Some Theoretical and Practical Issues of Medical Geographical Research

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Abstract

In the context of globalization of global economy and intense competition and steady increase in population, mortality rates among people with infectious and parasitic diseases are increasing. International organizations are also paying much attention to fighting these problems and their consequences. In particular, the UN Sustainable Development Program up to 2030 emphasizes "issues related to the elimination of immunodeficiency, tuberculosis and malaria epidemics in the period up to 2030, as well as measures to combat hepatitis and other waterborne infections". Successful implementation of these tasks requires stabilization of nosocheological and nosogeographic situations in arid climates. Medical geographical situation in the regions is one of the most important factors determining the development of society and the way of life of the population. Addressing medical geographical problems and improving public health, reducing morbidity and increasing life expectancy are of vital scientific and practical importance.

Key words: *population health, pathological processes, nosogeographic center, nosogeographic range, nosogeographic area.*

Introduction

Issues related to medical geographical studies, including the geographical pathology and the territorial structure of diseases, were presented by P.N. Pavlovsky, A.P. Avtsin, K.I. Skryabin, et al.[1] O.B. Ata-Mirzaev, H.T. Tursunov, et al, with close links to the problems in our country, namely from the point of view of economic and social geography. The above research investigates the public health problems, but little has been done on the geographical aspects of this problem in our country. The main purpose of this work is to fill such gaps.[2]

Traditional zoning is also important in medical geography. Medical geographical zoning is an important result of comprehensive medical geographic research. In medical geographical zoning, nosogeographic centers and ranges are first identified.[3] Nozogeographic Furnace – it is the place where the disease is born. From a natural geographical point of view, it is in line with E.N. Pavlovsky's idea of natural foci of infectious and parasitic diseases.

As a result of medical geographic surveys, a set of thematic cards can be created. Such cards are made at the Institute of Geography of the Russian Academy of Sciences, the Department of Geography of the Academy of Sciences of the Republic of Uzbekistan. In the zoning of the population in terms of its health, the allocated territories differ from each other by the prevalence of various diseases. From this point of view, geography of the population is an important area of social geography as the theoretical and methodological basis of medical geography.

In the study of medical geography, as in other geographical studies, a comprehensive, integrated approach is essential. This implies two distinct meanings: first, the complex, comprehensive, interdisciplinary study of the research object; This is especially true in

the area of healthcare. It is well-known that regional complexes play an important role in economic and social geography and geography in general.[4]

Nosogeographic Complexes

Nosogeographical complexes are a combination of the spatial combination of various diseases that occur under their influence in a specific natural geographic and socio-economic, social environment (space). This theoretical idea is based on the ideas of Chicago medical scientists about the regional complexes and energy production cycles created in human ecology and socioeconomic geography.

The regional disease complexes are the basis of this, not the nosogeographical region. As the pathological processes are influenced by the landscape, environmental and social geographical factors of the regions, their study is theoretically important. Thus, it is possible to say that a regional set of diseases is a methodology for the analysis and forecasting of nosogeographic regions. Such complexes are usually associated with a specific sociogeographic environment with natural geographical and economic landscapes. In the study of nocogeocomplexes it is necessary to understand first and foremost the effects of their occurrence on each other. Therefore, the process of studying nosogeocomplexes requires extensive practical and theoretical research.

With the passage of time, some types of diseases will diminish, and some new forms will occur. Specifically, in recent years, lethal species of tuberculosis have disappeared. The incidence of infectious intestinal infections, especially amyobiosis and lambliosis, has increased significantly. Nonmaterials can be classified into the following groups: climate-related systems; hydrogen fluxes are recognized as the leading factors in the emergence and spread of diseases of surface water sources, including canals, swamps, rivers or lakes; gene-causing effects of ground water on hydrogeogenic nematodes play a major role, such as kidney and circulatory disorders, metabolic disorders; chemogenic nozzles; biogenic organisms.[5]

Diseases of the Source and their Spread

The nosogeographic source is the place where the disease is caused.[6] The nosogeographic range is the direct spread of a particular disease or the area in which the disease is present, making it the basis of the nosogeographic area.[5] If people spend too much time indoors during the winter, they can spread respiratory infections, while wearing warm clothes without personal hygiene will cause an increase in lice and typhoid fever.[7]

