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## CHRONIC OBSTRUCTIVE PULMONARY DISEASE: EPIDEMIOLOGIC ASPECTS

*L.V.Iakovlieva, A.A.Vasylieva, I.E.Kuznetsov, N.O.Matyashova*

National University of Pharmacy

*Key words: COPD; morbidity; mortality; losses*

*The research of the main epidemiologic parameters of chronic obstructive pulmonary disease have been carried out within the study using the analytical method of research of evidence based medicine data bases, namely ACP Journal Club, Cochrane Library, Clinical Evedence, PubMed and others. The results of the research have shown that the main epidemiologic parameters of COPD, such as prevalence, morbidity and mortality vary considerably in different countries and sub-populations within a country and usually depend on the tobacco prevalence. The results of this research have shown that the average prevalence rate of COPD within the general population is registered at the level of 7.6%, while for smokers this index reaches 15.4%. The share of COPD in the structure of respiratory diseases was about 11% in Ukraine within the period of 2007-2011. According to the WHO data chronic obstructive pulmonary disease took the fourth position among TOP-10 causes of death in the world – 5.8% of all lethal cases in 2011. Lethality of COPD is about 60% of the total lethality cases in Ukraine. At present COPD is one of the main causes of morbidity and lethality all over the world, which results in a great economic and social loss. According to the WHO by 2020 COPD will have taken the fifth place in the world by the level of economic and social damage.*

Chronic obstructive pulmonary disease (COPD) is a primary chronic inflammatory disease affecting mainly the distal parts of the respiratory tract and lung parenchyma with formation of emphysema, bronchial patency obstruction with partially or completely irreversible bronchial obstruction development caused by the inflammatory response [3].

COPD is not curable, but preventable. The primary cause of COPD is tobacco smoke (including breathing in the secondary tobacco smoke, or passive smoking). At present the disease affects men and women almost equally, partly, due to increased tobacco use among women in high-income countries [7]. Other risk factors include:

- indoor air pollution (e.g., the use of solid fuels for cooking and heating);
- atmospheric air pollution;
- the presence of dust and chemicals at workplaces (vapours, irritants, and fumes);
- frequent infections of the lower respiratory tract in childhood [5].

The pathogenesis of COPD includes chronic inflammation of the

airways, parenchyma and pulmonary vessels; imbalance of protease / antiprotease systems in lungs; oxidative stress (imbalance of oxidants / antioxidants, increase of the amount of oxidants).

Chronic inflammation leads to remodeling and narrowing of the small airways (bronchial tubes and bronchioles with the diameter of < 2 mm), which causes the fixed airway obstruction, pulmonary parenchyma destruction, destruction of the alveoli attachment to the small bronchi, decrease of elastic rebound of the lungs, and it reduces the ability to keep the airways open during exhalation [9, 11].

Peripheral bronchial obstruction, parenchyma destruction, and pulmonary vascular lesions reduce the ability of the lungs to adequate gas exchange, the ratio of ventilation – perfusion increases, first hypoxemia develops and then hypercapnia. Hypoxemia at early stages appears with physical load, later it is observed at rest. Hypersecretion of mucus, squamous metaplasia of the ciliated epithelium is likely to disrupt the mucociliary clearance. At advanced stages of COPD, at stage IV, pulmonary hy-

pertension develops, usually because of severe hypoxemia development ( $\text{PaO}_2 < 8.0 \text{ kPa}$  or 60 mm Hg), often on the background of hypercapnia. This is a major cardiovascular system complication of COPD directly associated with a poor disease prognosis [13,4].

The World Health Organization predicts that unless urgent measures are taken to reduce the major risk factors for COPD, especially reducing tobacco use, the total deaths from COPD in the next 10 years will increase by more than 30% [7].

### Materials and Methods

In the course of the research the analytical method was used to study the evidence-based medicine databases, namely ACP Journal Club, Cochrane Library, Clinical Evedence, PubMed, Best Evidence, UpToDate, Evidence-based-medicine (OVID), Scientific American Medicine with the purpose to review and analyze the basic epidemiological characteristics of chronic obstructive pulmonary disease worldwide and in Ukraine, in particular.

