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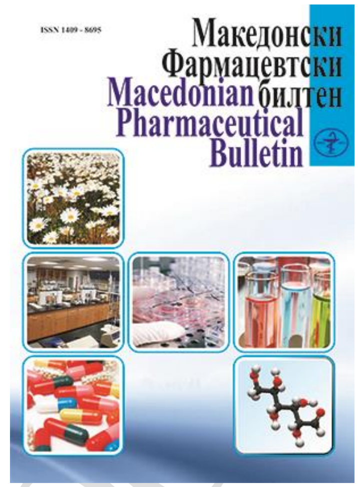

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The quality of drinking water in the Prilep region supplied by the Studenchica Regional Water Supply System and PHI General Hospital Prilep

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Abstract

Drinking water quality testing is made to control whether consumers are provided with safe and healthy drinking water, and to protect human health from the side effects of water contamination. The purpose of this paper is to show the health correctness and the quality of drinking water in the city of Prilep and the settlements that are supplied with it from the Studenchica Regional Water Supply System, and the local city water supply system which is supplied by the Public Health Institution (PHI) General Hospital Prilep with drinking water during the year of 2021. The Public Company for Water Supply and Sewerage Prilep manages most of the water supply facilities and carries out regular disinfection of drinking water. But there are some settlements where the water is not chlorinated since the water supply facilities are not managed by the public company.

The samples were subjected to both, basic physical-chemical and microbiological examination according to the Drinking Water Safety and Quality Requirements Rulebook (Official Gazette of the Republic of Macedonia No. 183 of 02.10.2018). Based on the monitoring, it can be concluded that the public enterprise guarantees safe and healthy drinking water for the parts of Studenchica Regional Water Supply System under its management and under the Municipality of Prilep jurisdiction. This is also the case with drinking water from the local water supply system at the PHI General Hospital Prilep.

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Key words: drinking water, quality, safety, health correctness, physical-chemical parameters, microbiological parameters

Introduction

All people, whatever their stage of development and social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs (UN; The Human Right to Water and Sanitation; Mar del Plata UN Water Conference, 1977). It is a necessary substance for the origin, maintenance, and development of life on our planet. Drinking water must have good hygienic properties and all elements of health safety. Safe and healthy drinking water in sufficient quantities provided to consumers improves living conditions, raises the health culture to a higher level, and improves the environment as a whole (Gjorgjev et al., 2008). The quality of drinking water as a source of life is of particular importance for the survival and economic development of an urban environment.

The causative agents of bacterial, viral and parasitic diseases can be transmitted through drinking water, the so-called intestinal infectious diseases (Water-borne diseases). A sudden appearance of a large number of patients in a short period of time is called a hydric epidemic and indicates accidental water pollution. Therefore, it is necessary to carry out permanent expert control of the drinking water quality and systematic analysis of the physical-chemical and bacteriological parameters (Guidelines for Drinking-water Quality fourth edition, 2011). The criteria of the World Health Organization (WHO) for hygienic water supply are the following: drinking water health correctness (Safety); safe sufficient water amounts supply (Adequacy); convenience in use (Convenience); water supply continuity (Continuity) (https://www.who.int/).

Drinking water supply means supplying the population with water, healthy and safe, and in sufficient quantities, which is used for drinking and other domestic needs in households; for the production and sale of food products in the economy; in school and preschool institutions; in tourist facilities and localities, and many other facilities and activities. Public water supply is the supply of water to at least 5 households, that is, more

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than 20 inhabitants or consumption greater than 10 m^3 per day (Gjorgjev et al., 2008). There are two ways of public water supply:

- Central water supply-organised public water supply for the population in a certain settlement or region;
- Local water supply-underground water is mostly used, and also atmospheric water in some circumstances (Kochubovski et al., 2021).

