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TREATMENT PROPERTIES OF THE SPRINGS IN JIZZAKH REGION, UZBEKISTAN

Sabokhat Tashpulatova Akbarovna
Department of Ecology and Environmental Protection, Jizzakh polytechnic institute, Jizzakh, Uzbekistan
sabo_8728@mail.ru

ABSTRACT

The chemical characteristics and physical properties (total mineralization, Fe, Br, J, CO_2, organic matter, H_2SiO_3 + $HSiO_3$) of 107 sources in Farish, Bakhmal, Zaamin and Gallaorol districts of the Jizzakh region of Uzbekistan have been studied and analyzed. The chemical and physical properties of these springs are especially advantageous due to several factors and show their medicinal properties. The results of the analysis help to distinguish between five springs in the Farish region and four springs in the Zaamin, which have a higher mineralization index than other sources. Andigansay, located in the Farish, has the advantage of being rich in iron. Since the water of five springs in the Farish district is rich in bromine, and the Karamazar spring in the Zaamin district is close to the norm, the amount of free CO2 dissolved in water is common in the Bakhmal district (23 sources). This is followed by the Zaamin district (3 sources). By organic matter, Farish is a leader and (49 sources), followed by Zaamin (3), Bakhmal (1) and Gallaral (1). Farish is the leader in terms of the content of silicon compounds (16 sources), followed by the Bakhmal region (9 sources). The article describes the treatment properties of the sources on the basis of tables reflecting the treatment of diseases. In addition, there is a concise explanation of diseases and medical terms to help the researchers get the most out of the information.

Keywords: *springs, water quality, rural health, mineral water, treatment factors, Jizzakh*

INTRODUCTION

Jizzakh is one of the important economic and social centre of the Republic of Uzbekistan. Farish, Bakhmal, Zaamin and Gallaaral districts are located in the mountains and foothills of the region. For this reason, these areas are rich in unique natural resources, one of which is natural sources. All life forms especially humans depend on their surrounding biophysical environment for their well-being and survival but due to overuse of these resources, environment has been degrading rapidly. Among these springs, water is one of the most important natural resource for humans, wildlife and the whole environment. Assessment of ambient water quality determines its use for humans and ecological purposes [1-4]. Water quality represents the purity of water and expresses the suitability of water for various uses like drinking, industrial water supply, and irrigation, propagation of aquatic organisms and generation of hydro power. The water quality is assessed in order to determine its portability, safety of human contact and ecosystem health. Poor quality of water is due to high level of organic and inorganic substance that does not fit in the standard limits given by government. Water quality indicated by various physical parameters such as pH, total solids, total dissolved solids, total suspended solids, alkalinity, free CO_2, dissolved oxygen, hardness, chlorine content, and sodium content. Nitrate contamination results from human and animal wastes, soil nitrogen content, plant debris, industrial effluents and

chemicals, and seepage and drainage system [5, 6]. Springs described as «bowls of liquid light» [7], are one of the most wonderful and scenic place in the nature. Moreover, springs are the best area for swimming, picnicking and diving; they are one of the oldest tourist attractions [8-11] for people. A spring is a water resource formed when the side of a hill, a valley bottom or other excavation intersects a flowing body of groundwater at or below the local water table, below which the subsurface material is saturated with water [12-14]. The turbidity in the groundwater is an indication of pollution of water resulting from deterioration of organic matter and improper disposal of domestic and industrial solid wastes and wastewater. Electrical conductivity (EC) is a measure of the presence of dissolved salts in water which are responsible to conduct electric current [15]. Total hardness (mg/l) is defined as the sum of magnesium and calcium carbonate contents. High magnesium content affects the domestic use of water [16]. High levels of water hardness lead to heart diseases and kidney stone formation [17].

METHODOLOGY

2.1. Study Area

The study area (Farish, Bakhmal, Zaamin, Gallaaral) is located in Jizzakh of Uzbekistan. Geographically, Jizzakh region is located in the central part of the Republic of Uzbekistan between the Syrdarya and Zarafshan rivers. It is bordered on the north and northeast by the Republic of Kazakhstan and the Syrdarya region, on the southeast by the Republic of Tajikistan, on the west by the Navoi region and on the southwest by the Samarkand region. The peculiarity of the region is that it does not form a single natural-geographical district; it covers a certain part of the natural-geographical regions of Kyzylkum, Mirzachul and Zarafshan, and is also located between the desert and the mountains. Jizzakh region is divided into two very different parts. The northern part of the region is represented by lowlands, and in the southern part - by the mountain ranges of Turkestan from east to west and northwest.