In our view, the nosogeographical condition or condition is characterized primarily by the mortality rate of a population in a particular area or region, including child mortality rates, the average life expectancy and overall morbidity, the presence or origin of certain groups of diseases. In our study, we found it necessary to study the prevalence of brucellosis in the Samarkand and Navoi regions, which is the most common among the livestock population. For the first time, the idea of natural sources of disease was highlighted in the works of D.K. Zabolotny[8] in the late 9th and early 20th centuries. The theory of natural sources of disease, the origin and formation of infectious diseases is studied by many fields of science: epidemiology, parasitology, geography of medicine, biogeography, ecology.[9] Parasitic systems that play an important role in the study of disease foci.[10]

It is well known that one of the most common diseases not only in our country, but also in the world today is brucellosis, which is a contagious disease, and is known as Malta, Mediterranean, Cyprus, Gibraltar fever, Traum, Bruce syndrome.[11] In Uzbekistan, the incidence of this disease has increased significantly in recent years (Table 1).

Table 1. Incidence of brucellosis in the population of Uzbekistan (Per 100,000 people)

Regions	2010	2011	2012	2013	2014	2015	2016	Index of changes
The Republic of Uzbekistan	1,5	1,4	1,2	1,9	2,3	2,8	2,7	1,8
The Republic of Karakalpakstan	0,2	0,3	0,1	0,1	-	0,2	0,2	1
Andijan	-	-	-	-	-	0,2	0,2	1
Bukhara	6,2	4,6	5,3	4,1	6,0	3,0	3,9	0,6

Cont... **Table 1. Incidence of brucellosis in the population of Uzbekistan (Per 100,000 people)**

Jizzakh	7,2	7,0	7,4	8,2	10,0	9,3	8,5	1,1
Navoi	3,2	6,7	5,9	3,2	13,3	10,6	11,1	3,4
Namangan	0,1	0,1	0,1	0,2	0,3	-	0,3	3
Samarkand	1,4	1,2	0,6	1,1	1,4	1,7	1,5	1,0
Syrdarya	3,1	2,2	0,5	2,0	4,0	8,9	6,5	2,0
Surkhandarya	0,8	0,7	0,8	9,5	5,9	12,5	10,7	13,3
Tashkent	1,1	0,7	0,3	0,6	0,8	1,0	0,9	0,9
Fergana	-	0,1	-	0,1	0,1	0,1	-	0,1
Kashkadarya	3,0	2,9	2,1	2,0	3,1	3,8	4,4	1,4
The city of Tashkent	1,7	0,9	0,6	0,8	0,5	0,8	0,6	0,3

Source: The table was developed by the author based on data from the Ministry of Health

Brucellosis is a part of zoonoses, and the main source of the disease is agricultural animals: goats, cows, sheep, pigs, camels. Studies have been conducted mainly on farm animals.[11] For humans, the source of this disease is pets. 70% of the population living in the outbreak is likely to be infected. Microbes enter the body through aerogenic pathways through the upper respiratory tract of wool, dust. Microbes in dust particles enter the body through a conventional mucosa. Professional factors also play an important role in the epidemiology of brucellosis. These activities include animal processing, animal processing and veterinarians, as well as laboratory workers. Seasonality is typical for brucellosis, especially during the spring and summer months.

Navoi region is unique in Uzbekistan on brucellosis incidence. It should be noted that the incidence of a particular disease is not the same in all provinces or in other territorial units (Table 2).

