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PREVALENCE OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE AS A GLOBAL HEALTH PROBLEM

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Abstract

Introduction. Chronic obstructive pulmonary disease (COPD) is one of the most important problems of modern health care by all over the world [55.67], cause of the prevalence, frequency of complications of this disease and mortality from it constantly increasing. The relevance of COPD is evidenced by the results of modern epidemiological studies, which indicates that over the past few decades, the incidence, mortality and disability rates have increased significantly. [70]. According to publishing journal Lancet in 2020 "Global burden of 369 diseases and injuries in 204 countries and territories in 1990-2019" COPD among all age groups by cause of mortality ranks 6th in the world and 4th in the age group from 50 to 74 years, about 2.8 million people die from COPD annually, which is 4.8% of all causes of death [22.49]. In 2021, it claimed the lives of 3.5 million people, it is approximately 5% of all deaths worldwide.[62] In 2021 it took the lives of 3.5 million people - this is approximately 5% of all deaths in the world.

Thus, due to the increasing of frequency rates, mortality and disability in COPD, this disease is a medical and social problem of modern healthcare.

Objective: to analyze the prevalence and risk factors for the development of chronic obstructive pulmonary disease (COPD).

Search strategy. A literature search was conducted in the following databases: PubMed, Medline, eLibrary, Google Scholar. Search depth was 10 years. 263 sources were found totally.70 publications were selected for analysis. Inclusion criteria: publications in Russian and English, since 2014 to 2024, the results of authentic research, meta-analyses, clinical cases, dissertations on the research topic and sources were found manually; Exclusion criteria: publications without clear formulation of results and conclusions; articles, abstracts with paid access. Several sources published earlier than the given period (1999, 1990) were also taken for analysis in 10 years, due to the content of the necessary data to make comparison.

Results and conclusions. The literature analysis showed that the high prevalence of COPD is becoming a heavy burden for society and is a socio-economic evil for most developed countries.

According to the forecasts of WHO experts, COPD will take the 3rd place among other causes of mortality by 2030 and will overtake mortality from injuries and accidents. Risk factors are the spreading epidemic of smoking,stable environmental pollution and recurring respiratory infectious diseases. According to scientists, COPD is the only disease, the mortality rate from which has increased by 25.5% over the past 10 years. Consequently, COPD is currently becoming a global international health problem**.**

Key words: *epidemiology of COPD, chronic obstructive pulmonary disease, risk factors, smoking, harmful production**.***

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Резюме

РАСПРОСТРАНЕННОСТЬ ХРОНИЧЕСКОЙ ОБСТРУКТИВНОЙ БОЛЕЗНИ ЛЕГКИХ КАК ГЛОБАЛЬНАЯ ПРОБЛЕМА ЗДРАВООХРАНЕНИЯ

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Актуальность: Хроническая обструктивная болезнь легких (ХОБЛ) - одна из важнейших проблем современного здравоохранения во всем мире [55,67], т. к. распространенность, частота осложнений этой болезни и смертность от нее постоянно возрастает. Доказательством актуальности ХОБЛ, являются результаты современных эпидемиологических исследований, которые свидетельствуют о том, что за последние нескольких десятилетий значительно выросли показатели частоты, смертности и инвалидности. [70]. В журнале Lancet опубликованные данные в 2020 г. «Глобальное бремя 369 болезней и травм в 204 странах и территориях 1990-2019» ХОБЛ среди всех возрастных групп по причине смертности занимает 6 место в мире и 4 место в возрастной группе от 50 до 74 лет, ежегодно от ХОБЛ умирает около 2.8 млн человек, что составляет 4.8% всех причин смерти [22, 49]. В 2021 г. унесла жизни 3,5 млн человек – это примерно 5% всех случаев смерти в мире. [62]

Таким образом в связи с возрастанием показателей частоты, смертности и инвалидности при ХОБЛ, это заболевания является медико-социальной проблемой современного здравоохранения.

Цель: анализ распространенности и факторов риска развития хронической обструктивной болезни легких (ХОБЛ)

Стратегия поиска. Поиск литературы проведен в базах данных: PubMed, Medline, eLibrary, Google Scholar. Глубина поиска - 10 лет. Всего было найдено 263 источника. Для анализа были отобраны 70 публикаций. Критерии включения: публикации на русском и английском языках, с 2014 года по 2024 год, результаты оригинальных исследований, мета анализы, клин. случаи, диссертации по теме исследования и источники, найденные ручным способом. Критерии исключения: публикации без четкого формулирования результатов и выводов; статьи, тезисы, имеющие платный доступ. Также были взяты для анализа несколько источников, опубликованных ранее указанного периода (1999, 1990), в 10 лет, поскольку содержали необходимые данные для проведения сравнения.

Результаты и выводы. Анализ литературы показал, что высокая распространенность ХОБЛ становится тяжелым бременем для общества и несет социально-экономическое зло большинству развитых стран мира.

По прогнозам Экспертов ВОЗ ХОБЛ к 2030 году среди других причин летальности будет занимать 3-е место и опередит летальность от травм и несчастных случаев. Факторами риска являются распространяющаяся эпидемия курения, непрекращающиеся загрязнения окружающей среды и повторяющиеся респираторные инфекционные заболевания. По мнению ученых, ХОБЛ является единственной болезнью, летальность от которой, за последние 10 лет, выросла на 25,5%. Следовательно, ХОБЛ в настоящее время становиться глобальной международной проблемой здравоохранения.

