Prevalence and Morbidity Prognosis of Allergic Rhinitis

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ABSTRACT

On the basis of mathematical modeling of allergic rhinitis, hay fever diseases the analysis of dynamics of its prevalence in the 2000-2013 was conducted. Based on the results of the analysis of morbidity with the use of modern methods of evidence-based medicine was compiled prognosis of allergic rhinitis, hay fever in the Republic of Uzbekistan until 2023. According to the results of the prognosis it can be calculated in advance the need for medications, treatments and preventive processes, diagnosis of diseases of allergic rhinitis, hay fever. These tests were proved by the expected incidence rates of some regions and the whole of the Republic of Uzbekistan until 2023. It is proved that the studies comply with the objectives of improving the diagnosis and treatment of disease of allergic rhinitis, hay fever in inpatient and outpatient conditions and improvement in the field of drug supply and improve the efficiency of the treatment process.

Keywords: Allergic rhinitis; Hay fever; Prevalence of disease;Prognosis, Index cases; Analysis, Diagnosis; Treatment

INTRODUCTION

Currently, most of the activity is to study the role of etiological and pathogenetic factors and the environment as a consequence of the high incidence of the respiratory system diseases [1]. Uzbekistan is differed in regional characteristics, where there is a severe solar radiation, much of dryness, dust, high temperatures, combined with intermittent exposure to pesticides and their degradation products. This creates unfavorable conditions for the normal lung defense mechanisms, leading to the formation of broncho pulmonary pathology for the population [2].

It is recognized that in most industrialized countries three basic forms of allergic diseases bronchial asthma, rhinitis, atopic eczema alone or in various combinations affect up to 20% of the population. In European countries, the number of patients with atopia ranged from 17.8% to 26.6%, more than half of them suffered from hay fever sensitization to pollen. At the end of the twentieth century the allergy pathology according to the prevalence has firmly taken 3–6 places among the most common diseases. The incidence of allergic rhinitis is from 1.6% to 24%. In the structure of diseases of the respiratory organs pollinosis in Uzbekistan is 0.95% [3]. Due to the growth in the second half of the XX century, the prevalence of allergic diseases in the world, with increasing of disability and mortality due to this group of patients, from the medical problems of internal diseases was highlighted separately the specialty of allergology.

The World Health Organization is paying close attention to the most common diseases, which include, in particular, an allergic pathology, transformed in recent decades to a global medical and social problem. It should be noted that in different regions of the country it is noted under diagnosis of the disease. In Uzbekistan about pollen allergy doctors treat from 10% to 20% of the population, allergic rhinitis from 9% to 16% according to some sources up to 32.7%, in this connection, the consumption of drugs prescribed to patients with this disease is being increased. As shows the analysis of the spread of allergic rhinitis in Uzbekistan, from this disease often suffer people living in areas with poor environment. On average, the number of cases in the Republic with allergic rhinitis for women 48.5%, men 51.5% [4].

In Uzbekistan, as well as throughout the world, there is a constant increase in the prevalence of allergic diseases among the population. So, for the period from 2012 to 2014 the absolute number of patients with allergic rhinitis has increased by 7%, especially among children from 10 to 15 years has increased more than 2.8 times. Allergic rhinitis, identifying high risk of developing asthma, dictate the need for wideranging therapeutic and preventive measures in many regions of the Republic [5]. Allergic rhinitis often takes its course in a slight form and usually do not affect the quality of life of millions of people. The level of appealability in patients with allergic rhinitis in the early stages of the disease is low. Many patients have long engaged in selftreatment, usually involving the excessive use of decongestants and antihistamine drugs of the first generation [6].