PHI Center for Public Health Prilep, as part of the preventive health care system of the Republic of North Macedonia, monitors the quality of drinking water in the city of Prilep and its settlements in accordance with the National Program for Public Health and in accordance with the Drinking Water Safety and Quality Requirements Rulebook (Official Gazette of the Republic of Macedonia No. 183 of 02.10.2018). The purpose of this paper is to show the health correctness and the drinking water quality in the city of Prilep and the settlements that are supplied with it from the Studenchica Regional Water Supply System and the local city water supply system which supplied the PHI General Hospital Prilep with drinking water during 2021. Studenchica Regional Water Supply System supplies drinking water to 69704 citizens of the city of Prilep and to 25 settlements with 10618 citizens which are connected to the Studenchica Regional Water Supply System (Report on monitoring the condition of water supply and the quality of drinking water for 2021 Organisational Unit Prilep).

Materials and methods

Drinking water quality and health correctness from the water supply system of the city of Prilep control is done at precisely defined measuring points (Table 1), two tanks, and a chlorine station where raw water is controlled. The sampling frequency is from 4 measuring points in the city on a daily basis, once a month from the tanks, and a sample is taken from the chlorine station at least once a month. Drinking water samples from the settlements connected to the Studenchica Regional Water Supply System are controlled once a month, including the primary schools in those settlements. The control of drinking water from the local city water supply that supplies PHI General Hospital Prilep is

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monitored twice a week, and more often if necessary. The basic physical-chemical analysis of water were done in the sanitary-chemical laboratory and the microbiological analysis in the sanitary-microbiological laboratory at PHI Centre for Public Health Prilep. Both laboratories are accredited for water testing according to the MKC EN ISO/IEC 17025:2018 standard.

Table 1

Sampling procedure

For physical-chemical analysis, samples are taken in chemically clean bottles (clean, well-washed) made of inert plastic with a plastic cap, with a volume of 1 L. Before taking the sample, the water is allowed to flow for 3-5 min, and then the bottle is rinsed with the water to be tested, at least three times. When the bottle is filled, a small space of 10-25 mL is left, and then the bottle is tightly closed. The sampler measures the amount of residual chlorine on the spot.

For microbiological analysis, water is taken in clean sterile bottles with a volume of 500 mL, and with plastic caps. When taking water from the water supply system and taps, the faucet must first be ignited with a flame (laboratory lamp, portable burner, flame from a tampon soaked in alcohol), and then the water is allowed to flow for 3-5 minutes. The bottle is held by the bottom end, the opening which is burned, faces down. Then the bottle is filled with water. When the bottle is full, the opening is burned again and immediately closed. The bottles with the samples of residual chlorine should contain dechlorinating agents, such as sodium-thiosulfate, in an amount of 10 mg for an amount of 100 mL of water, or 0.1 mL of 3% sodium-thiosulfate for 200 mL of water, that is, 0.6 mL of 5% sodium thiosulfate for 1000 mL of water (Angelevski, 2000).

After taking the water sample, a label is placed on the sampling container with the following data: name of the facility which the sample was taken from, place and date of sampling. The sampler fills out a Record and writes the amount of residual chlorine, and then the water sample is submitted together with the record. The procedure for transporting the water samples does not influence the results of the laboratory tests. All samples are

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analyzed in the shortest possible time, that is, no later than 6 hours after taking, and they are delivered to the laboratory in portable cooling devices.

According to the Drinking Water Safety and Quality Requirements Rulebook (Official Gazette of the Republic of Macedonia No. 183 of 02.10.2018), basic physical-chemical examination of water is performed on the samples, which includes the following parameters: turbidity, pH-value, consumption of $KMnO_4$, electrical conductivity at 20°C, chlorides, iron, ammonia and nitrates.