Table 2. Number of patients with brucellosis in cities and districts of Samarkand region (for every 100 000 people)

T / r	City and Districts	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1.	The city of Samarkand	2	-	-	5	-	1	-	-	-	-	3	1
2.	City Kattakurgan	8	5	1	2	-	-	1	-	-	-	-	-
3.	Urgut	2	8	2	3	1	2	4	-	2	6	3	6
4.	Samarkand	4	3	3	3	1	2	7	2	4	2	1	2
5.	Toylok	-	-	-	-	-	1	-	1	1	-	-	-
6.	Bulungur	15	5	-	-	1	1	3	2	-	2	11	2
7.	Jomboy	4	1	-	-	1	1	-	1	1	1	2	1
8.	Okdaryo	-	-	-	1	-	-	1	-	1	-	1	-
9.	Payariq	7	1	4	3	4	6	3	1	6	7	6	4
10.	Ishtihon	-	-	-	-	-	-	3	3	1	1	5	2

Cont... **Table 2. Number of patients with brucellosis in cities and districts of Samarkand region (for every 100 000 people)**

11.	Pastargom	3	6	5	2	1	2	1	3	2	3	2	3
12.	Nurabat	10	7	5	4	5	9	12	1	9	23	17	18
13.	Kattakurgon	9	9	1	-	2	7	3	3	6	1	1	5
14.	Kushrabot	6	5	2	1	1	7	2	3	3	-	3	5
15.	Narpay	-	-	-	1	-	-	-	-	-	1	2	2
16.	Pahtachi	3	-	-	-	-	-	-	-	-	2	3	1
17.	Total	73	50	23	23	17	39	35	20	36	49	60	51

Source: The table is compiled by the author based on the data provided by the regional statistical department.

In recent years in the border areas of present-day Samarkand and Jizzakh regions nosogeographic centers of various infectious diseases have been formed, especially Bulungur, Gallaorol and Bakhmal districts. In recent years, great attention has been paid to the prevention of especially dangerous infectious diseases. In particular, anthrax is one such disease. [10] An analysis of the morbidity rate among populations in Uzbekistan with natural fever and zooanthroposis shows a slight increase over the last decade.[12] One of the first medical geographic zoning studies was A.A. Keller.[13] In the 90s of the 20th century B.B. Prokhorov studied the geographical area of Russia and allocated 20 medical and ecological regions. [14] V.Y. Podolyan argues that the essence of medical geographical zoning is a thorough study and evaluation of natural and socio-industrial conditions that have the same impact on the human body and have their own regional features.[13]

Medical Geographical District of Karmana. Navoi Cement Plant, Electrochemical Plant, Navoi GRES, Navoi Mining and Metallurgical Complex and other enterprises have a great influence on the development of pathological processes in urban and suburban areas. The research has focused on diseases associated with air pollution in Samarkand and Navoi, with a slight increase in respiratory, cardiovascular, malignant neoplasms, and nervous systems (Table 3).

Table 3. Air pollution disorders in Samarkand and Navoi (per 100 000 people)

No.	Diseases	Samarkand region			Navoi region		
		2005	2010	2016	2005	2010	2016
1	Respiratory members	67009,1	79112,3	90122,6	23363,5	26938,8	24706,7
2	Cardiovascular	2462,3	5367,1	5321,5	1872,7	1088,8	2104,5
3	A malignant tumor	262,2	322,8	332,5	108,1	68,8	99,8
4	The nervous system	1327,1	1621,7	2355,4	5240,9	1866,6	2189,7

Source: Compiled by the author based on data from regional health departments.

Uchkuduk Medical Geographical Region. The main source of pathological processes in the region are dust particles in the form of aerosols rising from the frequent dust storms in the Kyzylkum desert and salt-dust particles from the dried Aral Sea. Changes in pathological processes in these areas are also influenced by air composition and climatic features (Table 4).

Table 4. Anemia in cities and districts of Navoi region. Number of infected (per 100 000 people)

T/r	City and Districts	2011	2012	2013	2014	2015	2016
1	Konimex	13867,2	14571,9	12134,1	11899,5	11519,5	9436,3
2	Tomdi	22335,3	22982,5	19288,4	12140,5	8514,9	4220,6
3	Uchkuduk	21629,7	24224,2	12227,0	8720,0	8669,1	12796,6
4	Zarafshan city	8026,7	4776,8	6958,4	5742,2	5294,7	3439,2

Source: Based on data from the Navoi Regional Health Administration.

In general, medical and geographic zoning of the territories of Samarkand and Navoi regions is of great importance in practical terms. However, this process is very complex and complex, along with natural and environmental factors, and their economic and social geographical aspects.