Allergic rhinitis a chronic disease, which is based on the inflammatory response induced by allergens hit on the nasal mucosa. Clinically allergic rhinitis is manifested with nasal discharge, obstruction of

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nasal breathing, sneezing and burning sensation in the nasal cavity. These symptoms are reversible. This is due to, firstly, the common mechanisms of allergic inflammation in the mucous membrane of the upper and lower respiratory tract, and secondly, the complex and diverse rhino bronchial interactions. Research results allow us to consider allergic rhinitis as pre-asthma or its risk factor. Half of all forms of chronic rhinitis is allergic rhinitis, the prevalence of which is increasing every year. Allergic rhinitis is characterized by inflammatory infiltration, mainly consisting of leukocytes and mast cells. Depending on the form of the disease there is seasonal allergic rhinitis occurring during flowering of herbs and flowers, and perennial rhinitis, which may disturb in any season. Mild course of allergic rhinitis symptoms do not impair the performance and do not interfere with sleep. With an average it is noted a moderate decrease of daily activity, sleep quality impairment. About severe allergic rhinitis testify the expressed these symptoms [7,8].

Purpose of the study

To study the prevalence and prognosis of diseases with allergic rhinitis, hay fever.

Research objectives

To achieve this goal it was necessary to solve the following problems:

- According to domestic and foreign official sources to identify the main factors influencing the allergic rhinitis, hay fever.

- To analyze outpatients and case histories of patients with allergic rhinitis, hay fever.

- To analyze the performance of allergic rhinitis, hay fever and give prognosis until 2023 in various climatic zones of the Republic of Uzbekistan.

Object of study

The objects of the study were patients with allergic rhinitis, hay fever hospitalized in the Republican specialized scientific allergological center. The study used information of the Institute of Health and Medical Statistics of the Ministry of Health of the Republic of Uzbekistan.

RESEARCH METHODS

The generally accepted in modern science methodology and techniques have been used in the course of scientific research: comparative, correlation, regression, logical, mathematical, analytical.

The validity of the results is confirmed by the fact that all the statistics of comparative studies are processed using information and computer technologies.

Scientific novelty

The features of spread and prognosis of allergic rhinitis, hay fever were studied. The analysis of the incidence of allergic rhinitis, hay fever in dynamics for 2000-2013 years was conducted. Scientific prognosis of allergic rhinitis, hay fever in the Republic of Uzbekistan until 2023 was substantiated.

Epidemiology of allergic rhinitis, hay fever diseases can not be considered favorable, because there are many cases among the population.Data on the prevalence of allergic rhinitis, hay fever, in absolute rate per 100 thousand of population in certain regions. The highest incidence of allergic rhinitis, hay fever accounts for Dzhizakh region, per 100 thousand people in 2000 were registered 117 cases, in 2006-279, in 2013-192, in Navoi region in 2000, the prevalence of these diseases was 224 cases, in 2006-466, in 2013-268, in Fergana region-respectively 69, 186 and 188, in Khorezm region-736, 906 and 576. In general, in Uzbekistan the prevalence of allergic rhinitis, hay fever in 2000 was 261, in 2006 year-232, in 2013-186 cases (Figure 1).

One way to improve the effectiveness of antiepidemiological service of the population is the scientific validity of the planning of preventive measures. The basis for the development of targeted plans are the results of a retrospective epidemiological analysis and prediction of disease. 2 methodological approaches were proposed for the preparation of shortterm prediction of annual incidence rates:

- The prediction using the method of determining "maximum stability".
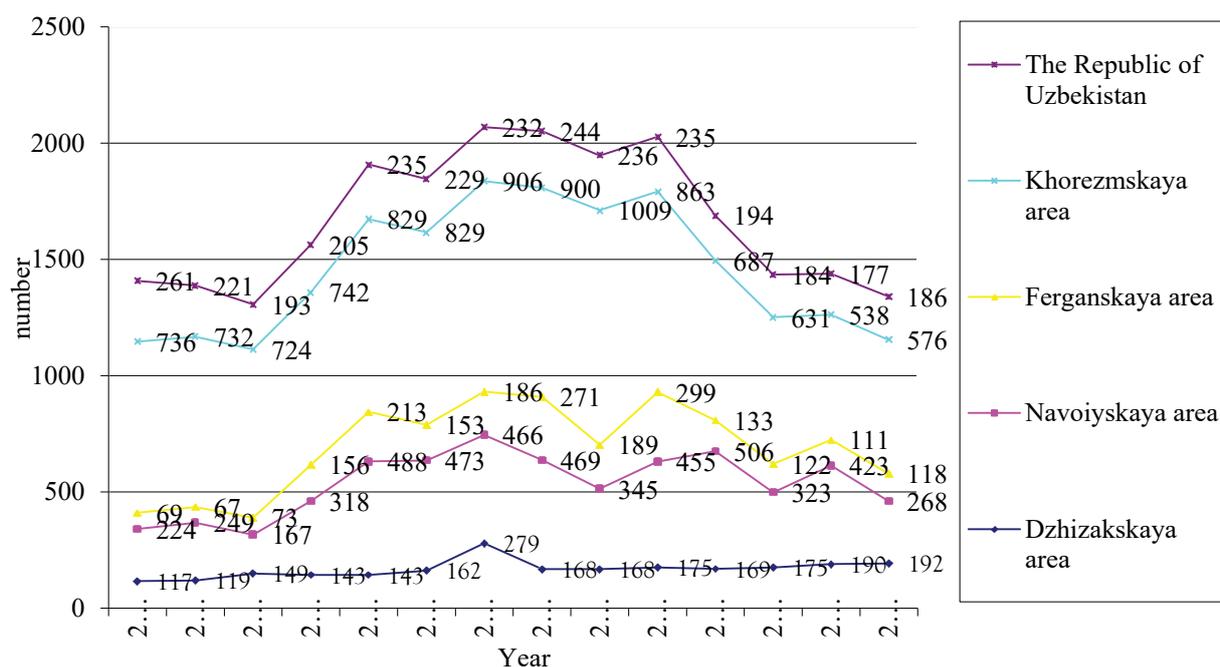
Figure 1: Prevalence of allergic rhinitis, hay fever per 100 thousand of population.

- The regression equation.

The algorithm and analysis of the parametric prognosis are as follows. Under parametric prognosis in this case refers the prognosis function, the argument of which changes as a discrete variable with a constant sampling interval. When prognosing the incidence of changes over time the elements of this vector should be numerical values of incidence, measured at regular intervals of time, namely one year. A number of annual morbidity, showing a change in a timephenomenon, is a dynamic number.

Through statistical analysis of time series the following problems were solved:

- Identification and description of the specific trends in time phenomenon.

- Selection of a statistical model that describes these changes.

- The search for the missing intermediate values (interpolation) on the basis of available indicators.

- A prediction based on the available results of future values (extrapolation) of the analyzed series.

A characteristic feature of the time series as the independent variable X stands the time factor, and Y dependent changing variable, the relationship between the variables X and Y is onesided, since the time factor does not depend on the variability of symptoms [9-11].

Graphs of the time series are not smooth going, and broken lines, since, along with the main reasons for defining the overall pattern in the variability of symptoms, their increase is influenced by numerous secondary causes random variations: natural disasters, changes in diet, environmental degradation, random emissions of harmful substances, epidemics, etc. In order to identify the main trends of the conjugate signs of variation for the averaging effect of random factors need to align the values of time series, i.e., we need to replace the broken lines on the smooth, gradually reaching the line.

One of the most effective approaches is considered the alignment of the time series according to the method of least squares. According to this method, with an infinite number of lines, which could theoretically be carried out between the points representing the original series, only one line is selected, that would have the smallest sum of squared deviations from the starting points of the theoretical straight line:

$$\sum (x_i - \bar{x})^2 = \min$$

Hence the name of the method the method of "least squares".

The requirement for the least squares method is that theoretical point $\bar{y}_x$'should be prepared so that the sum of the squared deviations from these points to empirical observations yi was minimal,

$$Q = \sum (y_i - y_x)^2 = \sum (y_i - f(x))^2 = Q_{\min}$$

Calculating in accordance with the principles of mathematical analysis at least, of this expression, converting it, you can get the system of normal equations in which the unknown values are the required parameters of the regression equation and the known values of the coefficients are determined by empirical signs, usually amounts of their values and their crossderivatives.