### Results and Discussion

*Prevalence rate.* As the evaluation of the COPD prevalence in

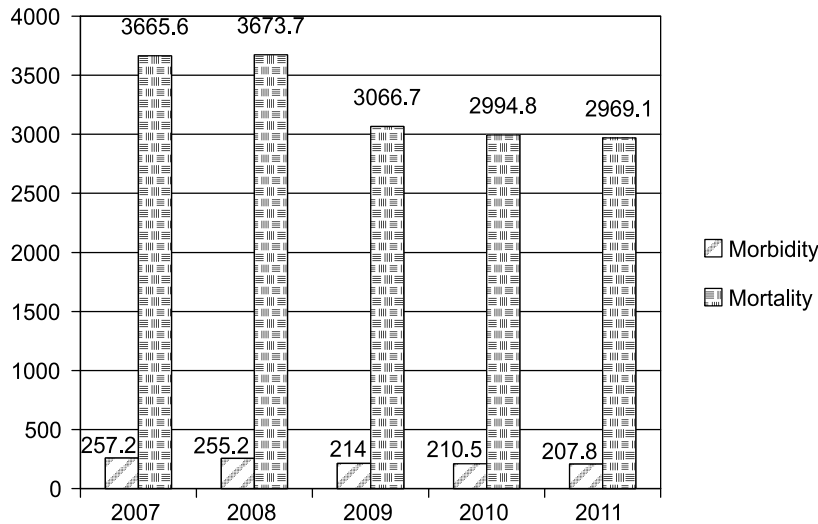


Fig. 1. The COPD prevalence and incidence per 100 000 of the adult population in Ukraine in 2007-2011

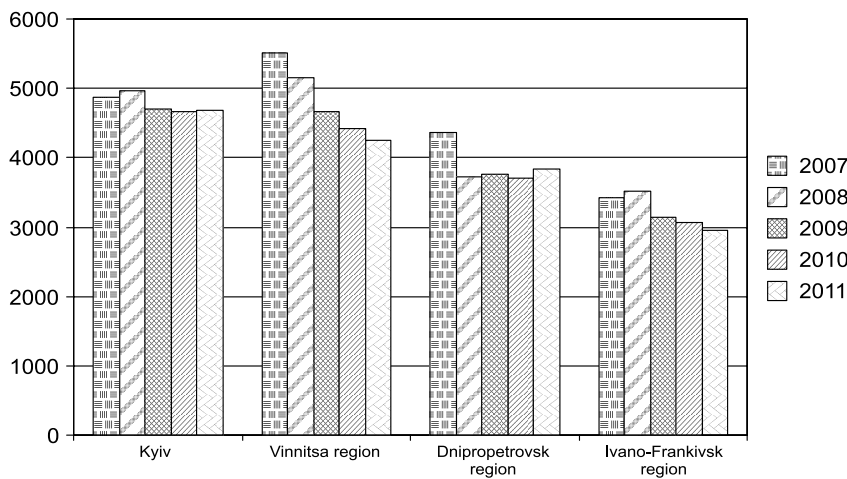


Fig. 2. The COPD prevalence in some regions of Ukraine in 2007-2011 among the adult population

epidemiological studies are often based on the expert opinion or diagnosis made only on the basis of the medical examination, one cannot exclude that the actual values of the COPD prevalence are higher than those indicated by official health sources. For example, according to the USA National Health and Nutrition Examination Survey III, 70% of patients with COPD identified during the study in the USA did not have that diagnosis before [6]. As a result of the study conducted in Spain (IBERPOC study, 2000) it was reported of 78% of patients with symptomatic COPD whose disease had not been previously diagnosed, and only 49% of patients with signs of severe COPD received some treatment [12].

By the experts' estimates 64 million people worldwide suffered from COPD in 2004. According to the data of international studies the prevalence of COPD is 9-10% among people over 40 years old. Among smokers this figure reached 15.4%, while the average prevalence of COPD in the general population was 7.6% [6, 1].

According to the results of epidemiological studies in Ukraine in the period from 2007 to 2011 the proportion of COPD in the structure of respiratory diseases