Turbidity is determined turbidimetrically on a turbidimeter, device that is designed according to the requirements and recommendations of MKC EN ISO 7027-1:2017 (Water quality- Determination of turbidity-Part 1). The pH and conductivity parameters were measured electrochemically on a Jenway 3540 multimeter device designed according to the requirements and recommendations of MKC EN 27888:2007 (Water quality-Determination of electrolytic conductivity) and MKC EN ISO 10523:2013 (Water quality-Determination of pH). Consumption of $KMnO_4$ was processed according to MKC EN ISO 8467:2007 (Water quality-Determination of permanganate index, boiling method with sulfuric acid). The principle of the mentioned method is heating the sample in a water bath, with a known amount of potassium permanganate and sulfuric acid for a certain time (10 min), reducing part of the permanganate from the oxidizing substances in the sample, and determining the consumed permanganate by adding an excess of oxalate solution, followed by titration with permanganate. Chlorides were processed according to MKC ISO 9297: 2007 (Water quality-Determination of chlorides, Silver nitrate titration with chromate indicator- Mohr method). Iron, ammonia and nitrates were determined spectrophotometrically on a Hach 4000DR spectrophotometer using methods accepted by the USEPA, with appropriate Spectroquant tests for each parameter. Iron-FerroVer Iron reagent converts all soluble iron and most insoluble forms of iron in the sample to soluble iron. Iron reacts with 1-10 phenanthroline indicators in the reagent to form an orange color proportional to iron concentration. The measurement of iron concentration is done at a wavelength of 510 nm (USEPA FerroVer® Method 8008). Ammonia compounds combine with chlorine to form monochloramine. Monochloramine reacts with salicylate to form 5-aminosalicylate. 5-aminosalicylate is oxidized in the presence of sodium nitroprusside catalyst to form a blue-

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colored compound. The blue color is masked with the yellow color from the excess reagent to give a final green-colored solution. The measurement of ammonia concentration is done at a wavelength of 655 nm (Salicylate Method 8155). Nitrates are processed according to the principle of the cadmium reduction method. Cadmium metal reduces the nitrate in the sample to nitrite. The nitrite ion reacts in an acidic environment with sulfanilic acid and a diazonium salt is formed. The salt combines with gentisic acid and an amber-colored solution is formed. Nitrate concentration measurement is done at a wavelength of 500 nm (Cadmium Reduction Method 8039).

According to the Drinking Water Safety and Quality Requirements Rulebook (Official Gazette of the Republic of Macedonia No. 183 of 02.10.2018), a basic microbiological examination of water is performed on the samples, which includes the following parameters:

Total number of coliform bacteria according to MKC EN ISO 9308-1:2015,

Escherichia coli according to MKC EN ISO 9308-1:2015;

Streptococcus faecalis according to MKC EN ISO 7899-2:2009;

Pseudomonas aeruginosa according to MKC EN ISO 16266:2009;

Number of colonies at 37 °C according to MKC EN ISO 6222:2009;

Number of colonies at 22 °C according to MKC EN ISO 6222:2009.

The microbiological laboratory at PHI Center for Public Health Prilep uses the MPN method, i.e., the membrane filtration method for low bacterial flora waters (APHA, 2005), to determine these parameters.

Results and discussion

In this paper, a total of 1459 water samples were tested during 2021, of which 1241 samples were chlorinated water and 218 samples were non-chlorinated water (Table 2).

Table 2

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Table 3 shows the number and percentage of defective water samples concerning the total number of analyzed ones, due to the water supply method in the Prilep region during 2021 (Table 3).

Table 3

According to the Drinking Water Safety and Quality Requirements Rulebook (Official Gazette of the Republic of Macedonia No. 183 of 02.10.2018), the MAC values (maximum allowed concentrations) of the parameters used during the basic physical-chemical examination of water are as follows:

Turbidity - 1.50 NTU

pH - MinAC 6.50 / MaxAC 9.50

Consumption of $KMnO_4$ - 8.0 mg/L O_2

Electrical conductivity - 2500 µS/cm

Chlorides - 250.0 mg/L

Iron - 0.2 mg/L

Ammonia - 0.5 mg/L

Nitrates - 50 mg/L

Table 4 shows data for the defective water samples in relation to the analyzed physical-chemical parameters (Table 4).

Table 4

It can be noted from the physical-chemical analyzes that the largest percentage of defective samples refer to the turbidity parameter.

