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Original article

## The Incidence Trends of Chronic Diseases of the Tonsils and Adenoids in Kazakhstan

Zhansaya Telmanova<sup>1</sup>, Yermek Imangaliyev<sup>2</sup>, Dinara Kassenova<sup>3</sup>, Zarina Bilalova<sup>4</sup>,  
Gulnur Igissinova<sup>5</sup>, Serikbay Orozbaev<sup>6</sup>, Zhanerke Azhetova<sup>7</sup>, Kuanish Kulayev<sup>8</sup>,  
Yerlan Kuandykov<sup>9</sup>, Nurbek Igissinov<sup>10</sup>

<sup>1</sup> Medical Intern of the Faculty of General Medical Practice, Astana Medical University, Astana, Kazakhstan.

E-mail: telmanova.zhansaya@gmail.com

<sup>2</sup> Head of the Department of Otorhinolaryngology, City Multidisciplinary Hospital No. 2, Astana, Kazakhstan.

E-mail: iee.68@mail.ru

<sup>3</sup> Associate Professor of the Department of ENT Diseases, Astana Medical University, Astana, Kazakhstan.

E-mail: dinara.lor.kz@gmail.com

<sup>4</sup> Chief Researcher of the Central Asian Institute for Medical Research, Astana, Kazakhstan.

E-mail: z.bilyalova@gmail.com

<sup>5</sup> Associate Professor of the Department of Oncology, S.D. Asfendiyarov Kazakh National Medical University, Almaty, Kazakhstan. E-mail: gulnurs@list.ru

<sup>6</sup> Associate Professor of the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University, Astana, Kazakhstan. E-mail: orazbaev\_s.t@mail.ru

<sup>7</sup> Associate Professor of the Department of Obstetrics and Gynecology, Astana Medical University, Astana, Kazakhstan. E-mail: azhetova@mail.ru

<sup>8</sup> Associate Professor of the Department of General Medical Practice No. 1, Khoja Akhmet Yassawi International Kazakh-Turkish University, Shymkent, Kazakhstan. E-mail: kulaev\_k\_t@mail.ru

<sup>9</sup> Associate Professor of the Department of General Medical Practice No. 1, Khoja Akhmet Yassawi International Kazakh-Turkish University, Shymkent, Kazakhstan. E-mail: gipokrat78@mail.ru

<sup>10</sup> Professor of the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University, Astana, Kazakhstan. E-mail: n.igissinov@gmail.com

### Abstract

**The purpose of this study** is to study new trends in the incidence of chronic diseases of the tonsils and adenoids in Kazakhstan.

**Methods.** The research material was compiled summary reporting form number 12 of Ministry of Health of the Republic of Kazakhstan on new cases of chronic diseases of the tonsils and adenoids (ICD-10 – J35), established for the first time. A retrospective study was used as the main method for studying the incidence of chronic diseases of the tonsils and adenoids. According to generally accepted methods of biomedical statistics, extensive, intensive and equalized indicators of the incidence of chronic diseases of the tonsils and adenoids were calculated.

**Results.** For 2009 - 2018 651.934 new cases of chronic diseases of the tonsils and adenoids were registered in the republic, of which were in children – 64.6%, teenagers – 9.5% and adults – 25.9%. The average annual incidence rate of chronic diseases of the tonsils and adenoids in the entire population of Kazakhstan was  $383.3 \pm 8.1 \text{ ‰}_{0000}$  (95% CI=367.4 - 399.1  $\text{‰}_{0000}$ ), and for population groups having been studied was: in children –  $957.3 \pm 23.7 \text{ ‰}_{0000}$  (95% CI=910.9-1003.7  $\text{‰}_{0000}$ ), among teenagers –  $847.0 \pm 16.6 \text{ ‰}_{0000}$  (95% CI=814.5-879.4  $\text{‰}_{0000}$ ) and the adult population  $142.6 \pm 7.6 \text{ ‰}_{0000}$  (95% CI=127.7-157.6  $\text{‰}_{0000}$ ). The difference in incidence between groups was statistically significant. Disease tended to decrease in all age groups: in children (T=-1.8%), in adolescents (T=-1.1%) and in the adult population (T=-5.5%).

**Conclusion.** According to the dynamics, chronic diseases of the tonsils and adenoids incidence in Kazakhstan has a decreased tendency. The results obtained are recommended to be taken into account by health authorities when making managerial decisions.