2.2. Research Design

The research was an experiment. Water samples were collected from Farish, Bakhmal, Zaamin and Gallaaral in Jizzakh region and tested at the State Unitary enterprise of the Uzbekhydrogeology laboratory. As an external control, about 10% of the samples taken were examined at the "Central Chemical Laboratory" of the State Committee of Geology. Analysis accepted for 14 months - in 2018 - 3 months (August, September, October), in 2019 - 8 months (March - October), in 2020 - 3 months (March, April, May) with a cyclic of 1.5 years of springs quality control.

2.3. Sampling Procedure

Samples were taken in polyethylene bottles (500 ml). A total of 633 water samples from 242 sources were timely analysed in the laboratory for physical (pH and hardness) and chemical analysis, respectively.

2.4. Data collection and Analysis

All samples were analysed physically and chemically. The data were analysed using Microsoft excel computer software.

2.4.1. Physical Quality Analysis Methods

The physical examinations focused mainly on pH and water properties. The table pH meter was used to measure the pH level of the Jizzakh region spring water. The electrode was immersed in the sample. Reading was taken after 20-30 seconds after the water readings have stabilized.

2.4.2. Chemical Quality Analysis Methods

Hardness, free content of CO_2, Fe (Fe^{2+} + Fe^{3}), Br, J, silicic acids (H_2SiO_3 + $HSiO_3^-$), organic substances, and total mineralization was determined.

RESULTS

107 springs were found to be qualitatively beneficial to human health. Table 1 shows the main criteria for assessing (determining) the treatment properties of mineral waters in Uzbekistan. All results obtained in the laboratory were analysed and sources with medicinal properties were selected based on these criteria (Table 1).

Table 1.
Treatment and factors of mineral waters in springs

Balneological group of mineral waters	Treatment factors
Without specific components, little, medium and highly mineralized hydrocarbonate	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
Chlorinated	Digestive system, urology, organs of support and movement, peripheral and central nervous system, gynecology
Sulfate	Digestive system, metabolism, organs of support and movement, peripheral nervous system
Carbonic	Digestive & Cardiovascular System
Hydrogen sulfide	Cardiovascular & Nervous System, Radiculitis, Gynecology, Skin Diseases, etc.
Ferruginous	Iron deficiency anemia, a general tonic, cell building, body growth, oxygen transport, increased hemoglobin, respiratory tract catalyst
Arsenic	Growth of tissues and bones, weight gain, proliferation of cells of internal organs (liver, kidneys, muscle tissues), stimulation of nitrogen metabolism, increase in the assimilation of nitrogen and phosphorus, strengthening the body, skin, allergic reactions, nervous diseases
Bromine	Cardiovascular and nervous systems, support and movement organs, skin
Iodine	Chronic gastritis, colitis, liver, swelling, support and movement organs, skin, cardiovascular and peripheral nervous system, gynecology

Siliceous	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
Boric	Digestive organs
Organic matter	Digestive organs, liver, biliary tract, metabolism, urolithiasis
Radon	Nervous and cardiovascular systems, respiratory and digestive organs, diseases of bones, joints, muscles, gynecology, metabolism
Pickle	Support and movement organs, peripheral and central nervous systems, skin, etc.
Nitrogen-alkaline baths	Gastrointestinal tract, organs of support and movement, peripheral nervous system, gynecology, skin

The table above shows that, medicinal waters have a positive effect on several diseases at once. The sources distributed in the Jizzakh region were selected based on Table 1 based on their medicinal properties and explanation of diseases or medical terms.

3.1. pH

Table 2 shows the pH of the springs that are considered curative in the Jizzakh region.
Table 2.
The pH indicators of treatment sources (springs) in Jizzakh

