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Prediction of the Population Morbidity due to Bronchial Asthma

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ABSTRACT

On the basis of mathematical modeling of the incidence of bronchial asthma analyzed the dynamics of its prevalence over 2000–2013 years, results of analysis of asthma using modern methods of the prognosis of asthma morbidity in Uzbekistan until 2023. According to the results of the forecast can be calculated in advance the need for medications, treatments and diagnosis of the disease of asthma. The resulting analyzes reasonably expected incidence of certain regions and in general for the Republic of Uzbekistan to 2023. It is proved that the studies meet the objectives of improving the diagnosis and treatment of asthma morbidity in inpatient and outpatient settings and improvements in the field of drug supply and improve the efficiency of the treatment process.

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Introduction

In the world the prevalence of allergic diseases is of catastrophic scale, both in the developed as well as in the developing countries. These diseases include asthma, anaphylaxis, drug and food allergies, rhinitis, allergic to insect venom, eczema and angioedema. The World Health Organization estimated that every year due to drug allergy there are died about 150000 patients [1].

Of these, bronchial asthma – a chronic inflammation of the airways, accompanied by reversible airflow obstruction and change the sensitivity of the bronchi. Asthma symptoms asthma attacks, status asthmaticus, respiratory symptoms of discomfort against the background of a genetic predisposition to allergic diseases and extra pulmonary manifestations of allergy. Bronchial asthma is treated as a special chronic allergic inflammatory disease of the respiratory system. The first manifestations occur in childhood or adolescence, although the disease may debut at any age. Disease in most cases due to allergies and has hereditary nature. Bronchial asthma is an urgent problem for the health service in the world, as it affects about 300 million people on our planet.

In developed countries, the prevalence of asthma among adults is 5 % in the US – more than 5 % in New Zealand – less than 5 %. In the Russian Federation, asthma remains the most common allergic disease, the frequency of which varies from 2.6 to 20.3 %. In Uzbekistan, in patients with bronchial asthma ranges from 42 to 65 % of the total number of patients with allergic diseases, seeking the Republican specialized scientific and Allergy Center.

The prevalence of bronchial asthma in the world ranges from 18% in Wales to 1% in Albania and Nigeria. In Moscow, 13% of patients with bronchial asthma were examined, which is 2 times higher than the official statistics. In the world there are 300 million patients with bronchial asthma. A remarkable increase in the

prevalence of bronchial asthma in recent decades should be noted. So for the period from the 1930s to the 1980s marked an increase in the spread of bronchial asthma in 7-10 times in Europe and the United States [2].

Chronic obstructive pulmonary disease with bronchial asthma is currently a global health problem. The prevalence of chronic obstructive pulmonary disease in various countries of the world reaches 19.7%, and this figure is quite high among nonsmokers - 3-11%. Death from chronic obstructive pulmonary disease ranks 3-4th among all causes of death. Bronchial asthma affects from 1 to 18% of the population in different countries, in Russia - about 7%. The prevalence of chronic obstructive pulmonary disease and bronchial asthma is steadily increasing in all countries, as well as the overlapping syndrome of chronic obstructive pulmonary disease and bronchial asthma [3].

In the treatment of patients with asthma, the issue of severe forms of the disease remains important. Over the past 10 years, the Russian Respiratory Society has twice conducted an epidemiological study, the purpose of which was to analyze the effectiveness of treatment programs. According to the data obtained, the proportion of patients with severe bronchial asthma exceeds 20%, which means extremely low efficacy of the drugs and treatment methods discussed. The causes of bronchial asthma are late diagnosis and basic therapy, inadequate choice of drugs, low level of cooperation between the doctor and patients, and other factors. Similar data have been published by researchers in Western Europe and the United States [4].

One of the main characteristics of allergic rhinitis is its frequent association with asthma, 20–77 % of patients who suffer 60-80 % of patients with allergic rhinitis. In Uzbekistan, Association of allergic rhinitis with asthma noted in 38 % of cases. Among living in the city of Tashkent with asthma teenagers and young men for severe and moderate observed in 80 % of cases [5, 6].

In this regard, prognosis and treatment of bronchial asthma, its prevention is one of the most urgent problems of medicine and pharmacy.

The object of the study – used information of the Institute of Health and Medical Statistics of the Ministry of Health of the Republic of Uzbekistan for bronchial asthma. Asthmatic patients hospitalized in the Republican specialized scientific Allergic center. Initial information served as the medical history, hospital records of patients.

Methods of research used conventional modern methods: comparative, correlation and regression, mathematical.