Ключевые слова: *эпидемиология ХОБЛ, хроническая обструктивная болезнь легких, факторы риска, курение, вредное производство.*

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Түйіндеме

ЖАһАНДЫҚ ДЕНСАУЛЫҚ ПРОБЛЕМАСЫ РЕТІНДЕ СОЗЫЛМАЛЫ ОБСТРУКТИВТІ ӨКПЕ АУРУЛАРЫНЫҢ ТАРАЛУЫ

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Өзектілігі: Өкпенің созылмалы обструктивті ауруы (ӨСОА) дүние жүзіндегі заманауи денсаулық сақтаудың маңызды мәселелерінің бірі болып табылады [55.67], өйткені бұл аурудың таралуы, асқыну жиілігі және одан болатын өлім-жітім үнемі өсіп келеді. ӨСОА өзектілігін қазіргі эпидемиологиялық зерттеулердің нәтижелері дәлелдейді, бұл соңғы бірнеше онжылдықта сырқаттанушылық, өлім-жітім және мүгедектік көрсеткіштері айтарлықтай өскенін көрсетеді. [70]. Lancet журналында 2020 жылы жарияланған «204 ел мен аумақтағы 369 ауру мен жарақаттың жаһандық ауыртпалығы 1990–2019» ӨСОА өлім себебі бойынша барлық жас топтары арасында әлемде 6-шы және 50-ден 74 жасқа дейінгі 4-ші орында, жыл сайын шамамен 2,8 миллион адам қайтыс болады. өлім [22.49]. 2021 жылы ол 3,5 миллион адамның өмірін қиды, бұл дүние жүзіндегі барлық өлімнің шамамен 5%-ын құрады. [62]

Осылайша, ӨСОА-дағы аурушаңдық, өлім және мүгедектік көрсеткіштерінің артуына байланысты бұл ауру заманауи денсаулық сақтаудың медициналық-әлеуметтік мәселесі болып табылады..

Мақсаты: Өкпенің созылмалы обструктивті ауруларының (ӨСОА) таралуы мен қауіп факторларын талдау.

Іздеу стратегиясы. Келесі дерекқорларда әдебиеттерді іздеу жүргізілді: PubMed, Medline, eLibrary, Google Scholar. Іздеу тереңдігі – 10 жыл. Барлығы 263 дереккөз табылды. Талдау үшін 70 басылым таңдалды. Қосылу критерийлері: 2014 жылдан 2024 жылға дейін орыс және ағылшын тілдеріндегі жарияланымдар, түпнұсқа зерттеулердің нәтижелері, мета-талдаулар, клиникалық жағдайлар, зерттеу тақырыбы бойынша диссертациялар және қолмен табылған дереккөздер; Алып тастау критерийлері: нәтижелер мен қорытындылар нақты тұжырымдалмаған жарияланымдар; ақылы қолжетімді мақалалар, тезистер. Көрсетілген мерзімнен бұрын (1999, 1990 ж.) жарияланған бірнеше дереккөздер де 10 жыл ішінде талдауға алынды, өйткені оларда салыстыру үшін қажетті деректер болды.

Нәтижелер мен қорытындылар. Нәтижелер мен қорытындылар. Әдебиеттерге шолу COPD-ның жоғары таралуы қоғамға ауыр жүк және әлемнің көптеген дамыған елдері үшін әлеуметтік-экономикалық ауыртпалық екенін көрсетті.

ДДҰ сарапшыларының пікірінше, ӨСОА 2030 жылға қарай жарақаттар мен жазатайым оқиғалардан болатын өлім-жітімнен асып түсетін өлімнің үшінші себебі болады. Тәуекел факторларына темекі шегу эпидемиясының таралуы, қоршаған ортаның тұрақты ластануы және қайталанатын респираторлық инфекциялар жатады. Ғалымдардың айтуынша, ӨСОА – соңғы 10 жылда өлім көрсеткіші 25,5%-ға өскен жалғыз ауру. Демек, COPD қазір жаһандық халықаралық денсаулық мәселесіне айналуда.

Негізгі сөздер: *ӨСОА эпидемиологиясы, өкпенің созылмалы обструктивті ауруы, қауіп факторлары, темекі шегу, қауіпті өндіріс.*

Дәйексөз үшін:

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Introduction

Currently, chronic obstructive pulmonary disease (COPD) is the only one of the most common diseases, the mortality rate from which continues to increase, ranking 4th in the structure of mortality in the world. [19] Statistics predict that by 2030, about 4.5 million people could die from COPD and related diseases in the world. [1,26.] About 90% COPD mortality among people under 70 years of age occurs in low- and middle-income countries [55**].**

WHO data for 2019 shows that 212.3 million patients were diagnosed with COPD, 3.3 million patients died, and the DALYs rate was 74.4 million all over the world. WHO data, for 2019 shows that 212.3 million patients worldwide were diagnosed with COPD, 3.3 million patients died, and the DALYs rate was 74.4 million. The prevalence of COPD was 2638.2 per 100,000 people, mortality was 42.5 per 100,000 people [42].

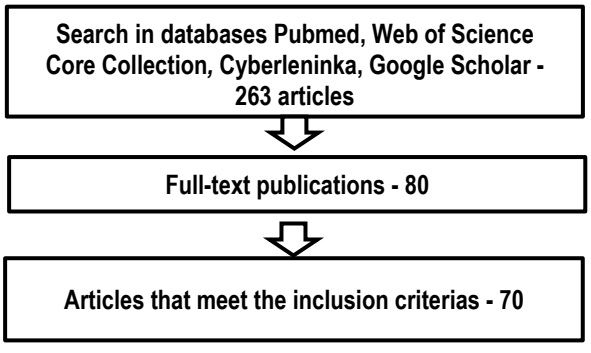
Aim: analysis of prevalence and risk factors for the development of chronic analysis of prevalence and risk factors for chronic obstructive pulmonary disease (COPD)

Search strategy. The study examined full-text publications in English and Russian, which are devoted to the prevalence and risk factors for the development of gestational diabetes mellitus. The following searching mechanisms were used in the literature searching process: Pubmed, Web of Science Core Collection, Cyberleninka, Google Scholar by key words.