Geographical Aspects of Pathological Processes Prediction

We analyzed statistical data on some infectious diseases, including brucellosis in the Republic (Table 5), and developed a forecast for 2021-2031 using extrapolation linear method.

Table 5. Incidence of brucellosis in the population of Uzbekistan. The forecast for 2031 (for 100 thousand people)

Regions	2010	2016	2021	2026	2031
Uzbekistan Resp.	1,5	2,7	3,70	4,70	5,70
Karakalpakstan Resp.	0,2	0,2	0,20	0,20	0,20
Andijan		0,2	0,37	0,53	0,70
Bukhara	6,2	3,9	1,98	0,07	-1,85
Jizzakh	7,2	8,5	9,58	10,67	11,75
Navoi	3,2	11,1	17,68	24,27	30,85
Namangan	0,1	0,3	0,47	0,63	0,80
Samarkand	1,4	1,5	1,58	1,67	1,75
Syrdarya	3,1	6,5	9,33	12,17	15,00
Surkhandarya	0,8	10,7	18,95	27,20	35,45
Tashkent	1,1	0,9	0,73	0,57	0,40
Kashkadarya	3	4,4	5,57	6,73	7,90
Tashkent city	1,7	0,6	-0,32	-1,23	-2,15

Source: The table was developed by the author based on data from the Ministry of Health.

$$F = \frac{\sigma_k^2}{\sigma_s^2}, \quad (1)$$

is here σ_k^2 – large dispersion, σ_s^2 – small dispersion. Now consider the error, that is, the sample dispersions:

$$\sigma_b^2 = \frac{1}{n}\sum_{i=1}^{n}\left(b_i - \bar{b}\right)^2 = 7305543,\ \sigma_m^2 = \frac{1}{n}\sum_{i=1}^{n}\left(m_i - \bar{m}\right)^2 = 1{,}25 \quad (2)$$

So, $\sigma_k^2 = \sigma_b^2 = 7305543$ and $\sigma_s^2 = \sigma_m^2 = 1{,}25$ will be. In that case

$$F_{ну} = \frac{7305543}{1{,}25} = 5855554 \quad (3)$$

We will now investigate the relationship of water chemistry with appropriate diseases. To determine the appearance of the link between them (x, y) we calculate the correlation coefficient of the random vector:

$$r_{x,y} = \frac{\overline{xy} - \bar{x}\cdot\bar{y}}{\sqrt{S_x^2 \cdot S_y^2}}, \quad (4)$$

here $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$, $\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$, $\overline{xy} = \frac{1}{n}\sum_{i=1}^{n} x_i y_i$ – accordingly $(x_1, x_2, x_3, x_4, x_5)$, $(y_1, y_2, y_3, y_4, y_5)$ and $(x_1y_1, x_2y_2, x_3y_3, x_4y_4, x_5y_5)$ average values of options, $S_x^2 = \frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2$, $S_y^2 = \frac{1}{n}\sum_{i=1}^{n}\left(y_i - \bar{y}\right)^2$ – sampling dispersions. We will first consider the following characteristics:

$$\bar{x} = 0{,}275;\ \bar{y} = 9431{,}2;\ S_x^2 = 0{,}0003;\ S_y^2 = 29904534; \quad (5)$$

We find a functional link between the Urgut County renal disease index and water hardness. We use the least squares method. The functional link between renal disease and water hardness is shown in Figure 1.