Scientific novelty – results predict the prevalence of asthma in Uzbekistan until 2023. Identify the severity of patients, concomitant pathology analysis of case records. Using reliable analysis of outpatients assessed the structure and major comorbidities.

Credibility– the obtained results confirmed that surveys, studies processed using information and computer technologies.

The purpose of the study –prevalence of disease asthma based on an analysis of morbidity and justify its forecast until 2023 for different climatic zones of the Republic of Uzbekistan. Analyze clinical records and medical history of patients with bronchial asthma.

Materials and methods – the epidemiological situation of the disease of asthma needs improved analytical methods to make right conclusions. Graphs needs to replace the broken lines on a smooth with running line [5].

According parabola 1 expressed as a number of members of the deviations values, are as follows:

$$a = \frac{\sum y}{n} = \bar{y} \quad (1)$$

$$b = \frac{\sum y(x_i - \bar{x})}{\sum (x_i - \bar{x})^2} \quad (2)$$

Furthermore, independent variable defined by the time point designated natural numbers:

$$\bar{x} = \frac{1+14}{2} = 7,5$$

Now we count the deviation of a number of members of the dependent variable y from this value and calculate data by Table 2. Substituting data in the formula (1) and (2) define the parameters of the equation:

$$a = \frac{\sum y_i}{n} = \frac{3675}{14} = 262,5 \quad (2.10)$$

$$b = \frac{\sum y(x_i - \bar{x})}{\sum (x_i - \bar{x})^2} = \frac{-2004}{227,5} = -8,8 \quad (2.11)$$

Formula for equalization of the Dynamics of respiratory diseases and finding out the population of Tashkent has to be:

$$\bar{y}_x = 262,5 - 8,8(x_i - \bar{x})$$

Results and Discussion

We analyzed statistical data on diagnosed cases of primary and absolute numbers of asthma, officially registered by the Institute of Health and Medical Statistics of the Ministry of Health of the Republic of Uzbekistan.

Data on the prevalence of newly diagnosed asthma in Uzbekistan, 100 thousand of population in certain regions are shown in Table 1.

By calculating you can get a system of normal equations in which the unknown quantities are the required parameters of the regression equation, and the coefficients are defined by the known empirical values of features usually sums of their values and their cross derivatives.

Results and Discussion

Analyzed statistical data on diagnosed cases of absolute numbers of asthma, officially registered by the Institute of Health and Medical Statistics of the Ministry of Health of the Republic of Uzbekistan.

Data on the prevalence of newly diagnosed asthma in Uzbekistan, 100 thousand of population in certain regions are shown in Table 1.

Table 1: Prevalence of Bronchial Asthma (First Set on 100 Thousand Population)

Region	Year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
City of Tashkent	40	32	26	25	30	22	23	24	19	22
Andizhan region	38	56	28	29	31	27	24	19	17	20
Bukhara region	98	74	80	118	1068	110	62	75	77	63
Dzhizakh region	42	25	13	14	15	17	28	40	45	30
Kashkadarya region	36	38	36	35	35	49	25	30	32	49
Navoi region	59	32	31	28	32	31	39	28	28	46
Namangan region	122	67	73	21	17	124	20	21	19	16
Samarkand region	16	10	12	15	19	21	24	8	10	9
Surkhandarya region	53	62	54	76	56	59	46	48	36	32
Syrdarya region	30	32	35	33	21	21	14	16	23	18
Tashkent region	35	28	17	15	18	17	22	24	14	13
Fergana region	25	26	18	17	24	334	51	24	46	30
Khorezm region	356	304	302	57	80	86	113	129	116	110
The Republic of Karakalpakstan	90	42	23	24	30	27	67	55	57	33
The Republic of Uzbekistan	66	54	47	34	35	45	38	35	35	32

Table 2: Prevalence of Bronchial Asthma, in Absolute Terms

Region	Year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
City of Tashkent	7005	6693	5805	5544	6312	6421	6230	5893	5306	5657
Andizhan region	3247	3491	3590	3392	3503	3384	3305	3204	3080	3083
Bukhara region	4669	3069	3894	4133	4241	4107	3756	4221	4474	4497
Dzhizakh region	2059	2031	1911	1802	1690	1986	1864	2179	2287	2143
Kashkadarya region	6661	3921	5232	5103	5325	5892	4856	4410	4907	6307
Navoi region	3334	2531	2085	3057	3185	3474	3745	3755	3923	2644
Namangan region	8085	6125	8884	6416	5272	5337	2925	5612	7962	5384
Samarkand region	4746	3553	3529	3642	3566	3470	3681	3767	3704	3758
Surkhandarya region	5132	5540	4521	5396	3617	3384	2949	3152	3346	2119
Syrdarya region	1352	1308	1354	1117	1029	1210	1175	1227	1218	1044
Tashkent region	7449	6953	2314	3987	5016	5374	3720	3859	3767	3859
Fergana region	6604	4926	5401	5850	6434	7273	8868	9269	8771	6898
Khorezm region	10490	10781	10838	3592	4739	4971	5338	5931	5580	5089
The Republic of Karakalpakstan	4342	5407	2498	2732	2625	2710	2990	3015	2783	2289
The Republic of Uzbekistan	75175	66329	61856	55763	56554	58993	55402	59494	61108	54771