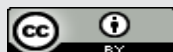
**Keywords:** chronic diseases of the tonsils and adenoids, incidence, age characteristics, epidemiology, trends, Kazakhstan.

Corresponding author: Nurbek Igissinov – Doctor of Medical Sciences, Head of Central Asian Institute for Medical Research, Astana, Kazakhstan; Professor of the Department of Surgical Diseases with courses of Cardiothoracic and maxillofacial surgery, Astana Medical University; Vice President of the Eurasian Institute for Cancer Research, Bishkek, the Kyrgyz Republic.  
Postal code: 010000  
Address: Kazakhstan, Astana, Beybitshilik str., 49a  
Phone: +77024293421  
E-mail: n.igissinov@gmail.com.

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## Introduction

Frequent respiratory diseases negatively affect the health of the population, causing a decrease in the immune resistance of the body and contributing to the formation of foci of chronic infection. The great social significance of ear, throat and nose diseases is determined by their high prevalence among the population. Recurrent or chronic adenotonsillary infections mainly affect children and often involve healthy people. Therefore, with the exception of systemic immunological insufficiency, this disease may be associated with local dysfunction of epithelial structures either at the level of the nasopharynx or at the level of the oropharynx [1].

The tonsils are two pieces of tissue located at the back of your throat. They are similar to lymph nodes and their job is to trap germs and help prevent infection. Adenoids are a cluster of lymphoid tissue located on the back wall of the nasopharynx behind the soft palate. Adenoids together with fascial tonsils, lingual tonsils and tubal tonsils of Gerlach make up the so-called Waldeyer ring. Together, these tissues function as an integral part of the human immune system in infancy. Adenoids are present at birth and increase in childhood, reaching a maximum size by the age of seven. In most people, they regress in size during puberty and can almost disappear in adulthood. For this reason, adenoiditis is usually a problem of childhood and adolescence [2].

Chronic adenoiditis is more often a polymicrobial infection, may include anaerobic pathogens and often occurs as a result of biofilm formation [3]. Despite this being one of the most common medical problems, our understanding of the pathogenesis of this disease process remains limited [4]. Recurrent or chronic inflammation of the adenoids and fascial tonsils leads to chronic activation of a cell-mediated and humoral immune response, which leads to hypertrophy of

## Materials and methods

**Registration and patient recruitment.** The material of the study was data from the reporting form No. 12 of the Ministry of Health of the Republic of Kazakhstan on patients with a diagnosis of chronic diseases of the tonsils and adenoids (ICD 10 – J35), established for the first time in their life.

**Population denominators.** Population denominators for calculation of incidence rates were provided by the Bureau of National Statistics. At the same time, data on the number of populations of the republic, taking into account the studied regions, are used, all data are presented on the official website [8].

**Statistical analysis.** A retrospective study (2009-2018) with descriptive and analytical methods of modern epidemiology was used as the main method for studying the incidence of chronic diseases of the tonsils and adenoids. Extensive and crude indicators of incidence are determined by the generally accepted methodology used in modern statistics. The mean value (M), the mean error (m) and the average annual rates of increase and decrease (T, %), 95% confidence intervals (95% CI) were calculated. The dynamics of incidence indicators have been studied over 10 years, while trends are determined by

## Results

During the study period, in Kazakhstan there were 651.934 new cases of chronic diseases of the tonsils and adenoids are: children (under 15 years) – 421.247 (64.6%), teenagers (15-17 years) – 61,687 (9.5%) and adults (18 years and older) – 169.000 cases (25.9%).

The average annual incidence rate of chronic diseases of the tonsils and adenoids among the entire population of Kazakhstan was  $383.3 \pm 8.1 /_{0000}$  (95% CI =  $367.4 - 399.1 /_{0000}$ ) and in the dynamics of incidence tended to decrease from  $420.1 \pm 1.6 /_{0000}$  (95% CI =  $416.9 - 423.3 /_{0000}$ ) in 2009 to  $350.3 \pm 1.4 /_{0000}$  (95% CI =  $347.6 - 353.0 /_{0000}$ ) in 2018, the difference is statistically significant ( $t=32.83$ ;  $p=0.000$ ). The above trend remained unchanged when this indicator is had been leveled, and the average annual rate of decline was  $T=-2.1\%$  (Figure 1).

the lymphoid tissue of the tonsils. This hypertrophied tissue is the cause of pronounced clinical symptoms: obstruction of the upper respiratory tract, snoring and sleep apnea with adenoiditis or angina, dysphagia and bad breath with recurrent tonsillitis [5]. To address this condition, medical treatment can involve adenoidectomy, a common surgical procedure in children and teenagers. Generally, adenoidectomy has appeared to be a safe and necessary operation for those symptomatic children or teenagers. It is a safe surgical procedure, with low complication and low revision rate of surgery [6].