The equation of a straight line or a parabola I order can be expressed in the form of a number of members of deviations from these averages:

$$\bar{y}_x - \bar{y} = b_{yx}(x - \bar{x}); \quad \bar{x}_y - \bar{x} = b_{xy}(y - \bar{y})$$

If the average $\bar{y}, \bar{x}$ move to the right side of the equation, we get

$$\bar{y}_x = \bar{y} + b_{yx}(x_i - \bar{x}); \quad \bar{x}_y = \bar{x} + b_{xy}(y_i - \bar{y})$$

The system of normal equations for determining the parameters a and b will be as follows:

$$an + b\sum (x_i - \bar{x}) = \sum y$$
$$a\sum (x_i - \bar{x}) + b\sum (x_i - \bar{x})^2 = \sum y(x_i - \bar{x})$$

As $\sum (x - \bar{x}) = 0$, then the system takes the following form:

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

Hence the parabola equation parameters of the I order (straight line), expressed as deviations of members of the line from their average values are as follows:

$$a = \frac{\sum y}{n} = \bar{y} \tag{1}$$

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

When aligning time series was used the statistical data on the incidence of allergic rhinitis, hay fever among the population of Tashkent city for 2000-2013 years.

In this case, the arithmetic mean value for the independent variable is determined from the point of time indicated by a series of natural numbers:

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

Then, we calculate the deviation of members of the line of the dependent variable y from this value (with signs) and perform calculations shown in Table 1. Substituting these values in the formula (1) and (2), we define the parameters of a linear equation:

$$a = \frac{\sum y_i}{n} = \frac{3802}{14} = 271,6$$

$$b = \frac{\sum y(x_i - \bar{x})}{\sum (x_i - \bar{x})^2} = \frac{1154}{227,5} \approx 5,07$$

Hence the formula for balancing the dynamics of spread allergic rhinitis, hay fever, and its prognosis among the population of Tashkent city is as follows:

$$y_x = 271,6 + 5,07(x_i - x_{cp})$$

Calculated on this equation the value $\bar{y}_x$ the dependent variable is placed in the last column of Table 2. More than a visual representation of this gives Figure 2, which shows the calculated scrap and smoothly running the line of the series.

$$y_x = 271,6 + 5,07(x_i - x_{cp})$$

The resulting smooth line can be extended to give a prognosis on 2014-2023 years.

This refers to the inertia of the interrelations, which ensures the keep in generalities the mechanism of formation of the phenomenon, and the inertia of the nature of the dynamics of the process (temperature, direction, stability) for sufficiently long periods of time. Dynamics in absolute rate of allergic rhinitis, hay fever, diseases registered, only per 100 thousand of population in the years 2000-2013 is accounted for Tashkent city, 299 cases were reported in 2000, in 2006-301, in 2013-310 up (Σ 105, 3802) cases. The aligned data of calculated continuously running

Table 1: Allergic rhinitis and hay fever (Reported diseases only per 100 thousand of population).