According to the analysis, the incidence in the Bukhara region in 2000 amounted to 98 cases in 2005 –110, in 2009 –63, in Kashkadarya region – respectively 36, 49 and 49 cases in the Navoi region – 59, 31 and 46 cases, in the Khorezm region 356, 86 and 110 cases in the Republic of Karakalpakstan, 90, 27 and 33 cases. In general, the Republic of Uzbekistan in 2000the incidence was 66 cases in 2005–45, in 2009 - 32.

When analyzing the overall prevalence of asthma in Tashkent in 2000 it was revealed 7005 cases in 2005 – 6421, 2009 –5657, in Bukhara region – respectively 4669, 4107 and 4497 instances on Kashkadarya region – 6661, 5892 and 6307 cases, in Namangan region – 8085, 5337 and 5384 cases, in the Fergana region – 6604, 7273 and 6898 cases in Khorezm region – 10 490 4971 and 5089 cases. In general, of Uzbekistan in 2000– recorded 75,175 cases in 2005– 58 993 2009 – 54 771 case.

Data on the prevalence of asthma, 100 thousand of population in Republic of Uzbekistan for individual regions are presented in Table 3.

Table 3: The Prevalence of Bronchial Asthma only per 100 Thousand of Population (In Absolute Terms)

Region	Year													
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
City of Tashkent	327	313	272	259	296	300	290	272	242	255	232	223	204	190
Andizhan region	147	156	158	148	151	143	138	132	124	122	109	106	104	101
Bukhara region	327	212	265	279	283	271	245	271	284	281	278	268	263	268
Dzhizakh region	209	203	189	176	163	190	176	203	210	193	186	181	181	175
Kashkadarya region	304	176	230	220	226	246	199	177	193	244	218	160	151	194
Navoi region	423	319	261	381	395	428	459	456	470	313	310	254	314	293
Namangan region	417	311	445	316	256	256	138	260	363	241	122	131	129	121
Samarkand region	176	130	127	130	125	120	126	126	122	122	120	130	128	114
Surkhandarya region	293	310	249	292	192	177	152	160	166	103	98	104	99	107
Syrdarya region	209	200	205	168	153	179	173	178	174	147	129	136	133	133
Tashkent region	316	292	96	165	205	218	150	154	148	150	148	151	150	150
Fergana region	246	182	197	210	228	254	306	315	293	226	265	244	221	239
Khorezm region	785	794	785	256	333	344	364	398	368	329	364	314	300	320
The Republic of Karakalpakstan	287	353	162	176	168	172	190	190	173	141	132	120	120	110
The Republic of Uzbekistan	305	266	245	218	219	225	209	221	224	197	186	174	169	172

According to the analysis, the incidence of asthma in the city of Tashkent in 2000 amounted to 327 cases, in 2006–290 in 2013–190, in the Bukhara region in 2000 amounted to 327 cases, in 2006–245, in 2013–268 in Dzhizakh region– respectively 209, 176 and 175 cases, in Fergana region– 246, 306 and 239 cases. In general, of Uzbekistan in 2000 an incidence of 305 cases, in 2005–209, in 2009 –172.

With the growth of environmental degradation has become a disease gaining ground. Undulation in the incidence of asthma in the population may be related to the manifestation of the external factors.

When aligning the dynamic series, the statistical data was used on the incidence of asthma in the population of Tashkent for 2000–2013year.