Accurate statistics on the incidence and prevalence of chronic adenoiditis or tonsillitis alone are difficult to establish, since adenoiditis or tonsillitis is usually considered in the context of a more extensive pathological process, such as rhinosinusitis and adenotonsillar disease. In Kazakhstan, respiratory diseases account for more than 30% of the total incidence. They are 2-3 times higher than the indicators of diseases of the circulatory system. The diseases are most common among children under the age of 15 and are 1.5 times more common in urban residents [7].

Over the past decade, our study is the first to study the incidence of chronic diseases of the tonsils and adenoids in Kazakhstan. This underlines the relevance of this study.

**The purpose of this study** is to study new trends in the incidence of chronic diseases of the tonsils and adenoids in Kazakhstan.

the least squares method. The geometric mean was used to calculate the average annual growth rates and decrease in the time series. The incidence rates for children in general (up to 15 years), adolescents (15-17 years), adults (18 years and over) and the total population are calculated for 100.000 ( $/_{0000}$ ) of the relevant population.

**Ethics approval.** Because this study involved the analysis of publicly available administrative data and did not involve contacting individuals, consideration and approval by an ethics review board was not required. At the same time, the submitted data is in accordance with the Law of the Republic of Kazakhstan No. 257-IV of March 19, 2010 «About State statistics» [9], the information in the summary report is confidential and can only be used for statistical purposes in accordance with the Principles of the World Medical Association [10].

The average annual incidence of chronic diseases of the tonsils and adenoids varied among the studied population groups. So, for children it was  $957.3 \pm 23.7 /_{0000}$  (95% CI =  $910.9 - 1003.7 /_{0000}$ ), for adolescents and adults it had been  $847.0 \pm 16.6 /_{0000}$  (95% CI =  $814.5 - 879.4 /_{0000}$ ) and  $142.6 \pm 7.6 /_{0000}$  (95% CI =  $127.7 - 157.6 /_{0000}$ ), respectively (Figure 2).

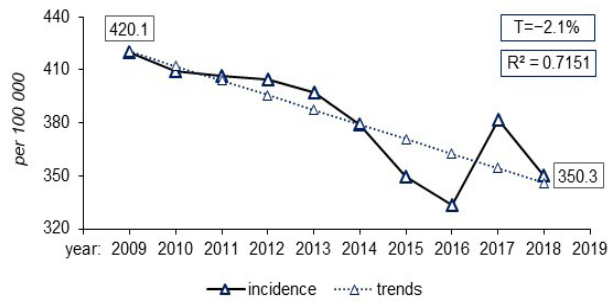


Figure 1 – Dynamics of chronic diseases of the tonsils and adenoids incidence of in the entire population of Kazakhstan for 2009-2018

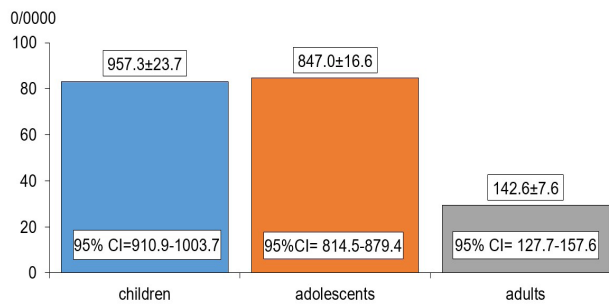


Figure 2 – Average annual incidence of chronic diseases of the tonsils and adenoids in the studied population groups in Kazakhstan for 2009-2018

According to the graph, the incidence chronic diseases of the tonsils and adenoids in the childish population of Kazakhstan decreased from  $1068.9 \pm 5.2 \text{ ‰}$  (95% CI=1058.6-1079.1 ‰) to  $907.6 \pm 4.2 \text{ ‰}$  (95% CI=899.4-915.8 ‰) for the time period

of 2009–2018, the changes are statistically significant ( $t=24.13$ ;  $p=0.000$ ), and the average annual rate of decline was  $T=-1.8\%$  (Figure 3).

