. Petersburg: Gidrometeoizdat, 2001, pp. 444,

29. V.L. Shultc *The river of Central Asia*, Leningrad,1965, pp. 691,

30. Y.N. Ivanov, I.A. Chulpanova "Water Resources of the Ahangaran Basin", SANIGMI, 2000, vol. 153(234). pp. 57-88,

31. Y.N. Ivanov "Water Resources of the Chirchik Basin", NIGMI, 2007,vol. 4(249), pp 60-88.

32. M. Jalali, "Salinization of groundwater in arid and semi-arid zones: an example from Tajarak, Western Iran," *Environmental Geology*, 2007, vol. 52, no. 6, pp. 1133–1149

33. N. C. Mondal, V. P. Singh, V. S. Singh, and V. K. Saxena, "Determining the interaction between groundwater and saline water through groundwater major ions chemistry," *Journal of Hydrology*, 2010, no. 1-2, pp. 100–111

34. E. Wanda, M. Monjerezi, J. F. Mwatseteza, and L. N. Kazembe, "Hydro-geochemical appraisal of groundwater quality from weathered basement aquifers in Northern Malawi," *Physics and Chemistry of the Earth A/B/C*, 2011, vol. 36, no. 14-15, pp. 1197–1207

35. L. Belkhiri and L. Mouni, "Geochemical modeling of groundwater in the El Eulma area, Algeria," Desalination and Water Treatment, 2012, vol. 51, no. 7–9, pp. 1468–1476

36.T.S.Narany, M.F.Ramli, A.Z.Aris,W.N.Azmin Sulaiman,H.Juahir and K. Fakharian "Identification of the Hydrogeochemical Processes in Groundwater Using Classic Integrated Geochemical Methods and Geostatistical Techniques, in Amol-Babol Plain, Iran" *Scientific World Journal* , 2014, pp.15 -17

37. S. Mazukhina, P.Tereshchenko, S.Drogobuzhskaya, V.Pozhilenko "The speciation of chemical elements in water and their possible impact on human health" 2019, Volume 98,

38. A. Evans, K. Jinapala "Proceedings of the national conference on water, food security and climate change in Sri Lanka." Volume 2: water quality, environment and climate change. Colombo, 2009, 9-11 June

39. A.Cook, K.Ljung, R.Watkins "Human Health and the State of the Pedosphere" *Encyclopedia of nvironmental Health*, 2011, pp.108

40. C.E.Walters, M.I. Meslé Margaux, Ian M. Hall, "Modelling the global spread of diseases: A review of current practice and capability" *Epidemics* vol. 25, 2018, pp 1-8

41. Colizza V., Barrat A., Barthélemy M., Vespignani *A. Predictability and epidemicpathways in global outbreaks of infectious diseases: The SARS case study. BMCMedicine.* 2007; 5(34).

42. Colizza V., Barrat A., Barthélemy M., Vespignani A. Epidemic predictions and pre-dictability in complex environments. *Biophysical Reviews and Letters*, 2008; 3(1-2):217-26

43. P.Piste, S. Didwagh, A.Mokashi "Calcium and its Role in Human Body" *International Journal of Research in Pharmaceutical and Biomedical Sciences*, Vol. 4 (2), 2013, pp 659-663

44.L.O. Hwei, K.P.Subedi, S. Ga-Yeon, L. Xibao, A.I. Suresh "Tuning store-operated calcium entry to modulate Ca2+-dependent physiological processes" *Biochimica et Biophysica Acta (BBA) - Molecular Cell Research*, Volume 1866, Issue 7, 2019, pp. 1037-1045

45.Christopher S. Kovacs, Chapter 5: "Physiology of Calcium, Phosphorus, and Bone Metabolism During Pregnancy, Lactation, and Postweaning" *Maternal-Fetal and Neonatal Endocrinology*, 2020 , pp 61-73

46.T. Zhong, X. Pan, J. Wang, B. Yang, L. Ding "The regulatory roles of calcium channels in tumors*"Biochemical Pharmacology*, Volume 169, 2019

47. Wang S.-X., Wang Z.-H., Cheng X.-T. et al. Arsenic and Fluoride Exposure in Drinking Water: Children's IQ and Growth in Shanyin County.Shanxi Province, China,*Environ. Health Perspect*. 2007,no 115, pp. 643–647,

48. Abanto J.A., Rezende K.M.P.C., Marocho S.M.S., Alves F.B.T. и др. Dental fluorosis: Exposure, prevention and management // Med. Oral Patol. Oral Cir Bucal, 2009, No 1; 14 (2), pp. 103–107

49.Kudryavtseva B.M. The fluorine content in drinking water and the incidence of the population of Russia with dental caries and fluorosis, ZNiSO, 2001, 4. - pp. 23-26.

50. R. Gelli, F. Ridi, P. Baglioni, "The importance of being amorphous: calcium and magnesium phosphates in the human body" Advances in Colloid and Interface Science, Vol. 269, 2019, pp 219-235,

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 1 , January 2020

51. A. Catalano, D. Chilà, F. Bellone, G. Nicocia, S. Loddo "Incidence of hypocalcemia and hypercalcemia in hospitalized patients: Is it changing?" *Journal of Clinical & Translational Endocrinology*, September 2018, Vol. 13, pp. 9-1

52.I.M. Azimov, M.Sh. Khodjaev. "The mineral composition of drinking water is the cause of the incidence of caries", *Natural and Medical Sciences, Scientific and Practical Conference* No. 10 (49).

53.M.A. Alyoshina " Metrological evaluation of the spectrophotometric method for determination of calcium and magnesium in standard solutions and determination of calcium and magnesium in food", *Scientific and Practical Conference*, 2013,No. 23 (53).

54.Z.D.Tillyakhodjaeva "Problems of identifying the relationship between the incidence of the population and pollution of water sources," *Vestnik,* No 4, 2014

55. Cheng-Yee Fish-Low, A. D. Balami, Leslie T. L. Than, King-Hwa Ling, Z. Sekawi "Hypocalcemia, hypochloremia, and eosinopenia as clinical predictors of leptospirosis: A retrospective study" *Journal of Infection and Public Health,* 2019

56 F. Anwar, J. Abraham, A. Nakshabandi, E. Lee "Treatment of hypocalcemia in hungry bone syndrome", 2018, Vol. 51, pp. 335-339

57. J. Liu, S. Li, D. Sun "Calcium Dobesilate and Micro-vascular diseases",Life Sciences, 2019, Vol. 221, pp. 348-353