Table 4: The Dynamics of the Spread of Bronchial Asthma in the Population of Tashkent City for the Years 2000-2013(per 100 Thousand of Population)

Year	x_i	Prevalence of asthma, y_i	$x_i - x_{cp}$	$y(x_i - x_{cp})$	$(x_i - x_{cp})^2$	y_x	ϵ
2000	1	327	-6,5	-2126	42,25	320	2,3
2001	2	313	-5,5	-1722	30,25	311	0,7
2002	3	272	-4,5	-1224	20,25	302	10,0
2003	4	259	-3,5	-906,5	12,25	293	11,7
2004	5	296	-2,5	-740	6,25	285	4,0
2005	6	300	-1,5	-450	2,25	276	8,8
2006	7	290	-0,5	-145	0,25	267	8,7
2007	8	272	0,5	136	0,25	258	5,4
2008	9	242	1,5	363	2,25	249	2,9
2009	10	255	2,5	637,5	6,25	240	6,0
2010	11	232	3,5	812	12,25	232	0,1
2011	12	223	4,5	1003,5	20,25	223	5,5
2012	13	204	5,5	1122	30,25	214	5,8
2013	14	190	6,5	1235	42,25	205	6,3
Σ	105	3675		-2004	227,5		5,6

$$y_x = 262,5 - 8,81(x_i - x_{cp})$$

The bronchial asthma resulting smooth line can be extended to give a forecast for 20113–2023.Hence the formula for balancing the dynamics of spread of asthma and its prediction in the population of Tashkent has the following form.

After calculations the dependent variable is placed in the last column of Table 2, which representation gives the figure 1 that shows the calculated scrap and smoothly running line.

Figure 1: Scrap and Calculated Smoothly Running Lines

While maintaining trends we can show reliability of predictions, i.e. if there is a certain degree of inertia effects.

More than a visual representation of this table gives 5, which shows a broken line and the calculated line running smoothly this series [7].

This paper was presented at the republican scientific-practical conference (with international participation) “Actual issues of education, science and production in pharmacy”. The poster’s abstract was published in the collection of conference materials “Actual issues of education, science and production in pharmacy”.

Similarly, the alignment was made of the dynamics of spread of asthma among the population of Republic of Uzbekistan Table 5.

Table 5: Prevalence of Bronchial Asthma per 100 Thousand of Population for 2000-2013year (Aligned Data)

Region	Year													
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
City of Tashkent	320	311	302	293	285	276	267	258	249	240	232	223	214	205
Andizhan region	162	157	152	148	143	138	134	129	124	120	115	110	106	101
Bukhara region	273	273	272	272	272	272	271	271	271	270	270	270	269	269
Dzhizakh region	195	194	193	191	189	190	189	188	187	186	185	184	183	182
Kashkadarya region	245	239	234	229	223	218	213	207	202	196	191	186	180	175
Navoi region	374	375	377	379	380	382	383	385	386	388	389	391	393	394
Namangan region	389	367	346	325	304	282	261	240	219	197	176	155	134	112
Samarkand region	141	139	137	135	133	131	129	127	125	123	122	120	118	116
Surkhandarya region	291	274	257	239	222	205	187	170	153	135	118	101	84	99
Syrdarya region	203	198	192	186	180	174	168	163	157	151	145	139	133	128
Tashkent region	233	224	216	207	199	191	182	174	165	157	149	140	132	123
Fergana region	227	229	232	235	238	241	243	246	249	252	254	257	260	263
Khorezm region	371	367	363	360	356	352	349	345	341	338	334	330	326	232
The Republic of Karakalpakstan	188	183	178	173	169	164	159	154	150	145	140	135	130	126
The Republic of Uzbekistan	233	229	225	220	216	212	208	204	199	195	191	187	183	178

Table 6: Forecast prevalence of Asthma Incidence (per 100 Thousand Population for 2010-2023 year)

Region	Year									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
City of Tashkent	196	188	179	170	161	152	144	135	126	117
Andizhan region	96	92	87	82	78	73	68	64	59	55
Bukhara region	269	269	268	268	268	267	267	267	267	266
Dzhizakh region	181	180	179	178	177	176	175	174	173	172
Kashkadarya region	170	164	159	154	148	143	137	132	127	121
Navoi region	396	397	399	400	402	403	405	407	408	410
Namangan region	269	2741	273	275	277	279	281	283	284	285
Samarkand region	114	112	110	108	106	104	102	100	98	96
Surkhandarya region	230	234	236	238	242	244	246	248	250	252
Syrdarya region	122	116	110	104	98	92	87	81	75	69
Tashkent region	115	107	98	90	81	73	65	56	48	39
Fergana region	266	268	271	274	277	279	282	285	288	290
Khorezm region	319	315	312	308	304	301	297	293	290	286
The Republic of Karakalpakstan	121	116	111	106	102	97	92	87	82	78
The Republic of Uzbekistan	174	170	166	162	157	153	149	145	141	136

Table 5 shows the aligned data on the prevalence of asthma

As a result the number of expected patients given 100 thousand population. As seen in Table 5, in 2023, the Republic of 100 thousand population expected 136 cases of asthma morbidity.