	Springs name
Farish district	Mujrumsay – 2 – 7,2 (slightly alkaline); Andigansoy – 7,2 (slightly alkaline); Hayot (Uxumsay) – 6,4 (slightly acidic); Asrofsay – 6,7 (slightly acidic); Old Farish – 1 – 6,7 (slightly acidic); Old Farish – 4 – 6,5 (slightly acidic); Kamishsay – 2 – 6,7 (slightly acidic); Kamishsay – 5 – 6,6 (slightly acidic); Kamishsay – 6 – 6,7 (slightly acidic); Kamishsay – 9 – 6,6 (slightly acidic); Akbulak – 7,7 (slightly alkaline); Tangisay – 7,2 (neutral); Yotokkishlak – 7,2 (neutral); Yotokkishlok – 2 – 7,15 (neutral); Kurukkulsay – 6,9 (neutral); Kurukkulsay – 2 – 7,05 (neutral); Middle village spring – 7,2 (neutral); Kuybulaksay – 7,0 (neutral); Yamchi – 1 – 6,9 (neutral); Yamchi – 2 – 7,0 (neural); Yangisay – 6,8 (neutral); Eshanlisay – 6,7 (slightly acidic); Yamchisay – 7,0 (neutral); Khujursay – 1 – 6,8 (neutral); Khujursay – 2 – 7,0 (neutral); Khujursay – 3 – 7,2 (neutral); Ilonchisay – 6,7 (slightly acidic); The rest area spring of «Zangori olov» – 7,0 (neutral); Akbulak ota – 6,9 (neutral); Matlubotchi - 1 – 7,4 (slightly alkaline); Tangibuloq – 6,6 (neutral); Balandosmon – 1 – 7,1 (neutral); Balandosmon – 2 – 7,3 (slightly alkaline); Kayragach – 1 – 7,1 (neutral); Ana – Muna– 2 – 7,1 (neutral); Ana – Muna – 3 – 7,3 (slightly alkaline); Ana – Muna – 4 – 7,1 (neutral); Karatash – 1 – 7,4 (slightly alkaline); Karatash – 2 – 7,2 (neutral); Karatash – 3 – 7,7 (slightly alkaline); Karatash – 4 – 7,2 (neutral); Khujabogbon ota – 7,1 (neutral); Kutirbulak – 7,8 (slightly alkaline); Egizbulak – 1 – 7,8 (slightly alkaline); Egizbulak – 2 – 7,4 (slightly alkaline); Egizbulak – 3 – 7,4 (slightly alkaline); Egizbulak – 5 – 7,4 (slightly alkaline); Egizbulak – 6 – 7,3 (slightly alkaline); Egizbulak – 7 – 7,8 (slightly alkaline); Garasha – 1 – 6,4 (slightly acidic); Garasha – 2 – 6,4 (slightly acidic); Garasha – 3 – 6,55 (slightly acidic); Jandakhor ota – 6,7 (slighty acidic); Khaydar ota – 1 – 6,8 (neutral); Khaydar ota – 2 – 6,8 (neutral); Khaydar ota – 3 – 6,6 (slightly acidic); Khaydar ota – 4 – 6,3 (slightly acidic); Yassikechuv – 4 – 6,55 (slightly acidic); Koraobdol

ota – 2 – 6,5 (slightly acidic); Akbulak – 7,4 (slightly alkaline); Doriston – 6,5 (slightly acidic); Sovurdovon – 7,4 (slightly alkaline); Mikhin – 1 – 7,8 (slightly alkaline); Mikhin – 3 – 7,6 (slightly alkaline); Yamchisoy – 7,2 (slightly alkaline); Yamchisoy (Kutirbulak) – 7,5 (slightly alkaline); Sayyod Uratepa – 7,5 (slightly alkaline); Korakhon – 7,4 (slightly alkaline); Korakhon - 2 – 7,4 (slightly alkaline)

Bakhmal district	Katartol – 6,5 (slightly acidic); Vadigan – 5,1 (acidic); Tangitopdi – 3,0; Akkurgansay 1 – 3,1; Akkurgansay – 2 – 6,3 (slightly acidic); Olim bogi spring – 1 – 5,6 (slightly acidic); Olim bogi spring – 2 – 6,65 (slightly acidic); Kirkkishlak spring – 1 – 6,25 (slightly acidic); Kirkkishlak spring – 2 – 6,5 (slightly acidic); Kukjarkishlak spring – 1 – 6,1 (slightly acidic); Kukjarkishlak spring – 2 – 6,5 (slightly acidic); Bakhmalsay – 2,8; Palakhmansay – 6,7 (slightly acidic); Ak-Mulla (Jilbulak) – 1 – 3,2; Ak-Mulla – 2 – 2,4; Ak-Mulla – 3 (Karongusay) – 2,4; Karasuv – 2; Kizilsay – 1 – 6 (slightly acidic); Supikishlak – 1 – 6,1 (slightly acidic); Supikishlak – 2 – 6,0 (slightly acidic); Muzbulak (Karashakshak) – 1 – 5,7 (slightly acidic); Muzbulak – 2 – 5,9 (slightly acidic); Muzbulak – 5 – 5,9 (slightly acidic); Nishansuv – 1,8; Jadik village – 7,4 (slightly alkaline); Aykar Tagbulak ziyoratgoh – 7,0 (neutral); Kizilsuv Temirli – 6,1 (slightly acidic); Kizilsuv Temirli – 2 - 6,1 (slightly acidic)
Zomin district	Taylansoy – 2,9; Karimqishloq – 4,2 (acidic); Tamtumqishloq -1- 6,2 (slightly acidic); Tamtimsay – 2 – 6,3 (slightly acidic); Uvolsay – 1 – 5,7 (slightly acidic); Suvlisay – 1 – 5,7 (slightly acidic); Koramozor – 7,5 (slightly alkaline); Sherbulak – 6,0 (slightly acidic); Koramozor – 2 – 7,9 (slightly alkaline).
Gallaorol district	Khovuzbulak – 1 – 7,3 (slightly alkaline)