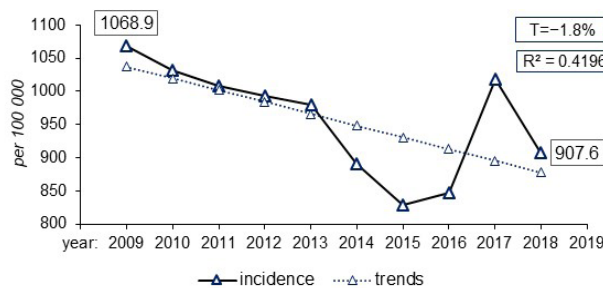


Figure 3 – Dynamics of the incidence of chronic diseases of the tonsils and adenoids in the childish population of Kazakhstan for 2009-2018

The incidence of chronic diseases of the tonsils and adenoids among adolescents decreased from  $913.0 \pm 10.1 \text{ ‰}$  (95% CI=893.3-932.7 ‰) in 2009 to  $757.8 \pm 11.3 \text{ ‰}$  (95%

CI=735.7-779.9 ‰) in 2018, also the difference is statistically significant ( $t=10.24$ ;  $p=0.000$ ). Also, the average annual rate of decline was  $T=-1.1\%$  (Figure 4).

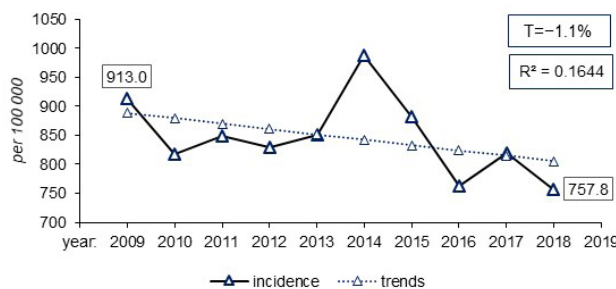


Figure 4 – Dynamics of the incidence of chronic diseases of the tonsils and adenoids in the adolescent population of Kazakhstan for 2009-2018

In dynamics, the incidence of chronic diseases of the tonsils and adenoids in the republic decreased among the adult population: from  $158.8 \pm 1.2$  ‰ (95% CI=156.4-161.1 ‰) in 2009 to  $102.2 \pm 0.9$  ‰ (95% CI=100.5-104.0 ‰) in 2018 and

the difference in these years is statistically significant ( $t=37.73$ ;  $p=0.000$ ). The average annual rate of growth was  $T=-5.5\%$  (Figure 5).

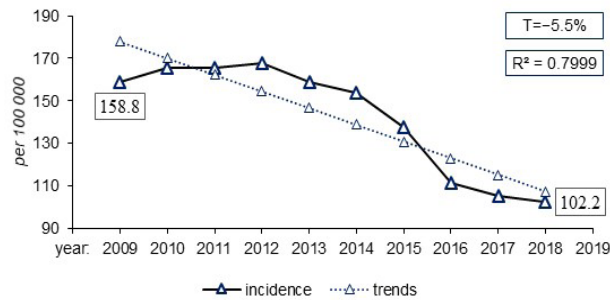


Figure 5 – Dynamics of the incidence of chronic diseases of the tonsils and adenoids in the adult population of Kazakhstan for 2009-2018

## Discussion

In Kazakhstan, in general, there is a decrease in the incidence of chronic diseases of the tonsils and adenoids. This may be due, first of all, to a decrease in calls to ENT doctors of patients of this category. After all, as global data show over the past 10 years, a decrease in the number of complaints about ENT problems in general practice has been registered in Europe and the USA, which may reflect a decrease in the «real» incidence among the general population [11,12]. Secondly, the decrease in morbidity may be associated with the timely and successful treatment of acute forms of ENT pathology. According to research in the Netherlands, prescribing antibiotics within the guidelines and protocols as needed and choosing the first-choice drug led to a decrease in diseases and complications of ENT organs [13].