Fig. 1

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Water turbidity comes from fine suspended particles of clay, soil, organic and inorganic matter, dissolved colored matter, plankton, and other microorganisms. It is formed from scattered colloidal particles, microorganisms, and gas bubbles (Dalmacija, and Ivanchev-Tumbas, 2004). Turbidity can be caused by water flow and external climatic influences such as large amounts of rain or snow melting in spring. The monthly overview shows that the most defective samples during 2021 are in the months when there was heavy rainfall in the specific year and when there was a sudden melting of snow in the water supply area of the source of Studenchica (Fig. 1).

The pH of the water is a parameter that affects the assessment of the water's hygienic correctness. This parameter is mostly influenced by industrial pollution (Mirich, and Stanimirovich, 1979). But since there is no possibility of such contamination of the samples which are subject of interest of this paper, there are no defective samples according to this parameter.

Consumption of $KMnO_4$ is a measure of pollution of organic origin. Organic substances can be found in water spontaneously as a product of plant and animal life. $KMnO_4$ as a strong oxidizing agent has an oxidizing effect on organic substances, but also on some substances of inorganic origin that can be oxidized under certain conditions (Mirich, and Stanimirovich, 1979). The number of defective samples according to this parameter is insignificant, i.e., only 0.18%.

Electrical conductivity is a parameter that serves as an indicator of the degree of mineralization of water and can be an indicator of some inorganic pollution. Electrical conductivity comes from dissolved salts and is the ability of water to conduct an electric current. This property of water is directly related to the presence of ions in the water, that is, to their concentration and water temperature (Dalmacija, and Ivanchev-Tumbas, 2004). The number of defective samples according to this parameter is insignificant, i.e., only 0.1%.

Chlorides are the majority of anions present in natural waters. Chlorides in water are not always of mineral origin, but can also be found in water with contamination from the fecal origin, wastewater, etc. For a geographical area, the content of chlorides from the water supply facility should not vary more than 20% during the year. If there is such a case,

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it is a sign of water pollution and the reason for their rise should be investigated (Mirich, and Stanimirovich, 1979). In the samples from the Studenchica Regional Water Supply System, the content of chlorides does not vary at all, and according to this parameter, there is not a single defective sample.

Iron is a common element in groundwater. The earth's crust is the main source of iron and its compounds are easily soluble in water, which is why it is present in many underground waters. Drinking water can also contain iron due to corroded pipes and pumps. Concentrations of iron above the permitted level give drinking water a reddish-brown color and have negative effects on human health and household appliances. Such water has an unpleasant taste and a precipitate of ferrous hydroxide-$Fe(OH)_2$ is created in it, which can create serious microbiological problems in the water supply network (Dalmacija, and Ivanchev-Tumbas, 2004). The number of defective samples according to this parameter is insignificant, i.e., only 0.1%.

Tests for the presence of decomposition products of organic material of biological origin should be performed in order to evaluate the hygienic correctness of drinking water. They are the most common cause of pollution of natural waters with pathogenic microorganisms. Various products of degradation of organic material are created under the influence of rotting bacteria in the land. Some of them are nitrogen compounds, which have a special significance for determining the safety of drinking water. Nitrogen, that occurs as a result of the decomposition of organic material, passes into ammonia, nitrites and nitrates. If organic material is decomposed in the water, these compounds from the ground come into groundwater or are formed in the water itself (Trajkovich et al., 1983).

The presence of ammonium ions or free ammonia in water indicates that it has recently been in contact with decaying organic material. It is clear chemical evidence of dangerous water contamination (Mirich, and Stanimirovich, 1979; Trajkovich et al., 1983). The presence of ammonia was not proven in any of the samples that were analyzed.

Nitrates represent the highest degree of oxidation of nitrogen in its cycle in nature. The optimal content of nitrates gives the drinking water a pleasant and fresh taste. Higher nitrate concentrations can have negative effects. It is associated with the oxidation of normal hemoglobin to methemoglobin, which prevents the transport of oxygen to tissues in

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newborns. Adults are not very sensitive to the reduction of nitrates into nitrites in the mouth or stomach due to a low pH level and the existence of a special enzyme protection system (Dalmacija, and Ivanchev-Tumbas, 2004; Mirich, and Stanimirovich, 1979). According to the data of the Joint FAO/WHO Expert Commission of Food Additives (WHO, 1995), as well as the values for acceptable daily intake (ADI) and data on methemoglobinemia in newborns, the maximum permissible limit for nitrates is 50 mg/L. The number of defective samples according to this parameter is insignificant, i.e., only 0.1%.