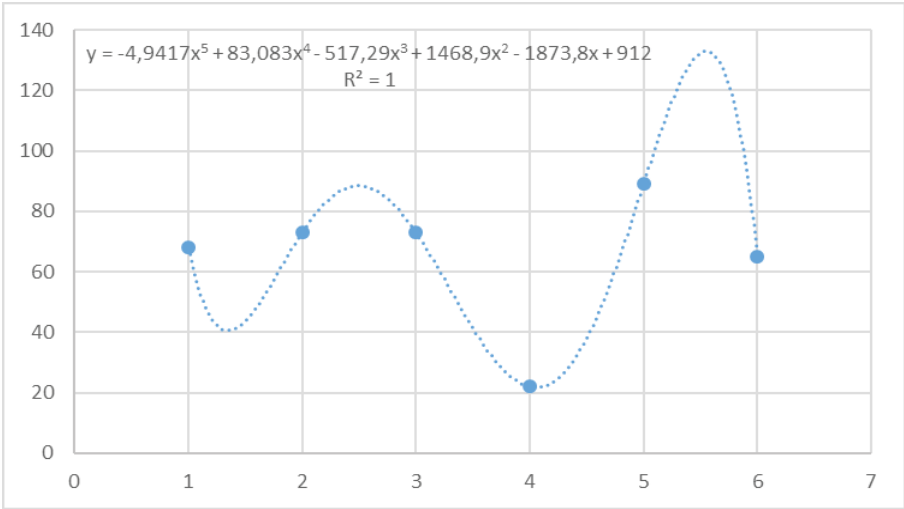

Figure 1. Kidney disease and water hardness functional connection between

Thus, using statistics from 2010-2017, we calculate the number of patients with gallbladder disease in Pastdargom district using the least squares method.

Conclusions

In the world geography and medicine, serious research is being conducted to study the main areas of correlation between pathological processes and geographical factors in the environment and human health, and to identify the mechanisms of this linkage, the emergence and optimization of nosochemical and nosogeographic situations. In particular, priority is given to the study of the pathological processes of medical geography and nosogeography as a separate category, to assess the factors influencing them, to determine the range, dynamics and prognosis of the spread of the

incidence of urinary incidence.

Thus, according to the results of Method 1, we expect that by 2020, the number of cases of gallbladder disease in Pastdargom district will be 897.54. Using the above calculations, we predict and compare the number of cases of gallbladder disease by 2020. In general, medical geographical studies are of vital importance in the assessment of public health in the regions and in the prediction of diseases occurring in them.

Ethical Clearance: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study. A study was approved by National Ethics Committee of Uzbekistan, September 19, 2019, No 415-I.

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References

1. Komilova N.K. Territorial analysis of medical-geographycal conditions and the problems of health of the population of the Republic of Uzbekistan. *Journal of Environmental Science and Engineering,* 2010, 4(12): 64-68.
2. Ravshanov A. Development of medical geographic surveying in Uzbekistan. *Information from the Geographical Society of Uzbekistan,* 2015, 45: 133-138.
3. Komilova, N. *Theoretical and practical issues of medical geography*. Tashkent: SHARQ, 2017.
4. Komilova N.K., Ravshanov, A.H. Peculiarities of the prevalence of some fecal diseases in Uzbekistan. *Information from the Geographical Society of Uzbekistan,* 2018, 54: 76-80.
5. Komilova N.Q. *Regional analysis of medical geographic conditions in Uzbekistan and public health problems.* Tashkent: SHARQ, 2012.
6. Komilova N.Q., Ravshanov A.H. Peculiarities of the prevalence of some source of diseases in Uzbekistan. *Information from the Geographical Society of Uzbekistan,* 2018, 54: 76-80.
7. Ubaydullaeva R., Ata-Mirzaev O., Umarova N. *Demographic processes and employment in Uzbekistan.* Tashkent: SHARQ, 2006.
8. Zabolotny D.K. *Year. Geography medinskinsk*. Moscow: Nauka, 1929.
9. Komilova N.Q., Abduvalieva Z., Ravshanov A. Medical geographic features of endocrine diseases in Uzbekistan. *Proceedings of the International Scientific Conference (pp. 312-314).* Andijan, 2018.
10. Voronov A.G. *The medical geography*. Moscow: Nauka, 1981.
11. Jeludkov M.M., Tsirelson L.E. Reserve brucellosis infection in prirode. *Zoology,* 2010, 89(1): 53-60.
12. Komilova N.Q. *Nasogeographic situation in Bukhara region.* Tashkent: Publisher TU, 1999.
13. Podolyan V.Y., Byakov V.P. Keller A.A., Shpilenya S.E. *Current issues of medical geography*. Moscow: Znaniye. 1980.
14. Polsky S.A. *Geography of landmarks and irrigated strings.* Minsk: Universitetskoe, 1987.