Hyperplasia of the adenoids and tonsils with or without infection causes a high incidence in both adults and children. According to meta-analysis, the prevalence of adenotonsillar hypertrophy in a randomized representative population is 34%, and among patients referred to ENT clinics, participants without concomitant diseases and/or fully diagnosed sleep apnea, the prevalence ranged from 42% to 70% [14]. Since more than half of new cases occur in the child population, the burden on children and their families from both a social/emotional and economic point of view should be taken into account. Adenoiditis is a common problem in children and may be unavoidable, as they

often come into contact with common pathogens and allergens that cause inflammation. However, it is necessary to seek treatment before chronic adenoiditis, as well as the development of adenoid hypertrophy, as this can lead to serious complications and a decrease in the quality of life. Any form of chronic inflammation can lead to the proliferation of lymphoid tissue and subsequent hypertrophy of adenoids. This hypertrophy can lead to obstruction of the nasal airways and blockage of the Eustachian tubes, which in turn leads to other problems such as obstructive sleep apnea (OSA) and otitis media [15]. It has a negative impact on sleep quality and school success of young children. In children, persisting obstruction findings may cause aggressive behavior, anxiety, impaired attention, depression, somatization disorders and growth retardation at long-term [16,17].

If chronic inflammation of the palatine tonsils in children usually leads to hyperplasia and hypertrophy of tissues, then in adults it is associated with sclerosis of these structures. modification of the epithelium causes a violation of antigen capture, and this, in turn, leads to a relapse of inflammatory processes with increasingly severe hyperparakeratosis, triggering a vicious circle for which tonsillectomy is the only healing solution [1].

## Conclusion

The analysis of the data showed that despite the high incidence rates, the indicators tend to decrease in dynamics. The nutrition, growth, development and social lives of children are influenced negatively by this disease. Antibiotics and various adjunctive drugs used to treat this disease lead to many side effects in children. The economic burden of medical and surgical treatment of this disease is tremendous.

**Conflict of interest.** The authors declare no conflict of interest.

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## Contribution of the authors.

ZhT, KK, ZB – Collection and preparation of data, primary processing of the material and their verification.

ZB, YK, ZhT – Statistical processing and analysis of the material, writing the text of the article (material and methods, results).

ZhA, DK, SO, YI – Writing the text of the article (introduction, discussion).

NI, YI, GI – Concept, design and control of the research, approval of the final version of the article. All authors approved the final version of the manuscript.

All authors have read, agreed to the final version of the manuscript, and signed the copyright transfer form.

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#### Қазақстанда бадамшабездер мен аденоидтардың созылмалы ауруларымен сырқаттану үрдісі

Тельманова Ж. <sup>1</sup>, Иманғалиев Е. <sup>2</sup>, Касенова Д. <sup>3</sup>, Билялова З. <sup>4</sup>, Игисина Г. <sup>5</sup>, Орозбаев С. <sup>6</sup>, Ажетова Ж. <sup>7</sup>,  
Кулаев К. <sup>8</sup>, Куандықов Е. <sup>9</sup>, Игисинов Н. <sup>10</sup>

<sup>1</sup> Жалпы дәрігерлік практика факультетінің интерні, Астана медицина университеті, Астана, Қазақстан.  
E-mail: telmanova.zhansaya@gmail.com

<sup>2</sup> Оториноларингология бөлімшесінің меңгерушісі, № 2 қалалық көпбейінді аурухана, Астана, Қазақстан.  
E-mail: iee.68@mail.ru

<sup>3</sup> ЛОР аурулары кафедрасының доценті, Астана медицина университеті, Астана, Қазақстан.  
E-mail: dinara.lor.kz@gmail.com

<sup>4</sup> Central Asian Institute for Medical Research бас ғылыми қызметкері, Астана, Қазақстан.  
E-mail: z.bilyalova@gmail.com

<sup>5</sup> Онкология кафедрасының доценті, С.Д. Асфендияров атындағы Қазақ ұлттық медицина университеті,  
Алматы, Қазақстан. E-mail: gulnurs@list.ru

<sup>6</sup> Кардиоторакалды және жақ бет хирургиясы курстарымен хирургиялық аурулар кафедрасының доценті, Астана  
медицина университеті, Астана, Қазақстан. E-mail: orazbaev\_s.t@mail.ru