These results indicate that water of springs is different with pH indicators in every district. Springs of Farish indicate from 6,3 to 7,8 and springs of Bakhmal from 2,4 to 7,4, springs of Zaamin from 2,9 to 7,9. Finally, Gallaral spring is 7, 3 the indicator of pH.

3.2. General mineralization

The general index of mineralization in the spring of Farish district is different: Kamishsay - 6 – 1, 04 (low mineralization), Kamishsay - 9 - 1.04 (low mineralization), Jandakhor ota - 1.35 (low mineralization), Karaobdol - 1.01 (low mineralization), Garasha - 1.5 (low mineralization), and also mineralization indicators were obtained for the Tamtumsay - 1 - 1.36 (low mineralization), the Tamtumsay - 2 - 1.33 (low

mineralization), Suvlisay - 0.91 (weak mineralization), Shurbulak - 2.39 (low mineralization) in the Zaamin district, which means that the highest mineralization index was obtained. It can be seen that Shurbulak (2.39) is represented, but Farish is in the lead as an area with springs that meet the established rate of total mineralization. General mineralization is from 2, 39 to 0, 91 in the different areas in the Jizzakh region.

These springs are useful to treat of digestive system, urology, metabolism, gynecology, skin, support and movement organs, and peripheral nervous system diseases (Table 3).

Table 3.

Description of medical terms

Digestive system	The system used in the human body for the process of digestion. The human digestive system consists primarily of the digestive tract, or the series of structures and organs through which food and liquids pass during their processing into forms absorbable into the bloodstream. The system also consists of the structures through which wastes pass in the process of elimination and other organs that contribute juices necessary for the digestive process [18].
Urology	Urology is a surgical speciality that deals with the treatment of conditions involving the male and female urinary tract and the male reproductive organs [19].
Metabolism	Metabolism, the sum of the chemical reactions that take place within each cell of a living organism and that provide energy for vital processes and for synthesizing new organic material [18-21].
Gynecology	Gynecology is the medical practice dealing with the health of the female reproductive system (vagina, uterus, and ovaries). Outside medicine, the term means "the science of women". Its counterpart is andrology, which deals with medical issues specific to the male reproductive system [18-21].
Skin	The human skin is the outer covering of the body and is the largest organ of the integumentary system [18-21].
Support and movement organs	The musculoskeletal system provides form, support, stability, and movement to the body. It is made up of the bones of the skeleton, muscles, cartilage, tendons, ligaments, joints, and other connective tissue that supports and binds tissues and organs together [18-21].
Peripheral nervous system	The peripheral nervous system (PNS) is one of two components that make up the nervous system of bilateral animals, with the other part being the central nervous system (CNS). The PNS consists of the nerves and ganglia outside the brain and spinal cord [18-21].

3.3. Fe (Fe^{2+} +Fe^{3+}) (10 mg/l)

When analysed the iron content in the water of the Andigan located in the Farish region was 11.0 mg / l (ferruginous). In all other sources, the chemical element iron was below the established norm. The best indicator with Fe (Fe^{2+} +Fe^{3+}) is Andigansay in the Zaamin region. Iron content spring water is helpful to treat iron deficiency anemia, a general tonic, cell building, body growth, oxygen transport, increased hemoglobin, and respiratory tract catalyst system diseases (Table 4).