Region	Year													
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Tashkent city	299	223	178	212	242	304	301	301	318	307	252	266	289	310
Andizhan region	135	80	79	67	75	74	75	68	61	56	48	43	41	49
Bukhara region	308	208	239	258	258	287	341	343	202	226	301	298	205	248
Dzhizakh region	117	119	149	143	143	162	279	168	168	175	169	175	190	192
Kashkadarya region	295	232	164	199	203	240	215	190	193	206	192	166	167	157
Navoi region	224	249	167	318	488	473	466	469	345	455	506	323	423	268
Namangan region	342	220	305	134	147	151	71	100	80	53	47	58	65	85
Samarkand region	115	72	112	113	124	95	118	108	129	130	118	125	116	131
Surkhandarya region	438	518	404	315	388	302	262	363	398	254	192	145	134	155
Syrdarinskaya region	101	110	144	138	164	168	148	131	158	138	87	115	113	114
Tashkent region	365	316	88	178	195	177	159	188	192	224	202	231	234	254
Fergana region	69	67	73	156	213	153	186	271	189	299	133	122	111	118
Khorezm region	736	732	724	742	829	829	906	900	1009	863	687	631	538	576
The Republic of Karakalpakstan	193	115	101	136	146	166	143	136	166	156	136	138	150	151
The Republic of Uzbekistan	261	221	193	205	235	229	232	244	236	235	194	184	177	186
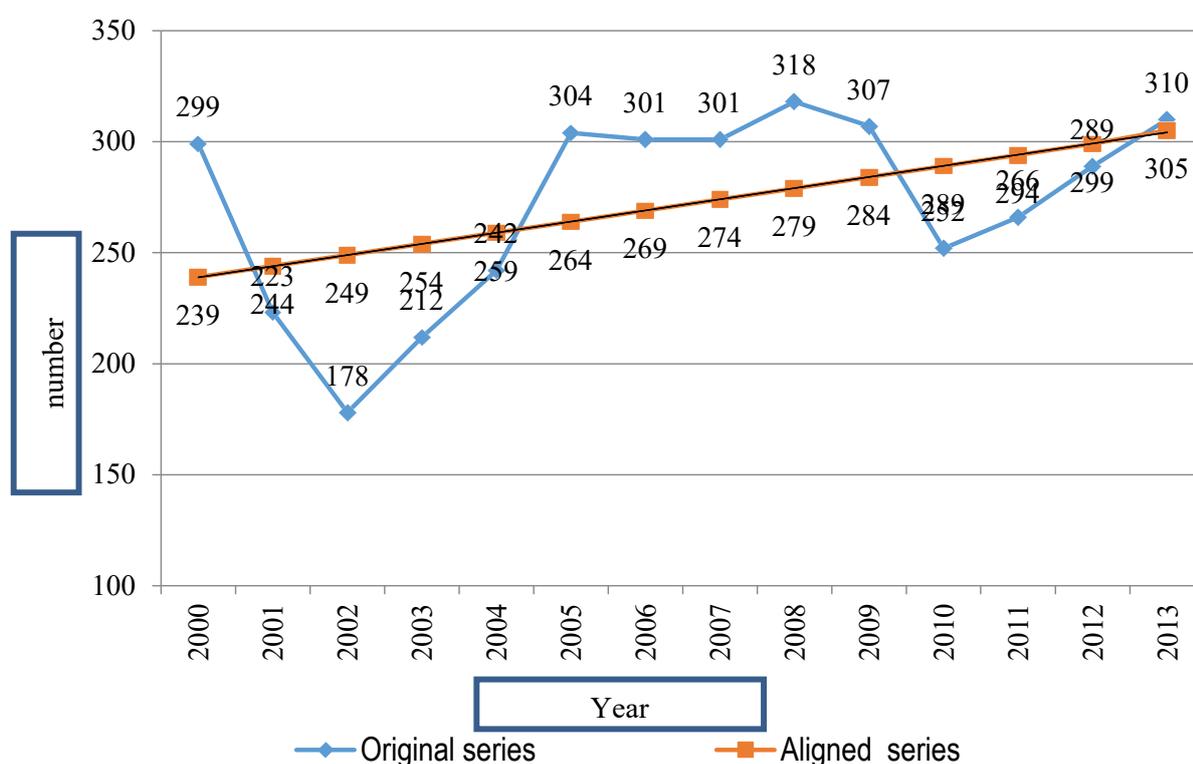
Figure 2: Scrap and calculated smoothly running lines.

line of prevalence allergic rhinitis, hay fever per 100 thousand of population in Tashkent city allergic rhinitis, hay fever in 2000 was reported 239 cases, in 2006-269, in 2013-305 cases. These figures are given in Table 3.

The resulting smooth line can be extended to give a prognosis for 2014-2023 years. To talk about the reliability of the statistical prognosiss of the dynamics of any phenomena is possible only while maintaining overall trends, i.e. with a certain degree of inertia phenomena. According to the prognosis prevalence of diseases of allergic rhinitis, hay fever in 2016 in Tashkent city per

100 thousand of population expected 320 cases, in 2020-340 cases, in 2023-355 cases. In Navoi region is expected 467 cases, in 2020-508, in 2023-539. In the republic per 100 thousand of population in 2016 it is expected 183 cases of illness, in 2020-170, in 2023-159. These figures are given in the Table 4.