Inclusion criteria: the search depth was 10 years: since 2013-2024 years, original full text scientific publications, literature reviews, systematic reviews, WHO guidelines, management of international organizations of health protection, State programs of the Ministry of Health, thematic studies in the field of health policy and economics in open access in English and Russian. Exclusion criteria: publications without a clear formulation of results and conclusions; articles, theses, which have paid access. Several sources published before the specified period were also taken for analysis (1999, 1990), in 10 years, because of they contained the necessary data to carry out the comparison

Picture 1.

Article selection algorithm.



Results of discussion.

Modern characteristics of COPD

According to the definition of A.Chuchalin, chronic obstructive pulmonary diseases (COPD) include a heterogeneous group of pulmonary diseases (bronchial asthma, emphysema, chronic obstructive bronchitis, etc.), which are united by a disorder of the external respiratory function of the lungs of the obstructive type. [36]

Chronic obstructive pulmonary disease (COPD) is the disease which is characterized, persistent airflow limitation that is usually progressive and results from a chronic inflammatory response of the airways and lung tissue to exposure to inhaled noxious particles or gases. Exacerbations and comorbid conditions are an integral part of the disease and make a significant contribution to the clinical picture and prognosis. [54].

COPD is a preventable and treatable disease characterized by persistent airflow limitation (usually progressive) and associated with an increased chronic inflammatory response in the airways and lungs to exposure to noxious particles or gases. [10.].

In the International document “Global Iniatiative on Chronic Obstructive Lung Disease” (Global Initiative for Chronic Obstructive Lung Disease – GOLD, 2023) The following definition of the disease is given: COPD is heterogeneous lung disease, characterized by chronic respiratory symptoms (dyspnea, cough, sputum production) and/or exacerbations due to respiratory pathology (bronchitis, bronchiolitis) and/or alveoli (emphysema), which causes persistent, often progressive airflow obstruction. [52]

Therefore, based on the above mentioned definitions of COPD, as well as the presence of frequent exacerbations and concomitant diseases we can talk about the global medical significance of this disease, both in the clinical aspect and in the organizational aspect of healthcare.

Prevalence of COPD

According to scientific data, there is an increase in the incidence of chronic obstructive pulmonary disease (COPD), which is why this disease is currently becoming one of the most pressing health problems worldwide and is acquiring increasing social significance. Comparing the prevalence of COPD since 1997, it turned out to be so great that it has become a real socio-economic evil for most developed countries of the world. [38,4,7.]. Most deaths (about 90%) from COPD occurs in developing countries, and complications cause about 3 million deaths [54,69].

The prevalence of COPD varies considerably both between countries and between different groups within a country. According to the WHO forecast, in 2020 COPD will take 2nd place among the overall incidence and 3rd place in the mortality structure among all morbidities. [54] 10 million patients with COPD were identified during medical examinations in the United States. At the same time, according to other data, 24 million adults in the United States had a disorder of external respiratory function, which indicates underdiagnosis. The reason for underdiagnosis of COPD is the late seeking of medical care by patients, which results in late detection of the disease. [63]

Statistics from the World Health Organization (WHO) showed that the average prevalence of COPD all over the world is 9.34/1000 and 7.33/1000 among men and women, respectively.

According to the statistics above, for every 30-45 cases of COPD, an average of 5-7 new cases are diagnosed annually. [31].

According to literary data from 2006-2007, there has been a steady increase in the prevalence of COPD [60,47]. The incidence of COPD is steadily increasing throughout almost the entire world. Literary data from authors of the 90s, 2015, 2022 note that the prevalence of COPD is high,

especially in the USA [3,63], in Europe [58, 3, 67], the prevalence rates lower in Korea and China [64,48,] In China, differences were found according to the geographic region, the highest prevalence reported in Southwest China (20.2%, 95% CI 14.7–25.8) and the lowest in central China (10,2%, CI 8,2 – 12,2). Among adults with COPD, 56, 4% (95% CI 53,7 – 59,2) was a mild degree of the disease (GOLD I), 36,3% (34,3 – 38,3) – moderate degree (GOLD II stages), 6,5% (5,5 – 7,4) had severe (GOLD III), and 0,9% (0,6 – 1,1) very severe degree of the disease (GOLD I) [48]. Data obtained from the analysis of the 5th Korea National Health and Nutrition Examination Survey showed that the prevalence of COPD from 2010 to 2012 was 13.7%, The prevalence of the disease has been steadily increasing: in 2010 it formed 12,2%, in 2011 - 13,2%, and in 2012 - 15,5%.[48] and the Russian Federation is no exception [3,].Among the population of the Russian Federation, in contrast to the general morbidity for the period 2002-2006, COPD shows a steady annual growth of at least 10%. [3] According to the official statistics of the Ministry of Health of the the Russian Federation, in Russia the number of COPD patients is approximately 3 million people. However, individual epidemiological studies show a wider prevalence of the disease and some authors claim that the actual number of patients is 16-20 million. [15]

In some literature data the frequency of COPD among adults is 4-15%. [35,52].

According to foreign authors *Davis Adeloye*, *Stephen Chua, Chinwei Lee and others*, who used epidemiologic model of metaregression and gave them an evaluation of about 227,3 million cases of COPD in 1990 among people aged 30 and over, and showed the global prevalence of 10,7% (95% confidence interval (CI) 7,3%-14,0%) in this age group.In 2010 currently, the number of COPD cases increased to 384 million, with global prevalence 11,7% (8,4%-15,0%).