Chlorine is not a natural water component. Drinking water must be disinfected, and in this particular case, it is done by chlorination. The public enterprise that manages the water supply facilities performs central disinfection in a chlorine station at the entrance to the city. Disinfection is automatic, there are residual chlorine meters, and information about its quantity is sent. If necessary, additional chlorination can be done in the tanks, and then the drinking water is distributed through the network to the users. After the process of disinfection, the drinking water must contain residual chlorine in the amount of 0.2 mg/L - 0.3 mg/L, but not more than 0.5 mg/L. This eliminates the risk of adverse effects on the health of the population during secondary pollution and the development of microorganisms in the network. By chlorinating drinking water, it is safe for the purpose of protecting human health from the side effects of contamination.

According to the Drinking Water Safety and Quality Requirements Rulebook (Official Gazette of the Republic of Macedonia No. 183 of 02.10.2018), MAC values of the parameters that are used during the basic microbiological examination of water are the following:

Total number of coliform bacteria - 0.0 cfu/100 mL;

Escherichia coli - 0.0 cfu/100 mL

Streptococcus faecalis – 0.0 cfu/100 mL

Pseudomonas aeruginosa - 0.0 cfu/100 mL

Number of colonies at 22 °C – 20.0 cfu/1 mL

Numbers of colonies at 37 °C – 100.0 cfu/1 mL

Table 5 shows data of defective water samples in terms of microbiological parameters (Table 5).

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Table 5

Regarding the microbiological parameters, no bacteriological finding has been proven in any of the chlorinated waters. There are microbiologically defective samples in the non-chlorinated water and in approximately the same percentage in the settlements and the city (Fig. 2).

Fig. 2

Part of the microorganisms that are found in the water comes from the water, which is their natural environment, and the other part comes from the air, soil, plants, animals and man. The greatest risk for microbiological contamination of drinking water is the presence of feces. Water provides essential elements, but when it is polluted, it becomes a source of infectious diseases in humans (Karavoltsos, 2008). The most important bacterial diseases transmitted by water are typhus, dysentery and cholera. These are intestinal diseases, so the causative agents are found in feces. Therefore, the penetration of sewage, that is, waste water into drinking water means that one or more types of microorganisms, the causes of those diseases, can be found in it and that such water is dangerous for human use (Angelevski, 2000).

Among the samples that are subject to analysis in terms of microbiological parameters, no bacteriological findings have been proven in any of the chlorinated samples. While in non-chlorinated samples, the percentage of malfunctions in the city and populated areas is almost identical and the largest percentage refers to the finding of the total number of coliform bacteria and *Escherichia coli*.

The group of coliform bacteria includes all aerobic and facultatively anaerobic gram-negative, asporogenous rod-shaped bacteria, which ferment lactose for 48 hours at 35-37 °C and produce acid and gas. They include *Escherichia coli, Citrobacter spp*. and *Enterobacter spp*. Some coliform species are designated as fecal because they are found in feces, and others as non-fecal because the soil is considered to be their normal habitat

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(Rajendra, 2012). However, from a sanitary point of view, contamination of any type indicates that the water is potentially dangerous and unsafe.

Fecal streptococci are indicators of fecal water pollution. They normally live in the intestinal tract of humans and animals and it is not known that they can be found in nature where there is no fecal pollution. In natural waters, the most common ratio of *coliform bacteria* to *enterococci* ranges from 10:1 to 1:2 (Angelevski, 2000).