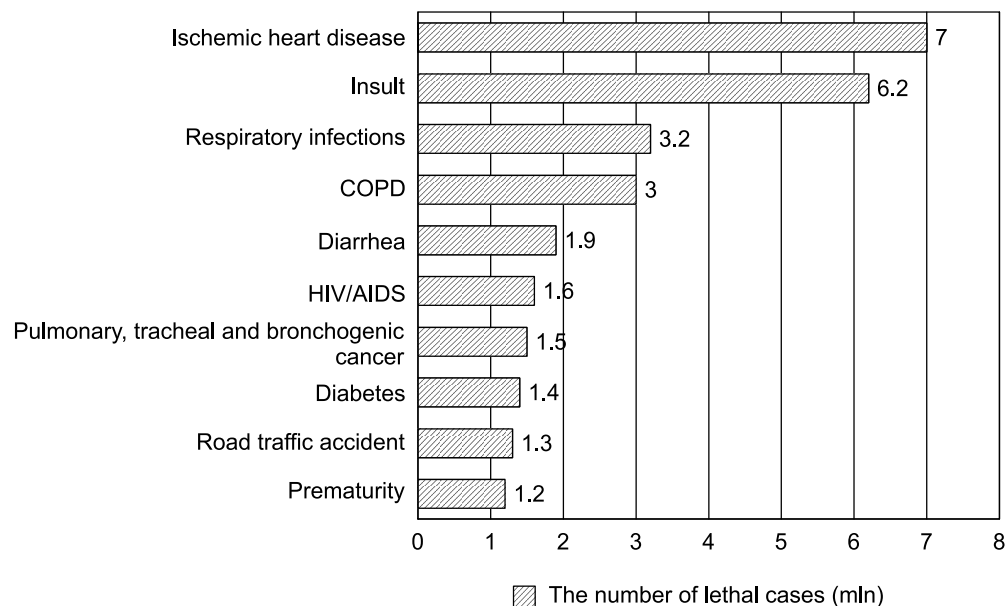


Fig. 3. Ten leading causes of death in the world according to the WHO (in millions, 2011)

Table

**Expenses for chronic obstructive pulmonary disease patients in Europe and in the USA  
(according to R. Chapman et al., 2006)**

Author	Country	Type of expenses	Price per a patient a year	The total price of the disease per year
Hilleman, 2000	USA	Direct	Stage 1 – 1681 USD Stage 2 – 5037 USD Stage 3 – 10812 USD	
Jacobson, 2000	Sweden	Direct and indirect		Direct – €109 mln Indirect – € 541 mln
Rutten van Molken, 2000	Netherlands	Direct	876 USD	
Dal Negro, 2002	Italy	Direct	Stage 1 – 151 € Stage 2 – 3001 € Stage 3 – 3912 €	
Jansson, 2002	Sweden	Direct and indirect	1284 USD	
Miravittles, 2003	Spain	Direct	Stage 1 – 1185 € Stage 2 – 1640 € Stage 3 – 2333 €	€ 427 mln
Masa, 2004	Spain	Direct	909 €	€ 238 mln

was about 11% [2] with the reducing tendency of prevalence and incidence rates in the period studied (Fig. 1).

Thus, in 2011 the prevalence of COPD compared with 2007 decreased by 20%, while in developed countries the values rapidly grew. The prevalence of COPD in 2007-2011, which exceeded the average level in Ukraine, was observed in Kyiv, Vinnytsia, Dnipropetrovsk, Ivano-Frankivsk (Fig. 2) and some other regions of Ukraine. For example, in the Vinnytsia region and Kyiv in the specified period the prevalence rates were almost 1.5 times above the ave-

rage in Ukraine, in the Dnipropetrovsk region – 1.2 times, and in Ivano-Frankivsk – 1.1 times [2].

In this country such regularity may be explained by the absence of active detection of patients with this pathology, lack of apparatuses for studying the respiratory function, as well as the absence of periodic health examination of these patients.

*Mortality rate.* Mortality rate is the most objective characteristic of epidemiological significance of the disease. The COPD mortality over the past decade has been steadily increasing as opposed to the mortality from cardiovascular

diseases and many other chronic diseases. Approximately 2.7 million people worldwide died of COPD in 2000, it is 0.5 million more than in 1990. In 2005 about three million people died of COPD, it was 5% of all deaths in the world that year [10].

According to the World Health Organization data, in 2011 COPD ranked the fourth position in the top 10 causes of death in the world; the number of deaths was 3 million (Fig. 3), it was 5.8% of all deaths in 2011 [7].

In Ukraine mortality from COPD takes a significant place in the structure of the total mortality from respiratory diseases (about 60%). In the period from 2007 to 2011 there was a tendency of mortality decrease from this disease (Fig. 4). In 2011 mortality from COPD in Ukraine compared with 2007 decreased almost to 40% [2].