Thus, the increase in COPD was 68.9%, the reason for this was the global demographic changes. [45]

Among WHO regions, the highest epidemiological incidence was in the America (13,3% in 1990 and 15,2% in 2010), and COPD was the leading cause of death from chronic lower respiratory disease, the fourth leading cause of death in the United States in 2016. In 2015 approximately 15.5 million adults aged ≥18 years (unadopted prevalence = 6,3% and age-adapted = 5,9%) announced about the diagnose of COPD. Estimates of the prevalence of COPD at the level of different states range from 3.8% in Utah to 12.0% in the Virginia economy. Corrected according to age the rate of death in a particular state (per 100 000 population) in 2015 hesitated from 15,8 in Hawaii till 64,3 in Oklahoma [44]. Between 1990 and 2010, the highest percentage of COPD was in the Eastern Mediterranean region (118,7%), the next was African region (102,1%), and the European region recorded the lowest growth (22,5%). [45].In 1990 the authors estimated that there was approximately 120.9 million cases of COPD among the urban population (prevalence 13,2%) and 106,3 million cases among rural population (prevalence 8,8%). In 2010 more than 230 million cases of COPD were registered among the urban population (prevalence 13,6%) and 153,7 million among rural population (prevalence 9,7%). [45]

In 2015 a meta-analysis of five spirometric studies showed that in Africa average prevalence of COPD compiled 13,4%, varying from 9,4 till 22,1% [55]. One of the nine researches of meta-analysis conducted in Sub Sahara showed prevalence the disease ranges from 4 to 25% [49,56]. In research of *G.Gashaw and others* where spirometry results showed prevalence of COPD equal to 17,8%.[70]. This observation will be compared with previous studies conducted in Uganda, where the prevalence of COPD was high and the lowest was in the South-East Asia/West Pacific region (8.80%). [61]

In the Cone of Southern countries of Latin America, the overall prevalence of COPD was 9.3%, according to the study. (95 CI 8,4, 10,2%). [47]

Ten countries with the highest number of COPD cases (China, India, Indonesia, the United States, Bangladesh, Japan, Pakistan, Russia, Vietnam and Germany) accounted for 255.4 million (65.2%) of the worldwide COPD cases in 2019. [37]

Global Burden of the Disease research showed that in 2019 who suffered from COPD is 212.3 million people in the world. The largest increase in COPD during the study period was observed in several countries such as Egypt (62%), Georgia (54.9%) and Nicaragua (51.6%) demonstrated the largest increase in COPD during the study period.[65]

From the first half of 2013 to the end of 2015, experts from Ukraine, Kazakhstan and Azerbaijan conducted research on the prevalence of COPD in megacities such as Kyiv, Almaty and Baku, involving 2842 adult participants (964 from Ukraine, 945 from Kazakhstan and 933 from Azerbaijan). [24]. The study used questionnaire and spirometry methods. The results of the survey for this study showed that the prevalence of COPD in Kazakhstan is 13.8 cases per 1000 people, in Ukraine - 10.4 cases per 1000 people, and in Azerbaijan - 4.3 cases per 1000 people. According to the results of the spirometry method, the prevalence of COPD was significantly higher in Ukraine: 31.9 cases per 1000 people, in Kazakhstan - 66.7 cases per 1000 people, and in Azerbaijan - 37.5 cases per 1000 people. [24,14]. According to the study data, a higher prevalence of COPD in Kazakhstan and Azerbaijan was noted in the age group ≥65 years, it means 73.5 and 38.5 per 1000, accordingly. However, in Ukraine, the highest prevalence was observed in the 40–64 age group: 14.8 per 1000.[24] Official statistics from Kazakhstan show that the incidence of COPD ranges from 360 to 500 cases per 100,000 adults. [14]. In 2013 the incidence of COPD was 64.4 per 100 thousand population, in 2014 – 73.5, (increased 9,1%). Among the regions of Kazakhstan, the highest rates were observed in the South Kazakhstan region – 145.5 per 100 thousand population, the lowest – in the Aktobe region – 19.4 per 100 thousand population [16].
While conducting a study using the GOLD questionnaire in the Pavlodar region, it was found that 13.8% of respondents were presumably diagnosed with COPD. Among them, those who is with possible COPD were city residents who made up 10.5%, while those who living in rural areas made up 18.6%. During the study, only survey data were taken into account, without the using of clinical diagnostic studies. [2]

According to the estimates of the Ministry of Health of the Republic of Kazakhstan, the number of patients with COPD in the country is at least 800,000 people, although this figure does not appropriate to the results of international studies - it is significantly underestimated. [14]**.** Official statistic of Kazakhstan shows that the prevalence of COPD remains between 360-500 per 100,000 adults, although according to WHO expert estimates, in real life the amount can be 7-9 times higher. In 2013 the incidence of COPD in Kazakhstan was 64.4 per 100 thousand. In 2014 - 73.5, which is 9.1 higher than the previous year. The highest incidence rate of COPD according to the regions among the population is noted in region of South Kazakhstan, it is 145.5 per 100 thousand people, the lowest incidence rate of COPD is noted in Aktobe region – 19.4 per 100 thousand people [13].

There is also no separate statistical record of mortality due to COPD in Kazakhstan. And it is only known that respiratory diseases take up to 10,000 lives per year [12]

Thus, analyzing the above data, we can say that chronic obstructive pulmonary disease remains a global, pressing problem in the world and also in Kazakhstan for both healthcare and practical medicine. Prevalence and mortality of COPD significantly varies depending on developing and developed countries, according to different social, economic, ecologic and other differences. Statistical data on COPD in the Republic of Kazakhstan record the highest incidence rate of COPD in the South Kazakhstan region - 145.5 per 100 thousand people, the lowest incidence rate of COPD in the Aktobe region - 19.4 per 100 thousand people.