Table 4
Description of medical terms

Iron deficiency anemia (1)	Iron deficiency anemia is a common type of anemia — a condition in which blood lacks adequate healthy red blood cells. Red blood cells carry oxygen to the body's tissues.
A general tonic	A generalized tonic – clonic seizure, commonly known as a grand mal seizure or GTCS, is a type of generalized seizure that produces bilateral, convulsive tonic and clonic muscle contractions [18-21].
Cell building	Cells are the basic building blocks of all living things. The human body is composed of trillions of cells. ... Cells have many parts, each with a different function. Some of these parts, called organelles, are specialized structures that perform certain [18-21].
Body growth	Body growth is the cumulative sum of cell proliferation and cell enlargement which occurs in multiple tissues [22].
Oxygen transport	The transport of oxygen is fundamental to aerobic respiration. Oxygen transport within the human body occurs through both convection and diffusion. Within the pulmonary capillaries, one hemoglobin molecule binds up to four oxygen molecules in a cooperative manner [18-21].
Increased hemoglobin	High hemoglobin count differs slightly from one medical practice to another [19-20]

3.4. Br (25 mg/l)

Mujrumsay - 2 – 54, Andigansay - 110, Eski Forish - 1 - 41.0, Eski Forish - 4 - 34.0, Karakhan - 2 - 70.2 in the Farish district. It can be concluded that Br has a high content of chemical elements in the Farish. Bromine is an important factor to treat cardiovascular and nervous systems, support and movement organs, skin diseases (Table 5).

Table 5.
Description of medical terms

Cardiovascular systems	The three main components of the cardiovascular system are the blood, the blood vessels and the heart. Blood is the fluid that is in continuous movement

	through all tissues of the body, blood vessels are the conduits for the blood and the heart is the muscular pump that is primarily responsible for driving the flow [18-21].
Nervous systems	The nervous system is a complex collection of nerves and specialized cells known as neurons that transmit signals between different parts of the body. It is essentially the body's electrical wiring. Structurally, the nervous system has two components: the central nervous system and the peripheral nervous system [18-21].

3.5. J (5 mg/l)

It can be seen that the iodine content in the water of the Karamazor spring in the Zaamin is much closer to the established normative norm - 4 mg / l compared to 5 mg / l (normative). The chemical element of J is an important factor to treat chronic gastritis, colitis, liver, swelling, support and movement organs, skin, cardiovascular and peripheral nervous system, gynecology diseases (Table 6).

Table 6.

Chronic gastritis	Chronic gastritis is a long-term condition in which the mucus lined layer of the stomach, also known as the gastric mucosa, is inflamed or irritated over a longer period of time [18-21].
Colitis	Colitis is an inflammation of the colon. Colitis may be acute and self-limited or long-term. It broadly fits into the category of digestive diseases [18-21].
Liver	Diseases caused by viruses, such as hepatitis A, hepatitis B, and hepatitis C. Diseases caused by drugs, poisons, or too much alcohol. Examples include fatty liver disease and cirrhosis [22].
Swelling	Swelling is any abnormal enlargement of a body part. It is typically the result of inflammation or a buildup of fluid. Edema describes swelling in the tissue outside of the joint. Effusion describes swelling that is inside a joint, such as a swollen ankle or knee [19-22].

3.6. CO_2 (0,5 g/l)

Bakhmal district springs: Katortol - 0,53 (weakly carbon dioxide), Vadigan - 0,57 (weakly carbon dioxide), Tangitopdi - 0,53 (weakly carbon dioxide), Dangara Akkurgansay - 0,7 (weakly carbon dioxide), Dangara Akkurgansay – 2 - 0,79 (weakly carbon dioxide), Olim bog - 1,06 (weakly carbon dioxide), Olim bog – 2 - 1,06 (weakly carbon dioxide), Kirkkishlak - 0,53 (weakly carbon dioxide), Kukjar - 0,62 (weakly carbon dioxide), Kukjar – 2 - 0,75 (weakly carbon dioxide), Baxmalsay - 0,97 (weakly carbon dioxide), Poloxmonsay - 0,62 (weakly carbon dioxide), Jilbulak - 0,88 (weakly carbon dioxide), Ak – Mulla - 1,1 (weakly carbon dioxide), Korongusay - 0,96 (weakly carbon dioxide), Korasuv - 1,76 (carbon dioxide with norm concentration), Supikishlak - 0,75 (weakly carbon dioxide), Supikishlak – 2 - 1,06 (weakly carbon dioxide), Muzbulak (Korashakshak) – 1 - 2,95 (strong carbon dioxide «carbonating»), Muzbulak – 2 - 0,88 (weakly carbon dioxide), Muzbulak – 5 - 1,06 (weakly carbon dioxide), Nishonsuv - 3,78 (strong carbon dioxide); Kizilsuv temirli – 5,7 (strong carbon dioxide).

Zaamin district springs: Karimkishlak - 0.92 (weakly carbon dioxide), Karamazor 2 - 1.3 (weakly carbon dioxide), Garasha - 2.2 (carbon dioxide with norm concentration).