In this context, the Republican specialized scientific allergological center was conducted the analysis of 276 case histories of outpatients with allergic rhinitis. In this mild form of allergic rhinitis is reported in 31.3%, of moderate form in 41.0%, severe form in 27.7%. Men accounted 55%, women 45%. Rural residents

Table 2: Dynamics of allergic rhinitis, hay fever per 100 thousand of population of Tashkent city in absolute rate.

Year	xi	The prevalence of allergic rhinitis, hay fever, yi	xi-xcp	y(xi-xcp)	(xi-xcp)²	yx	ε
2000	1	299	-6,5	-1944	42,25	239	25,3
2001	2	223	-5,5	-1227	30,25	244	8,5
2002	3	178	-4,5	-801	20,25	249	28,4
2003	4	212	-3,5	-742	12,25	254	16,5
2004	5	242	-2,5	-605	6,25	259	6,5
2005	6	304	-1,5	-456	2,25	264	15,2
2006	7	301	-0,5	-150,5	0,25	269	11,9
2007	8	301	0,5	150,5	0,25	274	9,8
2008	9	318	1,5	477	2,25	279	13,9
2009	10	307	2,5	767,5	6,25	284	8,0
2010	11	252	3,5	882	12,25	289	12,9
2011	12	266	4,5	1197	20,25	294	14,3
2012	13	289	5,5	1589,5	30,25	299	13,3
2013	14	310	6,5	2015	42,25	305	13,7
Σ	105	3802		1154	227,5		14,2

Table 3: The prevalence of allergic rhinitis, hay fever per 100 thousand of population for the years 2000-2013 (aligned data).

Region	Year													
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Tashkent city	239	244	249	254	259	264	269	274	279	284	289	294	299	305
Andizhan region	99	94	89	84	80	75	70	66	51	56	51	47	42	37
Bukhara region	271	271	270	269	268	267	266	265	265	264	263	262	261	260
Dzhizakh region	136	141	146	151	155	160	165	170	175	180	185	190	195	200
Kashkadarya region	240	234	228	222	216	210	204	198	192	187	181	175	169	163
Navoi region	303	313	323	334	344	354	364	375	385	395	405	416	426	436
Namangan region	255	236	217	198	180	161	142	123	105	86	67	48	30	11
Samarkand region	101	103	105	107	109	112	114	116	118	120	122	124	126	129
Surkhandarya region	467	442	417	392	367	342	317	292	267	242	217	192	167	142
Syrdarya region	139	138	137	135	134	133	131	130	129	127	126	125	123	122
Tashkent region	224	223	221	220	218	217	215	214	212	211	209	208	206	205
Fergana region	125	130	134	139	143	148	152	157	161	165	170	174	179	183
Khorezm region	832	822	811	800	790	779	769	458	748	737	727	716	706	695
The Republic of Karakalpakstan	142	143	143	144	144	145	145	145	146	146	147	147	148	148
The Republic of Uzbekistan	239	236	232	229	225	222	218	215	211	208	204	201	197	194

Table 4: Prognosis prevalence of allergic rhinitis, hay fever (per 100 thousand of population) for 2014-2023 years.

Region	Year									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Tashkent city	310	315	320	325	330	335	340	345	350	355
Andizhan region	68	71	74	76	79	82	86	89	90	94
Bukhara region	259	258	258	257	256	255	254	253	252	252
Dzhizakh region	205	210	215	219	224	229	234	239	244	249
Kashkadarya region	157	151	145	139	133	127	122	116	110	104
Navoi region	446	457	467	477	487	498	508	518	528	539
Namangan region	134	137	141	144	147	148	152	156	158	161
Samarkand region	131	133	135	137	139	141	143	145	148	150
Surkhandarya region	233	244	246	248	250	252	254	256	258	261
Syrdarya region	121	120	118	117	116	114	113	112	110	109
Tashkent region	203	202	200	199	198	196	195	193	192	190