Risk factors

Prevalence according to the age.

One of the risk factors for the prevalence of COPD among others is the age of the population.

According to all literature data, COPD occurs at an age of ≥40, and it should also be noted that, according to some data, up to 50% of patients with COPD are people of working age (40 to 67 years) (A. Chuchalin, 2014). The authors' of the research data, *Davis Adeloye, Catriona Basquill, Angelique Papana and others*, show that in Africans, the difference in COPD prevalence between spirometry and non-spirometry data showed that in individuals aged 40 years and older (13.4%; IQR: 9.4%-22.1%) and (4.0%; IQR: 2.1%-8.9%),with statistical significance (p = 0,001) [46]. According to statistics in 2010, in relation to the corresponding age group (40 years and older), it was 196.4 million people in Africa, the prevalence is approximately 26.3 million (18.5-43.4 million) cases of COPD, similar figures for 2000, based on the same prevalence rates, would be 20.0 million (14.1-33.1), which would imply an increase of 31.5% per decade that can be explained only by the aging of the African population [46].

According to the research data of *G.Gashaw and others* prevalence of determined spirometry of COPD among men 16,6% and women 19,5%) [70]. Research work devoted to the problem of COPD in countries of Latin America among men and women showed high prevalence, men [11,8% (95% CI 0,3, 13,3%)], women [7,3% (95% CI 6,2, 8,3%)] at a fixed ratio. [53]

In Kazakhstan, according to the results of the GOLD questionnaire and demographic data in the Pavlodar region, increase in frequency of COPD was noted in the older age group: 50-59 years – 8%, 60-69 years – 27.8%. [53]

In the Turkestan region, the research was conducted on the problem of the spread of chronic non-communicable diseases among the elderly population, where it was determined that the incidence of COPD among people over 65 was 25.8% of the total number of surveyed respondents.

There are works among scientific data which are devoted to the study of prevalence of COPD among young people. A total of 986 people aged 18 to 44 years (358 men and 628 women) were examined, average age – 28.95±8.2 years. The newly diagnosed COPD accounted for 1.8% of the total number of respondents examined, among which first stage of COPD was detected in 16.7% of patients, the second stage - in 83.3%. The proportion of men was 72.2% compared with women 27.8%. [5] Consequently, COPD also occurs among young people, especially men, which is associated with the spread of smoking and the physiological decrease in respiratory function.

Thus, analyzing the data of the studies included in the review, it can be concluded that the epidemiological prevalence of COPD varies both in different countries and in different age groups within countries. The increased frequency of COPD in older age can be explained by higher exposure to risk factors and a physiological decrease in respiratory function according to the age, which begins at about 30-40 years.

Prevalence by gender.

Comparison of statistical data from studies in developed countries since 1999 shows that gender should be considered as a risk factor for the development of COPD. [60,2] Based on the results of scientific research, we observe a high prevalence of COPD among men, however, there is some research data that show the same prevalence of COPD among men and women. [60,2]

Due to the increase in tobacco consumption among women, there is an increase in the prevalence of diseases among them. Thus, the Global Adult Tobacco Survey (GATS) revealed that 43.9 million people smoke in the Russian Federation: 21.7% women, 60.2% men.

In the most economically and demographically active age group from 19 to 44 years old, 4 out of 10 women and 7 out of 10 men smoke. [11] According to S. Ovcharenko and co-authors (2009), the rapid development of COPD in women is facilitated by the following features: a shorter medical history; development of pathology with a shorter smoking history; the course of the disease with more pronounced dyspnea; decreased tolerance to physical activity; fewer concomitant diseases; worse quality of life parameters than in men; higher survival. [25.]

Totally 60 articles were reviewed with the 127,598 topics of the total sample size. The pooled prevalence of COPD was 15.70% (13.80–18.59%) in men and 9.93% (8.73–11.13%) in women.[61] The pooled prevalence among men aged 30 years and older was 14.3% (95% CI 13.3%–15.3%) compared with 7.6% (95% CI 7.0%–8.2%) in women.[45]

By gender, men had a higher prevalence of COPD compared to women (15.47%; 95% CI 12.22%-19.02% for men 8.79%; 95% CI 6.94%-10.82% for women). Using the LLN criteria, the prevalence of COPD was almost equal in both sexes (8.67%; 95% CI 8.44%–8.90% for men and 8.00%; 95% CI 6.42%–9.73% for women). [32]

In the countries of Latin America and the Caribbean, the prevalence of COPD in the general over 35 years was 8.9%. Among men, the prevalence was 13.7% and among women, 6.7%. [58] In the Southern Cone Countries of Latin America, men had a higher prevalence of 11.8% (95% CI 10.3, 13.3%) than women 7.3% (95% CI 6.2, 8.3%) with a fixed ratio [47].

Smoking as a risk factor. In the context of the progression of the development of unfavorable ecology, the prevalence of tobacco smoking increases and, accordingly, the incidence of COPD and mortality increases. [31,30] The role of tobacco use is one of the main etiological factors of COPD, which has been proven as a result of more than 45 years of studying this problem. [31]

Tobacco smoking is one of the main causes of development and the most studied risk factor for COPD, however, the disease can also develop in non-smokers, the reason for this is still not entirely clear [31,30] Even after adjusting for other respiratory diseases (asthma and tuberculosis), male gender, older age, smoking was the reason of higher prevalence of COPD, obesity and higher education was the reason for the lower prevalence of COPD.[30]The risk of developing the disease while smoking tobacco is 80–90%. [22,30.] The prognostic features of COPD are the following: age at which smoking began, its duration and intensity, the social status of the smokers, which also influence the lethal outcome from this disease.