Pseudomonas aeruginosa belongs to fecal bacteria and is very widespread in the human environment. It is found in the ground, in surface water, on various plants, on fruits, in many food products, on human skin, and very often in the colon of healthy people. This bacterium persists for a long time and multiplies a lot in the human environment because of its modest food needs and rapid reproduction. It is often found in tap water (Angelevski, 2000). But in the examined samples of drinking water during 2021, the bacterium *Pseudomonas aeruginosa* was not proven in any sample.

Counting all living bacteria in the water is of great importance for controlling the efficiency of the technological process of water purification. This analysis is significant for evaluating the degree of permeability of the various geological layers covering the source. Determining the number of all viable bacteria that multiply at 22^0C and at 37^0C can provide useful data on the quality of drinking water.

Conclusion

The following conclusions can be drawn from the analysis of the obtained results: Regarding the physical-chemical parameters, the water has an insignificant defect and shows stability in relation to them with very small deviations. The largest percentage of the examined samples are defective according to the turbidity parameter. This condition corresponds to the climatic conditions of the particular year and is remedied relatively quickly.

In terms of microbiological analyzes of chlorinated waters, no bacteriological findings have been proven in any of them. This means that water disinfection is effective and the water is safe.

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There are microbiologically defective samples in the non-chlorinated water and in approximately the same percentage in the populated areas and the city. This is because it is a water of the same origin. Water with this bacteriological finding should not be used for drinking.

The public enterprise that manages the part of the Studenchica Regional Water Supply System which is under the jurisdiction of the Municipality of Prilep, guarantees safe and healthy drinking water. The same is the case with drinking water from the local water supply at PHI General Hospital Prilep.

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Резиме

Квалитетот на водата за пиење во Прилепскиот регион што се снабдува од регионалниот водовод Студенчица и ЈЗУ Општа болница Прилеп

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Клучни зборови: вода за пиење, квалитет, безбедност, здравствена исправност, физичко-хемиски параметри, микробиолошки параметри

Испитувањето на квалитетот на водата за пиење се прави за да се контролира дали потрошувачите добиваат безбедна и здравствено исправна вода за пиење, за да се заштити здравјето на луѓето од несаканите ефекти од контаминацијата на водата. Целта на овој труд е да се прикаже здравствената исправност и квалитетот на водата за пиење во град Прилеп и населените места кои се снабдуваат со истата од Регионалниот водовод Студенчица и локалниот градски водовод од кој се снабдува со вода за пиење ЈЗУ Општа болница Прилеп во текот на 2021 година. Јавното претпријатие за водовод и канализација Прилеп стопанисува со најголем дел од водоснабдителните објекти и прави редовна дезинфекција на водата за пиење. Но има населени места каде водата не е хлорирана бидејќи со водоснабдителните објекти не стопанисува јавното претпријатие.

На примероците е направен основен физичко - хемиски и микробиолошки преглед според Правилникот за барања за безбедност и квалитет на водата за пиење (Сл. весник на РМ бр.183 од 02.10.2018 г.). Врз база на мониторингот може да се заклучи

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дека таму каде што стопанисува јавното претпријатие со делот од регионалниот водовод Студенчица што е во надлежност на Општина Прилеп, гарантира безбедна и здравствено исправна вода за пиење. Истото е случај и со водата за пиење од локалниот водовод при ЈЗУ Градска болница Прилеп.

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Table 1. Description of the origin of the samples

No.	Water supply object	Measuring points
1.	City water supply system Prilep	Regions: Varosh, Alichair, Dimo Markovski, Marino Maalo, Krushevsko Djade, Center, Rid Chkatra, Trizla, Kuzman Josifoski 1, Kuzman Josifoski 2, Tochila, Railway Station, Bus Station, Tank 1, Tank 2, Chlorine station
2.	Villages attached to the city water supply system	Selce, Mazhuchishte, Novo Lagovo, Mramorani, Sarandinovo, Ropotovo, Novoselani, Dolneni, Senokos, Zapolzhani, Peshtalevo, Sekirci, Kostinci, Debreshte, Vranche, Belo Pole, Sredorek, Lazhani, Zhitoshe, Godivje, Korenica, Aldanci, Norovo, Vrboec, Presil
3.	Local water supply system of the PHI General Hospital Prilep	Departments: Pediatric, Infectious, X-ray, Internal, Surgery, Otorhinolaryngology, Ophthalmic Administration, Kitchen, Fountain