| Fergana region | 188 | 192 | 197 | 201 | 205 | 210 | 214 | 219 | 223 | 228 |
Khorezm region	685	674	664	653	643	632	622	611	601	690
The Republic of Karakalpakstan	149	149	150	150	151	151	152	152	153	153
The Republic of Uzbekistan	190	187	183	180	177	173	170	166	163	159
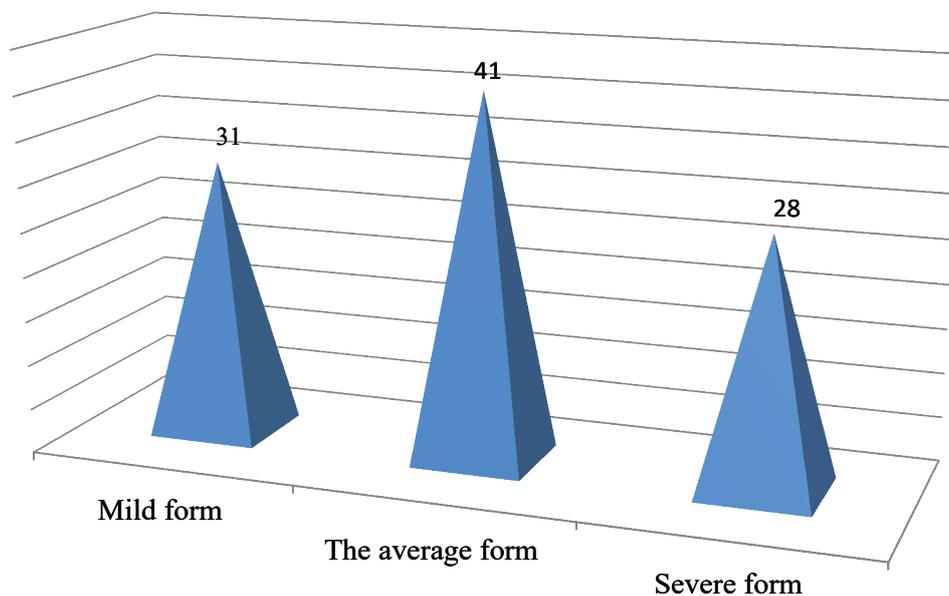
Figure 3: Form of patients with allergic rhinitis: A retrospective analysis of medical records of patients with allergic.

were 57.0%, urban 43.0%. As concomitant diseases diagnosed: pollinosis (41.6% cases), bronchial asthma (14.8%), chronic bronchitis (4.2%), bronchitis (7.5%), atopic dermatitis (2.2%), etc (Figure 3).

RESULTS AND DISCUSSION

Thus, further improvement in providing the population and medical institutions with medicines, their timely delivery to patients with allergic rhinitis, hay fever rational use of resources, contribute to the improvement of software quality and highly effective treatment. A prognosis of allergic rhinitis, hay fever until 2023 for the Republic of Uzbekistan was made. The obtained results in the future will allow calculating in advance the need for health care institutions in pharmaceuticals. The results can be used for the purpose of proper organization, diagnosis and treatment of allergic rhinitis, hay fever in outpatient and inpatient settings. All these measures will contribute to the improvement of providing system of public and medical institutions with quality and highly effective drugs.

CONCLUSION

In-depth study of domestic, foreign literature revealed the deterioration of health, worsening among patients with allergic rhinitis, hay fever, because of the environmental problems that require a prognosis of development and optimization of efficient methods of providing quality medical and pharmaceutical care. It has been analyzed the level of prevalence of disease with allergic rhinitis, hay fever in the Republic of Uzbekistan for the period from 2000 to 2013. It has been made and analyzed the prognosis of allergic rhinitis, hay fever until 2023 for the Republic of Uzbekistan. The prognosis prevalence of allergic rhinitis, hay fever in the Republic until 2023 per 100 thousand of population will be 159 cases. The results allow conducting therapeutic and preventive measures, to diagnose allergic rhinitis, hay fever, predict

the need of health care institutions in medicines. Analysis of medical records revealed a particular disease patterns, identified such factors as the severity and form of the disease, age and sex of patients, comorbidities. From allergic rhinitis of severe form suffer 27.7% of the patients.

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