According to foreign studies, the prevalence among smokers and ex-smokers was 24.3%.[37] The main risk factors for COPD, beside the age are smoking. A cross-sectional observational study conducted from November 2016 to December 2019 by Jia-Xi Duan, Wei Cheng, Yu-Qin Zeng, Yan Chen Shan Cai and others were included 5183 patients with COPD. Interpretation of the results showed that tobacco exposure combined with other risk factors resulted in significantly higher CAT scores (16.0 ± 6.7 vs. 15.3 ± 6.3, P = 0.003) and more severe dyspnea (patients with mMRC ≥ 2, 71.5% vs. 61.6%, P < 0.001) than tobacco exposure only. Additionaly, patients with COPD who was exposed by the smoke of biomass had the highest rates of CAT, than patients who was exposed by the tobacco or occupational exposure only (17,5 ± 6,3 against 15,3 ± 6,3 и 15,2 ± 6,3 accordingly, *P* <0,05 f), and were more likely the women and older. [57].

According to the World Epidemiological Research on Tobacco Consumption among girls aged 13-15, 61.3% of them tried smoking for the first time, and 29.8% were regular users of the tobacco products. [49]. The frequency of active smoking among girls – students of lyceum are 19%, students of vocational schools - 31%, among asocial teenagers (homeless) - 100 [22]. It should be noted that the sifnificant factor of using the tobacco is the passive smoking or exposure of “sidestream smoke” in families. [31].

The most researched factor among others in developing illnesses among women is smoking [22,31]. One of the first sign of lung disease is a cough, therefore during the research the effect of tobacco smoke on the appearance of the sympthom of cough was demonstrated among 232 women cough on the background of smoking was recorded in 53.4% of cases (n = 124), without the smoking factor - in 46.6% (n = 108) [20].

At the *Samara City Polyclinic, the authors V.Lotkova, and A.Dzyubailo* studied a cohort of 107 smoking women of childbearing age with varying degrees of nicotine dependence, who was divided into 2 groups: 53 patients - active smokers who consume passive smoking at home (first group), 54 patients - active smokers without passive smoking (second group). The conducted studies showed that the probability of developing moderate COPD in the first group is in the range of 0.04<P<0.98. Moreover, the gradient of the probability that COPD formulates in different years of smoking increased from 4% in non-smokers 48% in 10 year smoking patients and 98% in 20 year smoking patients, and in the second group, the probability of developing COPD was in the range 0.00<P <1.00. Moreover, the gradient of the probability that COPD will develop with different smoking history increased from 0% in non-smokers to 40% in patients with the smoking history of 10 years and 100% with the smoking history over 20 years. [22]

Thus, based on the presented research data, it can be said that passive smoking, in addition to active smoking, increases the nicotine load with the formation of more pronounced prerequisites for the pathogenetic processes of the development of COPD. Despite the decrease of the probability gradient in developing COPD in the second group, it is possible that the number of cigarettes nicotine load from 10 to 16 cigarettes per day) is to a greater extent the main factor in the development of the disease than in passive smoking. Accordingly the passive smoking, in patients with the smoking history of 11 years, additionally active, accelerates formation of the nicotine addiction which is the prerequisite for the development of COPD. In patients who has 20 years of smoking and more the predominant factor of the developing of COPD becomes the length of smoking [22].

In Japan, the combined effect of 40-years-old air pollution and concomitant smoking on lung function has been studied officially among women because women are more susceptible to the adverse effects of both irritants than men. A total of 655 subjects who live in the 40-years-old air pollution area, and 572 women lived in the area without pollution. Lung function of respondents measured in 2000 so first group with the air pollution (130 smoking and 525 non-smokers; average age 68,4 years), according to the period since 2004 till 2013 the second group is without air pollution (113 smokers and 459 non-smokers; average age 69,0 years). Victims with a smoking history had significantly lower volume of forced exhalation in 1 second (OFV 1% of predicted) (average 74%) and significantly lower OFV 1/increased lung capacity (FEVL) (average 70%), observed in women smokers than non-smokers (P <0.001). Thus, smoking worsens lung function in officially recognized female smokers, despite improvements in air pollution and ongoing medical care. [67] Authors *Kenji Kotaki[1], Hisao Ikeda[2], Takeshi Fukuda* and others in their research work used results of spirometry and medical questionnaires for screening 433 men from the city Omuta, Japan, Interpretation of obtained data showed, that non-smokers had a high estimated prevalence of COPD – 16%. Among smokers groups from 50 till 74 years estimated prevalence of COPD was 29%, in the group >75 years 37%. [59]

Results of the statistics in Canada 2012 of Aboriginal Peoples Survey (APS) data were reported at the work of Yelena Bird and others. The research was conducted among the indigenous population 35 years of age. According to the results, the incidence of COPD was 6.80%. Higher rates were observed in regular smokers (odds ratio [OR] 2,28; 95% confidence interval [95% CI] 1,65–3,14), aged 55 years and over (OR 3,04; 95% CI 2,14–4,30), who had a low socio-economic status also participated at the research which conducted in the Samarkand region among geriatric age groups diagnosed with COPD, where patients were divided into three groups. First group consist of 36 patients with COPD (29 men, 7 women) at the age of 60 to 74 years (average age 66,49±6,09 years). Another group involved 16 patients (14 men, 2 women) at the age of 75 to 89 years (average age 79,2±2,7 years). The control group included 18 patients (15 men, 3 women) at the age from 35 to 55 years (average age 46,1±3,6 years).