<sup>7</sup> Акушерия және гинекология кафедрасының доценті, Астана медицина университеті, Астана, Қазақстан.  
E-mail: azhetova@mail.ru

<sup>8</sup> №1 Жалпы дәрігерлік практика кафедрасының доценті, Халықаралық қазақ-түрік университеті, Шымкент,  
Қазақстан. E-mail: kulaev\_k\_t@mail.ru

<sup>9</sup> №1 Жалпы дәрігерлік практика кафедрасының доценті, Халықаралық қазақ-түрік университеті, Шымкент,  
Қазақстан. E-mail: gjokrat78@mail.ru

<sup>10</sup> Кардиоторакалды және жақ бет хирургиясы курстарымен хирургиялық аурулар кафедрасының профессоры,  
Астана медицина университеті, Астана, Қазақстан. E-mail: n.igissinov@gmail.com

#### Түйіндеме

**Зерттеудің мақсаты:** Қазақстанда бадамшабездер мен аденоидтардың созылмалы ауруларымен сырқаттану үрдісін зерттеу.

**Әдістері.** Зерттеу материалы Қазақстан Республикасы Денсаулық сақтау министрлігінің бадамшабездер мен аденоидтардың созылмалы ауруларының жаңа жағдайлары туралы алғаш рет жасалған №12 жиынтық есеп беру нысаны болды (АХЖ-10 – J35). Бадамшабездер мен аденоидтардың созылмалы ауруларын зерттеудің негізгі әдісі ретінде ретроспективті зерттеу қолданылды. Медициналық статистиканың жалпы қабылданған әдістеріне сәйкес бадамшабездер мен аденоидтардың созылмалы ауруларымен сырқаттанушылықтың экстенсивті, қарқынды және теңестірілген көрсеткіштері есептелді.

**Нәтижесі.** 2009-2018 жылдары республикада бадамшабездер мен аденоидтардың созылмалы ауруларының 651 934 жаңа жағдайы тіркелді, оның ішінде балаларда – 64,6%, жасөспірімдерде – 9,5% және ересектерде – 25,9%. Қазақстанның барлық тұрғындары арасында бадамшабездер мен аденоидтардың созылмалы ауруларымен сырқаттанушылықтың орташа жылдық көрсеткіші  $383,3 \pm 8,1 \text{ ‰}_{0000}$  (95% СА = 367,4 - 399,1  $\text{‰}_{0000}$ ) құрады, ал зерттелген популяциялар үшін: балаларда –  $957,3 \pm 23,7 \text{ ‰}_{0000}$  (95% СА = 910,9 - 1003,7  $\text{‰}_{0000}$ ), жасөспірімдер арасында –  $847,0 \pm 16,6 \text{ ‰}_{0000}$  (95% СА = 814,5 - 879,4  $\text{‰}_{0000}$ ) және ересек тұрғындар үшін  $142,6 \pm 7,6 \text{ ‰}_{0000}$  (95% СА = 127,7 - 157,6  $\text{‰}_{0000}$ ) болды. Топтар арасындағы кездесу жиілігінің айырмашылығы статистикалық маңызды болды. Ауру барлық жас топтарында төмендеген: балаларда (T = -1,8%), жасөспірімдерде (T = -1,1%) және ересек адамдарда (T = -5,5%).

**Қорытынды.** Қазақстанда бадамшабездер мен аденоидтардың созылмалы ауруларымен сырқаттанушылық төмендеу үрдісіне ие. Алынған нәтижелерді басқару шешімдерін қабылдау кезінде денсаулық сақтау органдарына ескеру ұсынылады.

**Түйін сөздер:** бадамша бездерінің және аденоидтардың созылмалы аурулары, сырқаттанушылық, жас ерекшеліктері, эпидемиология, үрдістер, Қазақстан.

## Тенденции заболеваемости хроническими болезнями миндалин и аденоидов в Казахстане

Тельманова Ж. <sup>1</sup>, Имангалиев Е. <sup>2</sup>, Касенова Д. <sup>3</sup>, Билялова З. <sup>4</sup>, Игисина Г. <sup>5</sup>, Орозбаев С. <sup>6</sup>, Ажетова Ж. <sup>7</sup>,  
Кулаев К. <sup>8</sup>, Куандыков Е. <sup>9</sup>, Игисин Н. <sup>10</sup>

<sup>1</sup> Интерн факультета Общей врачебной практики, Медицинский университет Астана, Казахстан.