According to the results of the analysis, it can be seen that the Bakhmal district is the leader in terms of area with the largest number of free CO_2 in the springs. There are different indicators from 5, 7 to 0, 53. The free CO_2 in the water of spring is an important factor to treat or prevent diseases digestive and cardiovascular system.

3.7. Organic substances - (5 mg/l)

Table 7.
The indicators of organic substances in spring of Jizzakh

Farish district	Springs name
	Tangisoy - 20,41; Yotokkishlak - 16,14; Yotokkishlak – 2 - 19,46; Kurukkulsay - 17,56; Kurukkulsay – 2 - 18,04; Urta kishlak – 1 - 20,41; Kuybulaksay - 13,76; Yomchi – 1 - 20,88; Yomchi – 2 - 18,98; Yangisoy - 16,61; Eshonlisay - 5,22; Yomchi - 22,31; Khujursay - 19,94; Khujursoy – 2 - 21,42; Khujursoy – 3 - 18,75; Ilonchisoy - 20,35; Zangori olov - 20,35; Akbulak ota - 21,42; Matlibotchi - 16,06; Tangibulak - 13,92; Balandosmon – 1 - 19,28; Balandosmon – 2 - 18,75; Kayragach - 17,14; Kurbonxuja – 2 - 15,53; Kurbonxuja – 3 - 15,53; Kurbonxuja – 4 - 17,99; Korajon – 1 - 17,99; Korajon – 2 - 18,99; Korajon – 3 - 16,49; Korajon – 4 - 20,99; Khujabogbon - 15,49; Kutirbulak - 10,49; Egizbulak – 1 - 11,99; Egizbulak – 2 - 19,49; Egizbulak – 3 - 15,99; Egizbulak – 5 - 15,99; Egizbulak – 6 - 7,49; Egizbulak – 7 - 18,49; Garasha – 1 - 7,57; Garasha – 2 - 5,68; Garasha – 3 - 13,3; Garasha - 9,46; Khaydar ota – 1 - 7,22; Khaydar ota – 2 - 7,2; Khaydar ota – 3 - 6,06; Khaydar ota – 4 - 5,68; Davlan – 4 - 5,25; Uzunbulak – 2 - 6,65; Diriston - 8,06
Bakhmal district	Supi kishlak - 1 - 5,1
Zamin district	Taylonsoy - 5,07; Karimkishlak - 19,25; Uvolsoy - 6,42
Gallaorol district	Khovuzbulak – 2 - 10,06

The table describes that the maximal indicator of organic substances is 22,31 in Yomchi spring in Farish district and the minimal indicator is 5,07 in spring of Zaamin district. Farish dominates with springs which saturated with organic substances in water than other area. Khovuzbulak is only spring in Gallaorol and Supi kishlak spring one source in Bakhmal district with rich organic substances in water. 49 springs are located in Farish district, 3 in Zaamin, 1 is Gallaorol and Bakhmal. Organic substance is an important to treat the diseases of digestive organs, liver, biliary tract, metabolism, urolithiasis (8).

Table 8.

Description of medical terms

Biliary tract	The organs and ducts that make and store bile (a fluid made by the liver that helps digest fat), and release it into the small intestine. The biliary tract includes the gallbladder and bile ducts inside and outside the liver [19].
Metabolism	Metabolism is a term that is used to describe all chemical reactions involved in maintaining the living state of the cells and the organism [19].
Urolithiasis	Kidney stone disease, also known as nephrolithiasis or urolithiasis, is when a solid piece of material (kidney stone) develops in the urinary tract. Kidney stones typically form in the kidney and leave the body in the urine stream. A small stone may pass without causing symptoms [21].

3.8. H_2SiO_3+$HSiO_3$ (50 mg/l)

Table 9 shows the results of H_2SiO_3+$HSiO_3$ in water of spring in Farish and Bakhmal district.

Table 9.

Farish district	Springs name
	Hayot – 52; Asrofsay - 44,2; Kamishsay 5 - 49,4; Korasuv – 52; Kizilsuv – 52; Sovurdovon – 60; Mikhin - 1 - 62; Mikhin 3 – 69; Yamchisoy – 60; Yamchisoy (Kutirbulak) – 51; Sayyod Uratepa – 64; Yamchisoy – 51; Kattabogdon – 55; Ana – Muna – 1 – 55; Koraxon – 1 – 55; Koraxon – 2 – 60
Bakhmal district	Kukjar – 1 – 51; Kukjar – 2 – 60; Ak – Mulla – 1 – 64; Ak – Mulla – 3 – 64; Korasuv – 1 - 60; Jadik – 60; Oykor – 64; Kizilsuvsoy-temirli – 83; Kizilsuvsoy-temirli – 2 – 83

The indicators show the different results from 69 to 44, 2 respectively. 24 springs are rich with H_2SiO_3+$HSiO_3$, however Farish is first with 15, and Bakhmal has 9. There are 16 springs in Farish and 9 in Bakhmal district. H_2SiO_3+$HSiO_3$ is the most important factor to treat gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system diseases (Table 10).