The duration of the disease among patients in the first and second group was more than 15 years, and in the third group the duration of the disease was up to 5 years. Among elderly and senile patients, the “Smoking Index” was found in 42 (80.8%), 19 (36.5%) of them were “heavy smokers”. [32]

Authors *E.Alexandrova, G.Ignatova, I.Zakharova and others* during conducting research at the age of 18 to 44, average age – 28,95±8,2 years, the number of smokers with COPD was found significantly higher – 69,2% against 46,5% accordingly. [5]

The survey was conducted among Nizhny Novgorod State Medical Academy (NizhNovSMA) students. The study involved 280 students, including 92 boys and 188 girls (average age 19.8 ± 1.2 years).

The purpose of the survey of students was to determine the smoking status, calculate the smoking index (pack/years), study the reasons and age of starting smoking, and assess subjective manifestations [23]. An analysis of the survey showed that among the students of the Nizhny Novgorod State Medical Academy students, smokers accounted for 18.9% of the respondents. The frequency of smoking among young men (32.6%) was 2.7 times higher than among young women (12.2%).

The results of the scientific research among the students of Nizhny Novgorod State Medical Academy are mainly comparable with the data of different authors, where they characterize the all-Russian situation with the prevalence of tobacco smoking among students, varying from 23 to 32%.

The beginning of smoking among students of Nizh Nov SMA was among the boys 8-9 years, girls 13-16 years, permanent smoking (at least 1 cigarette a week) was noted on average with 14.3 2.7 years.

Thus, according to these data, it can be said that young people generally start smoking at school. The smoking experience ranged from 1 year to 8 years (on average 5.4 ± 2.5 years), the smoking index was 2.6 ± 1.9 packs/year. [5].

The results of the study of lung function as indicators of peak speed of lung (PLV), forced vital capacity (FVC) and cardiac output (CO25) in smokers were significantly lower than in non-smokers ($p = 0.027$; $p = 0.0038$ and $p = 0.002$, respectively). There was also a trend ($p = 0.103$) towards a decrease in FEV1 in smokers compared with non-smokers. In addition, 30.8% of smokers and 8% of non-smoking students ($p = 0.035$) showed a “dip” in the descending part of the flow-volume curve, which is an early sign of broncho-obstructive disorders that precedes quantitative changes in FVD. [31] Researcher *A.Chuchalin (*2008) noted that the beginning of smoking in adolescence leads to a decrease in the age-related increase in FEV1 and “underdevelopment” of this indicator.

From the above data, it can be said that when studying the external respiratory function in a group of smoking students, a decrease in the FVC, PSV, and MOS25 indicators was revealed compared to non-smokers, as well as the presence of subjective symptoms of respiratory tract damage (in 20% of smokers).These data indicate the development of early broncho-obstructive disorders in young smokers.

Thus, the provision of a scientific evidence base contributes to understanding the importance of the role of tobacco smoking in the genesis of COPD development and the fight against it is an important measure for the prevention and treatment of this disease.

Occupational hazards.

COPD is the polyetiological and heterogeneous disease and dust and gases from the industrial environment play a significant etiological role in its development, which have been proven in epidemiological and experimental studies. [8,9,18,]. The proportion of occupational COPD (PCOPD) is 10-15% of cases in the disease structure.[50] It is a steadily progressive, disabling condition with the high probability of an unfavorable prognosis. [8,9] Work in production with harmful occupational factors (dust of various types, chemicals) affecting the respiratory system contributes to the development of COPD in non-smokers and increases the risk in smokers.

According to the authors *G.Prozorov, O.Tudanova and others* (2004), in sheet of rolling production with harmful working conditions of the working group there were 441 workplaces, 39% of them smoking. COPD was detected in 140 surveyed workers, which composed (31,8%). Among the 98% of surveyed workers were smokers. COPD I stage identified in 122 and second stage isin 18. Among workers who had no contact with harmful production factors and did not smoke, COPD was diagnosed in 123 (8.3%), 9 of them were non-smokers. Scientific research was conducted in the main workshops of the Nizhny Tagil Metallurgical Plant (Nizhny Tagil) and the Pervouralsk New Pipe Plant (Pervouralsk), where workers were exposed to industrial dust containing iron oxide, graphite, divandium pentoxide, and mangene oxide. The concentration of these dusts was 2-6 times higher than the permissible limits. Out of 2,053 examined workers, 1,468 (71.5%) of them were selected for the research of external respiration function (EFD). According to the ERF data, COPD was diagnosed in 515 workers who are selected for ERF, which amounted to 35.1%. An average age is 45,9 ± 9,4 years. Among those who suffers from COPD, 480 people (93.2%) were smokers with a smoking index of 21.2 ± 1.2 pack years.[22]

Authors of the research *I.Leshenko, I.Baranova and others (*2004) revealed that COPD of mild severity (stage I according to GOLD) was found in 351 examined people (68.1%) and COPD of moderate severity was found in 123

(23.9%) and 41 people (8.0%) (stages II A and II B, accordingly).