E-mail: telmanova.zhansaya@gmail.com.

<sup>2</sup> Заведующий отделением оториноларингологии, Городская многопрофильная больница № 2, Астана, Казахстан.

E-mail: iee.68@mail.ru.

<sup>3</sup> Доцент кафедры ЛОР болезней, Медицинский университет Астана, Казахстан. E-mail: dinara.lor.kz@gmail.com.

<sup>4</sup> Главный научный сотрудник Central Asian Institute for Medical Research, Астана, Казахстан.

E-mail: z.bilyalova@gmail.com.

<sup>5</sup> Доцент кафедры онкологии, Казахский национальный медицинский университет им. С.Д. Асфендиярова,

Алматы, Казахстан. E-mail: gulnurs@list.ru.

<sup>6</sup> Доцент кафедры хирургических болезней с курсами кардиоторакальной хирургии и ЧЛХ, Медицинский университет Астана, Казахстан. E-mail: orazbaev\_s.t@mail.ru

<sup>7</sup> Доцент кафедры акушерства и гинекологии, Медицинский университет Астана, Казахстан.

E-mail: azhetova@mail.ru.

<sup>8</sup> Доцент кафедры общей врачебной практики № 1, Международный Казахско-Турецкий университет имени Ходжи Ахмета Ясави, Шымкент, Казахстан. E-mail: kulaev\_k\_t@mail.ru.

<sup>9</sup> Доцент кафедры общей врачебной практики № 1, Международный Казахско-Турецкий университет имени Ходжи Ахмета Ясави, Шымкент, Казахстан. E-mail: gipokrat78@mail.ru.

<sup>10</sup> Профессор кафедры хирургических болезней с курсами кардиоторакальной хирургии и ЧЛХ, Медицинский университет Астана, Казахстан. E-mail: n.igisinov@gmail.com.

## Резюме

**Цель исследования:** Изучить тенденции заболеваемости хроническими болезнями миндалин и аденоидов в Казахстане.

**Методы.** Материалом исследования послужила составленная впервые сводная отчетная форма №12 Министерства здравоохранения Республики Казахстан о новых случаях хронических болезней миндалин и аденоидов (МКБ-10 – J35). В качестве основного метода изучения заболеваемости хроническими болезнями миндалин и аденоидов было использовано ретроспективное исследование. В соответствии с общепринятыми методами биомедицинской статистики были рассчитаны экстенсивные, интенсивные и уравненные показатели заболеваемости хроническими болезнями миндалин и аденоидов.

**Результаты.** За 2009–2018 годы в республике было зарегистрировано 651 934 новых случаев хронических болезней миндалин и аденоидов, из которых у детей – 64,6%, подростков – 9,5% и взрослых – 25,9%. Среднегодовой показатель заболеваемости хроническими болезнями миндалин и аденоидов среди всего населения Казахстана составил  $383,3 \pm 8,1 \text{ ‰}_{0000}$  (95% ДИ=367,4 - 399,1  $\text{‰}_{0000}$ ), а для исследуемых групп населения было: у детей –  $957,3 \pm 23,7 \text{ ‰}_{0000}$  (95% ДИ = 910,9 - 1003,7  $\text{‰}_{0000}$ ), среди подростков –  $847,0 \pm 16,6 \text{ ‰}_{0000}$  (95% ДИ = 814,5 - 879,4  $\text{‰}_{0000}$ ) и взрослого населения –  $142,6 \pm 7,6 \text{ ‰}_{0000}$  (95% ДИ=127,7-157,6  $\text{‰}_{0000}$ ). Разница в частоте встречаемости между группами была статистически значимой. Заболеваемость имела тенденцию к снижению во всех возрастных группах: у детей (T = -1,8%), у подростков (T = -1,1%) и у взрослого населения (T = -5,5%).

**Выводы.** Согласно динамике, заболеваемость хроническими болезнями миндалин и аденоидов в Казахстане имеет тенденцию к снижению. Полученные результаты рекомендуется учитывать органам здравоохранения при принятии управленческих решений.

**Ключевые слова:** хронические болезни миндалин и аденоидов, заболеваемость, возрастные особенности, эпидемиология, тенденции, Казахстан.