Table 10.

Description of medical terms

Gastrointestinal tract	Gastrointestinal diseasesrefer to diseases involving the gastrointestinal tract, namely

the oesophagus, stomach, small intestine, large intestine and rectum, and the accessory organs of digestion, the liver, gallbladder, and pancreas [19-21].

Table 11.
Treatment springs of Jizzakh region

№	Spring name	Location	The treatment properties of the spring
1	Kamishsay – 6	Farish district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
2	Kamishsay – 9	Farish district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
3	Tamtumsay – 1	Zaamin district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
4	Tamtumsay – 2	Zaamin district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
5	Suvlisay – 1	Zaamin district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
6	Jandakhor ota shrine spring	Farish district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
7	Karaobdol	Farish district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system

8	Garasha	Farish district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system, cardiovascular system
9	Shurbulak	Zaamin district	Digestive system, urology, metabolism, gynecology, skin, support and movement organs, peripheral nervous system
10	Andigansay	Farish district	Iron deficiency anemia, a general tonic, cell building, body growth, oxygen transport, increased hemoglobin, respiratory tract catalyst; Cardiovascular and nervous systems, support and movement organs, skin
11	Mujrumsay – 2	Farish district	Cardiovascular and nervous systems, support and movement organs, skin
12	Eski Farish – 1	Farish district	Cardiovascular and nervous systems, support and movement organs, skin
13	Eski Farish – 4	Farish district	Cardiovascular and nervous systems, support and movement organs, skin
14	Karakhon – 2	Farish district	Cardiovascular and nervous systems, support and movement organs, skin
15	Karamazar	Zaamin district	Chronic gastritis, colitis, liver, swelling, support and movement organs, skin, cardiovascular and peripheral nervous system, gynecology
16	Katartal	Bakhmal district	Digestive & Cardiovascular System

17	Vadigan	Baxmal district	Digestive & Cardiovascular System
18	Tangitopdi	Bakhmal district	Digestive & Cardiovascular System
19	Dangara Akkurgonsay	Bakhmal district	Digestive & Cardiovascular System
20	Dangara Akkurgansay – 2	Bakhmal district	Digestive & Cardiovascular System
21	Olim bog	Bakhmal district	Digestive & Cardiovascular System
22	Olim bog – 2	Bakhmal district	Digestive & Cardiovascular System
23	Kirkkishlak	Bakhmal district	Digestive & Cardiovascular System
24	Kirkkishlak – 2	Bakhmal district	Digestive & Cardiovascular System
25	Kukjar	Bakhmal district	Digestive & Cardiovascular System
26	Kukjar – 2	Bakhmal district	Digestive & Cardiovascular System
27	Baxmalsay	Bakhmal district	Digestive & Cardiovascular System
28	Poloxmonsay	Bakhmal district	Digestive & Cardiovascular System
29	Jilbulak	Bakhmal district	Digestive & Cardiovascular System
30	Ak – Mulla	Bakhmal district	Digestive & Cardiovascular System
31	Karangusay	Bakhmal district	Digestive & Cardiovascular System
32	Karasuv	Bakhmal district	Digestive & Cardiovascular System
33	Supikishlak	Bakhmal district	Digestive & Cardiovascular System
34	Supikishlak – 2	Bakhmal district	Digestive & Cardiovascular System
35	Muzbulak (Karashakshak) - 1	Bakhmal district	Digestive & Cardiovascular System
36	Muzbulak – 2	Bakhmal district	Digestive & Cardiovascular System
37	Muzbulak – 5	Bakhmal district	Digestive & Cardiovascular System
38	Nishansuv	Bakhmal district	Digestive & Cardiovascular System
39	Karimkishlak	Zaamin district	Digestive & Cardiovascular System
40	Karamazar 2	Zaamin district	Digestive & Cardiovascular System
41	Kizilsuv temirli	Bakhmal district	Digestive organs, liver, biliary tract, metabolism, urolithiasis