In the research of COPD patients who suffers from an occupational exposure, more severe dyspnea developed who exposed to tobacco only (70.8% vs. 61.6%, P<0.05), than those who exposed to the smoke of biomass only (74.2% vs. 61.6%, P<0.05). This difference stayed significantly even after adjustment for potential factors that may interfere with the treatment. [57]

Not only tobacco smoke, but also occupational dust, chemicals (vapors, irritants and fumes) can themselves cause the development of COPD in women. Among the 49 (16.1%) surveyed women reported that working in conditions of dust pollution for more than 1 year and 21 (6.9%) of them smoked. Prevalence of smoking factor among women who exposed to dust pollution amounted to 42.9%.[21]

Among 49 (16,1%) women, 12 (24,5%) of them were diagnosed violation of bronchial patency, from 21 of smoking women —6 of them (28,6%) had a decrease in indicator FEV1<80% D; among 28 non-smoking women —6 (21,4%). [21]

In addition, COPD patients with occupational exposure developed more severe dyspnea than those who exposed to tobacco alone (70.8% vs 61.6%, P < 0.05), as those who exposed to biomass smoke only (74.2% vs 61.6%, P < 0.05).This difference stayed significant even after adjusting by taking account potential factors, which can interfere with treatment. [21].

The researches of *A.Kuzubova, E.Kiseleva, O.Titova, N.Egorova* studied the influence of risk factors, exactly occupational hazards, on the development of COPD in men of working age in St. Petersburg

The data of 314 men (average age 53.7 ± 3.8 years) was analyzed, 98 men (31.2%) worked in conditions of dust pollution for more than 1 year. In 70 respondents (71.4%), a combination of risk factors (occupational hazards and smoking history) was observed, and 1/3 of respondents had occupational hazards and did not smoke. The data obtained by the authors *A.Kuzubova, E.Kiseleva and others* are consistent with the results of international scientific works. There are 10,000 adults in the III NHANES large-scale research.

Authors *L.Aftanas and others* conducted research on determining the connection between COPD and profession, which was studied at the Department of Occupational Patology of the Novosibirsk Clinical Hospital №2.The data obtained in conditions of exposure to inorganic dust indicating that the professional COPD (PCOPD) differed from the tobacco COPD by high serum concentrations: serous concentration of monocyte-based chemotaxis protein 1 (MCH1) (in patients with PCOPD - 3 times, in workers with normal lung function - 1.5 times), extracellular superoxide dismutase (SOD3) (in patients with PCOPD - 1.9 times, in healthy workers - 1.6 times), fibroblast growth factor 2 (FGF2) (in patients with PCOPD - 6.1 times, in healthy workers - 3.9 times) and 8-isoprostaglandin F2α (8-iso-PGF2α) PGF2α (in patients with PCOPD - 3.6 times). [6]

The development of occupational chronic obstructive pulmonary disease from the action of toxic gases was studied in the research work, where the high serum concentration (HMI) was determined at 3 times, and in workers with normal lung function - 1,5 times, the enzyme of the antioxidant system extracellular copper/zinc-dependent supero sidymo 3 (Cu/ZnSOD 3) in patients with PCOPD and healthy workers - 2 times. , interleukin 1 beta (IL-1β) 11.2 0.39, and in non-sufferers 1.8 0.26, the factor of fibroblast growth 2 (FGF2) (in patients with PCOPD - 3.1 0.68, in healthy workers - 1.5 0.98). [34] Therefore, from both scientific studies we see that patients who exposed to toxic gases and inorganic dust there is an impact on the cellular and molecular mechanisms of COPD inflammation.

Thus occupational chronic obstructive pulmonary disease (COPD) is the severe illness caused by exposure to industrial aerosols, resulting in severe consequences for the body and increasing mortality.

Discussion

The analysis of the literature has shown that the relevance of chronic obstructive pulmonary disease is gaining worldwide global importance both in clinical medicine and in public health. Evidence of this situation is the increasing prevalence and mortality of FOBD. Since 2006-2007 there is the steady development of the prevalence of COPD almost all over the world [60,47] Authors noted that the prevalence of COPD is high, especially in the USA [3,63] in Europe [58, 3, 67], lower prevalence rates are in Korea and China. [64,48] Every year about 3 million people die from COPD worldwide. Researchers predict that by 2030 about 4,5 mln people could die from COPD related with the complications of this disease. [1, 26.]. According to the above mentioned data COPD could be the third cause of the death after cardiovascular and oncological diseases. [26]

The frequency of the prevalence of COPD is observed at the age of 40 and older also it is noted that according to some data up to 50 % of patients with COPD are people of working age (from 40 to 67 years) (*A.Chuchalin*, 2014). The prevalence of COPD among elderly age can be explained by expose of risk factors and the decline of physiological respiratory functions related to the age which starts at about 30-40 years.

Comparing the literature data for 1999,2017 and 2020 the prevalence of COPD among men is higher than among women, as is the risk of gender. [64,58,75.] However, it was noted that the rapid development of COPD in women according to *S.Ovcharenko and co-author* (2009) contribute to the following features of the flow: shorter anamnesis; development of pathology with less smoking age; course of disease with more pronounced shortness of breath; reduced tolerance to physical exertion; fewer associated diseases; parameters of quality of life are worse than in men; higher survival rate [25].

Smoking tobacco is the most researched risk factor of COPD and it should be noted that the disease could be developed in non-smokers. The reason of the prevalence of COPD in non-smokers is not clear still. The risk of the developing of the disease during smoking is 80–90%. [5,31] The prognostic characteristics of COPD are the following: beginning age of smoking, duration and intensity of smoking, social status of smokers, which also affects the death rate from this disease. [3, 23]

The next important risk of developing of COPD is the occupational harmfulness (dust, gas etc.), which affects the

respiratory organs promote the developing of COPD in non-smokers and raise the risk in smokers. The case proportion of occupational COPD(PCOPD) is 10–15 % [50] in the structure of the disease.

Conclusion.

Thus, chronic obstructive pulmonary disease is the polyethiological heterogeneous disease, which characterized by increased frequency and mortality. Important risk factors such as age, gender, smoking and occupational harmfulness play important role in the development of this disease. Therefore, COPD is characterized by the pronounced comorbidity, which determines its relevance.

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