In this context, we studied the Republican specialized scientific analysis Allergic center 274 case histories of patients with bronchial asthma showed that inpatient treatment 1 every year receive 92 % of patients, 2 times – 8 %. Number of bed-days averaged 11.

Figure 2A: Retrospective analysis of the medical history of bronchial asthma

In 9.4 % of patients with bronchial asthma is mild, at 9.6 %– a moderate, 81 %– in the heavy. Women accounted for 55 % of men – 45 %. Patients aged of 15–18 years were 7.5 %, over 18 years – 92.5 %. There were 39 % of rural, 61 % of urban patients. As a registered gastritis associated diseases (18 %) cases, coronary heart disease (8 %), acute bronchitis (6 %), chronic pharyngitis (4.5 %), pharyngitis (7 %), chronic bronchitis (11.5 %), allergic conditions (6 %), rheumatic fever (6 %), gastric ulcer (7.5 %), and others.

Identify the severity of patients, concomitant pathology analysis of case records. Thus, further improvement of the security of the population and medical institutions drugs, their timely delivery to patients with asthma, management of foreign exchange reserves allocated from the state coffers contribute to the improvement of software quality and highly effective treatment.

Designed forecast incidence of asthma until 2023 for the of Uzbekistan and prediction of the of bronchial asthma results allow to calculate in advance the future need of medical institutions in pharmaceuticals.

The results obtained can be used for the purpose of proper organization, diagnosis and treatment of asthma in the outpatient and inpatient settings.

All these measures will help to improve the system for population and health facilities with quality and highly efficient drugs [8].

Findings

1. Analyzed level of prevalence of asthma morbidity in the Republic of Uzbekistan for the period from 2000 to 2009. Developed and substantiated forecast asthma morbidity until 2020 for the Republic of Uzbekistan.
2. Justified forecast of the prevalence of asthma in the republic to 2023–100 thousand of population morbidity, asthma accounted for 110 cases.
3. The results obtained allow for therapeutic and preventive measures, diagnose asthma predict the need of health care institutions in pharmaceuticals.
4. Analysis of the medical records revealed the structural features of disease. Bronchial asthma severe forms were registered in 81 % of the examined patients.

References

1. Суюнов Н.Д. Бронхиальная астма: эпидемиологические, медико-социальные аспекты и вопросы лекарственного обеспечения // Медицинский журнал Узбекистана. – Ташкент, 2012. – № 2. – С. 104–107.
(Suyunov ND (2012) Bronchial asthma: epidemiological, medical and social aspects and issues of drug supply. Medical Journal of Uzbekistan.-Tashkent 2: 104-107).
2. Ovsyannikov NV, Lyapin VA, Antonov NS, Avdeev SN, Bagishcheva NV (2012) Analysis of the incidence and prevalence of bronchial asthma among the population of the Omsk region. Pulmonology. Russia Moscow 1: 78-81.
3. Kryuchkova AV, Semynina NM, Kondusova Yu.V, Poletaeva IA, Knyazeva AM, et al (2016) Comparative study of adherence to treatment of patients with chronic obstructive pulmonary disease and bronchial asthma. Scientific medical bulletin. Rossi–Moscow 1: 30-36.
4. Chuchalin AG (2011) New perspectives in the treatment of bronchial asthma. Pulmonology. Russia Moscow 4: 5-12.
5. Suyunov ND, Mastibekov NN (2016) The prevalence and prognosis of the respiratory organ diseases. Cambridge Journal of Education and Science, «Cambridge University Press».- England 1: 220-231
6. Nazarov AA, Irsalieva F.Kh, Nizamov KF (2011) Allergic diseases as a problem of world health. Materials of the VI Republican scientific-practical conference “Modern problems of diagnosis, treatment and prevention of allergic diseases.” – Tashkent 63-65.
7. Suyunov ND, Ikramova GM, Mastibekov NN, Islamova MZ (2015) Prediction of the population morbidity due to asthma. Materials of the republican scientific and practical conference (with international participation): “Actual issues of education, science and production in pharmacy.” – Toshkent 243-245.
8. Суюнов Н.Д., Алимов Э.Л., Зайнутдинов Х.С. Прогноз потребления лекарственных препаратов, применяемых при лечении бронхиальной астмы // Фармацевтический журнал. Ташкент. 2005. № 1. С. 8–10.
(Suyunov ND, Alimov EL, Zainutdinov Kh.S (2005) Forecast of consumption of drugs used in the treatment of bronchial asthma. Pharmaceutical journal. Tashkent 1: 8-10).