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Table 2. Overview of the number of non-chlorinated samples in relation to the total number of samples taken

Water supply object	Number of performed laboratory analyses			
	physical-chemical analyses		microbiological analyses	
	total samples taken	non-chlorinated	total samples taken	non-chlorinated
Prilep	1089	26 (2.39%)	1085	26 (2.4%)
Settlements (25 villages)	237	186 (78.48%)	237	186 (78.48%)
PHI General Hospital	133	6 (4.51%)	110	0 (0%)

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Table 3. Overview of the samples taken and analyzed for physical-chemical and microbiological analysis

Water supply object	Number of performed laboratory analyses			
	physical-chemical analyses		microbiological analyses	
	total samples taken	number and % of defective	total samples taken	number and % of defective
Prilep 69704 citizens	1089	134 (12%)	1085	5 (0.5%)
Settlements (25 villages) 10618 citizens	237	36 (15%)	237	37 (15%)
Local Water Supply PHI General Hospital	133	18 (13%)	110	/

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Table 4. Overview of defective water samples in terms of physical-chemical parameters

	Total number of analyzed samples	Defective samples	Number and percentage of defective samples in terms of:							
			Turbidity NTU	pH	Consumption of $KmnO_4$ mg/L O_2	Electrical conductivity μS/cm	Chlorides mg/L	Fe mg/L	NH_4m g/L	NO_3 mg/L
Prilep	1089	134 12.3%	133 12.2%	/	2 0.18%	1 0.1%	/	1 0.1%	/	1 0.1 %
Settlements 25 villages	237	36 15.2%	36 15.2%	/	/	/	/	/	/	/
PHI General Hospital	133	18 13.5%	18 13.5%	/	/	/	/	/	/	/

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Table 5. Overview of defective water samples in terms of microbiological parameters

	Total number of analyzed samples	Defective samples	Number and percentage of defective samples in terms of:					
			Total number of coliform bacteria	*Escherichia coli* in 100mL	*Strepto coccus faecalis* in 100mL	*Pseudo monas aeruginosa* in 100mL	Number of colonies at 22°C	Number of colonies at 37°C
Prilep	1085	5	1 0.10%	2 0.18%	1 0.10%	/	2 0.18%	2 0.18%
Settlements - 25 villages	237	37	21 8.86%	23 9.70%	7 2.95%	/	/	5 2.11%
PHI General Hospital	110	/	/	/	/	/	/	/

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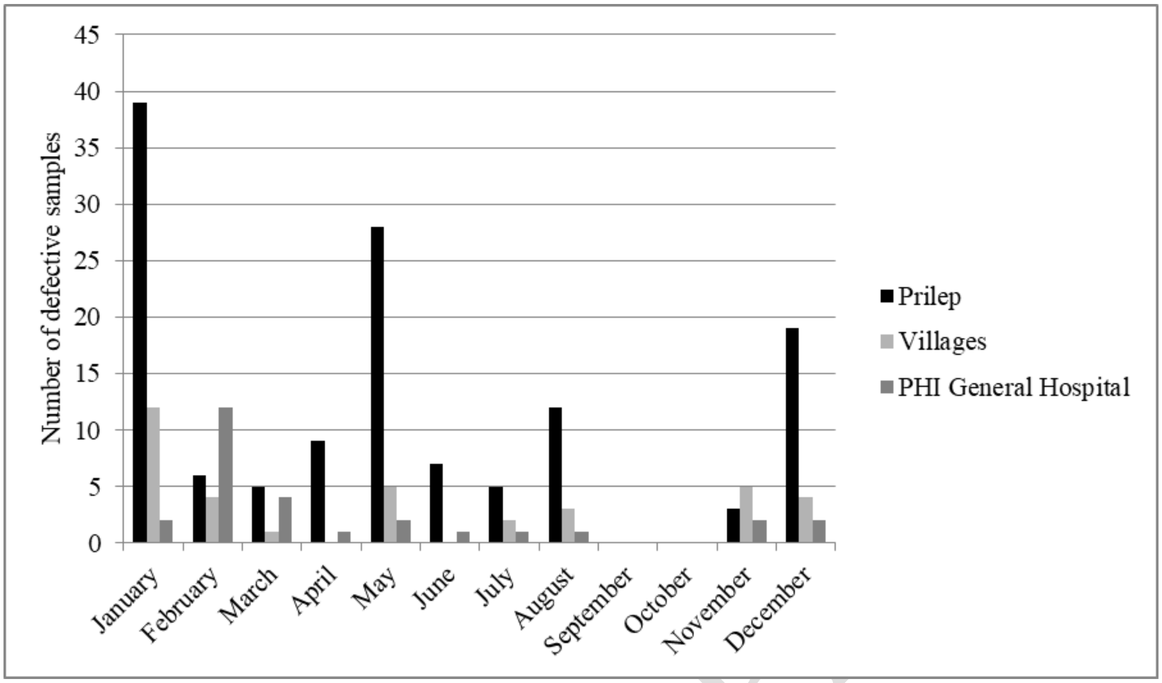