42	Tangisoy	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
43	Yotokkishlak	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
44	Yotokkishlak – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
45	Kurukkulsay	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
46	Kurukkulsay – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
47	Urta kishlak – 1	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
48	Kuybulaksay	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
49	Yomchi – 1	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
50	Yomchi – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
51	Yangisay	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
52	Eshonlisay	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
53	Yomchi	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
54	Khujursay	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
55	Khujursay – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
56	Khujursay – 3	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
57	Ilonchisay	Farish district	Digestive organs, liver, biliary tract,

			metabolism, urolithiasis
58	Zangori olov	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
59	Akbulak ota	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
60	Matlibotchi	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
61	Tangibuloq	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
62	Balandosmon – 1	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
63	Balandosmon – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
64	Kayragach	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
65	Kurbankhuja	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
68	Karajan – 1	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
69	Karajan – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
70	Karajan – 3	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
71	Karajan – 4	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
72	The shrine of Khujabogbon ota	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
73	Qo`tirbulak	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
74	Egizbulak – 1	Farish district	Digestive organs, liver, biliary tract,

			metabolism, urolithiasis
75	Egizbulak – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
76	Egizbulak – 3	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
77	Egizbulak – 5	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
78	Egizbulak – 6	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
79	Egizbulak – 7	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
80	Garasha – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
81	Garasha – 3	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
82	Khaydar ota – 1	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
83	Khaydar ota – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
84	Khaydar ota – 3	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
85	Khaydar ota – 4	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
86	Davlan – 4	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
87	Uzunbulak – 2	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
88	Khovuzbulak – 2	Gallaarol district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
89	Taylonsay	Zaamin district	Digestive organs, liver, biliary tract, metabolism, urolithiasis

90	Uvolsay	Zaamin district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
91	Diriston	Farish district	Digestive organs, liver, biliary tract, metabolism, urolithiasis
92	Hayot	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
93	Asrafsay	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
94	Kamishsay – 5	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
95	Sovurdovon	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
96	Mixin – 1	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
97	Mikhin – 3	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
98	Yamchisay children rest area spring	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
99	Sayyad Uratepa	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
100	Katta bog`don mosque spring	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
101	Ana – Muna – 1	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and

			movement, skin, nervous system
102	Karakhan buloq – 2	Farish district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
103	Ak – mulla – 2	Bakhmal district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
104	Ak – mulla – 3	Bakhmal district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
105	Jadik	Bakhmal district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
106	Aykar tagbulak shrine spring	Bakhmal district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system
107	Kizilsuvsay – temirli – 2	Bakhmal district	Gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system

DISCUSSION

Analysis of chemical and physical properties (total mineralization of the sampled water, iron, silicon compounds, bromine, iodine, carbon dioxide content, organic matter, pH, hardness, etc.) showed that 107 out of 242 sources are sources for human health was recognized as a source of treatment water.

It can be assumed that the general mineralization properties of springs in Forish and Zaamin districts of Jizzakh region are curative in the treatment or prevention of diseases of the digestive system, urology, metabolism, geneology, skin, support and movement organs, peripheral nervous system. In terms of iron richness, Andigansay in Forish is believed to be curative in the treatment or prevention of diseases of the iron defiance, anemia, general tonic, cell building, body growth, oxygen transport, increased hemoglobin, respiratory tract catalyst systems.

As springs rich in Br element, springs in Farish district can be used for the prevention or treatment of diseases of the cardiovascular and nervous systems, support and movement organs, skin systems. In terms of healing properties, the springs with CO2 standard properties have springs in Bakhmal and Zaamin districts, which have healing properties in the digestive and cardiovascular system.

The springs of organic matter meet the standard requirements in Farish, Bakhmal, Zaamin and Gallaorol districts. These springs have prophylactic properties in digestive organs, liver, biliary tract, metabolism, urolithiasis.

As for $H2SiO_3$ + $HSiO_3$, the springs in Farish and Bakhmal can be recommended for therapeutic and prophylactic purposes in diseases of the gastrointestinal tract, metabolism, biliary tract, organs of support and movement, skin, nervous system.

CONCLUSIONS

It turned out that the Jizzakh region is rich in groundwater sources - springs. It was found that most of the springs studied in the regions have medicinal properties. Their most common medicinal feature is that they are rich with organic matter. It became clear that organic rich sources are the leaders in the Farish district. The next place is occupied by the amount of free CO_2 in water, and such sources are most common in the Bakhmal district. It was found that Farish and then springs in Bakhmal districts contain large amounts of H_2SiO_3 + $HSiO_3$. Chemical elements important for human life, such as bromine, iron, iodine, were found in four districts: Farish, Bakhmal, Zaamin, Gallaaral. Considering the importance of identifying and depth study of healing springs and their preventive role for human health and diseases, plays an important role the construction of sanatoriums near the springs or the development of local and international tourism.

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