Fig. 1. Overview of defective samples by turbidity during 2021.

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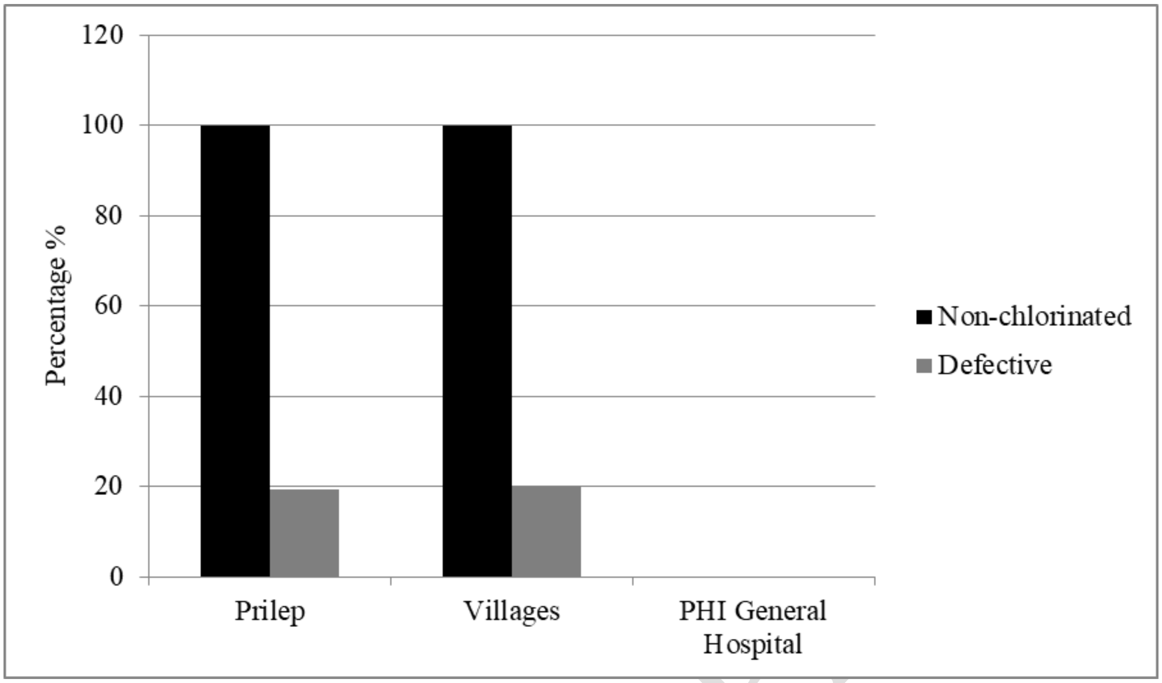

Fig. 2 Percentage of defective non-chlorinated samples according to microbiological parameters.

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