*Economic damage.* COPD today is one of the major causes of morbidity and mortality worldwide resulting in a significant economic and social loss. According to the WHO data COPD will have taken the 5-th place in the world in terms of socio-economic damage by 2020. In recent years the research aimed at assessing the

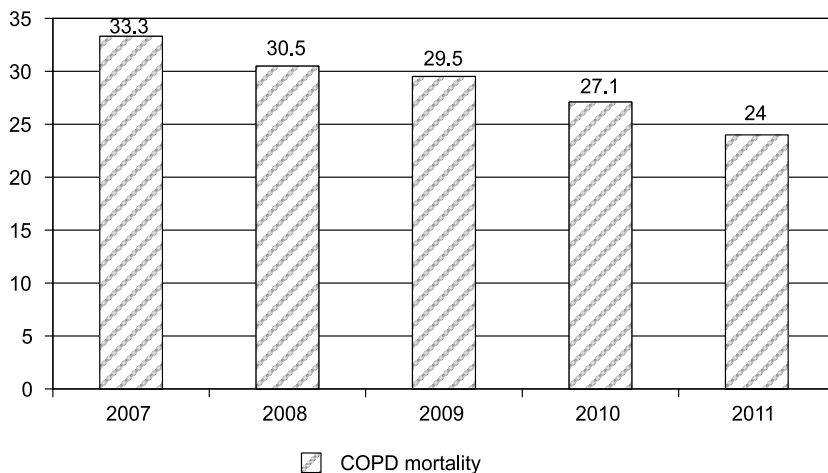


Fig. 4. The COPD mortality among adults in the period of 2007-2011

damage caused by COPD to the patient himself and the society in general has become of current concern. The results of studies of the COPD cost in different countries are shown in Table [8].

In Spain the direct expenses per a patient with COPD from the time of diagnosis to death were on the average 27,500 €. In patients with a mild or moderate degree of the airway obstruction they were 9730 € (with survival of 13.9 years) compared to patients with severe COPD – 43785 € (with survival of 10 years) [6].

In Sweden where total damage caused by COPD was about € 650 million per year 30% of all

funds were spent on 4% of patients with severe COPD, while only 29% of all funds were spent on 83% of patients with a mild course of the disease [16].

In the United States direct medical costs ranged from 1,681 \$ per year for patients with a mild form of COPD to 10,812 \$ per year for patients with a severe course of the disease [14]. The average cost of hospitalization for a patient with severe course of the disease is estimated as 7100 \$, in Sweden it is 2375 € [10].

Considerable variation in the cost of the disease reflects the level of economic development in different countries. In developed

countries a day bed in the hospital is considered to be more expensive, in the developing economies it is the cost of drugs, and in some cases transporting patients [15].

#### CONCLUSIONS

Prevalence, morbidity and mortality caused by COPD vary considerably in different countries and sub-populations within a country and usually depend on the tobacco prevalence.

Chronic obstructive pulmonary disease in terms of morbidity and mortality is a significant health and social problem and is considered to be the disease of the century along with CHD.

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#### ХРОНІЧНА ОБСТРУКТИВНА ХВОРОБА ЛЕГЕНЬ: ЕПІДЕМІОЛОГІЧНІ АСПЕКТИ

Л.В.Яковлєва, А.А.Васильєва, І.Е.Кузнецов, Н.О.Матяшова

Національний фармацевтичний університет

Ключові слова: ХОХЛ; захворюваність; смертність; збитки

У ході дослідження був проведений огляд основних епідеміологічних характеристик хронічної обструктивної хвороби легень (ХОХЛ) за допомогою аналітичного методу вивчення баз даних доказової медицини, а саме: АCP Journal Club, Cochrane Library, Clinical Evidence, PubMed та інших. Результати дослідження показали, що основні епідеміологічні параметри ХОХЛ, такі як поширеність, захворюваність, смертність значно різняться не тільки в окремих країнах, а й у підгрупах населення всередині однієї країни і носять пряму залежність від поширеності тютюнопаління. Згідно з результатами дослідження встановлено, що середня поширеність ХОХЛ у загальній популяції реєструється на рівні 7,6%, в той час як серед курців цей показник сягає 15,4%. В Україні в період 2007-2011 рр. питома вага ХОХЛ у структурі хвороб органів дихання становила близько 11%. За даними ВООЗ ХОХЛ у 2011 р. посіла четверту позицію серед ТОП-10 причин смерті у світі – кількість смертельних випадків

складає 5,8% від усіх смертельних випадків 2011 року. В Україні на смертність від ХОХЛ припадає близько 60% від загальної кількості випадків. ХОХЛ на теперішній день є однією з найважливіших причин захворюваності і смертності по всьому світу, що призводить до істотних економічних і соціальних збитків. За даними ВООЗ до 2020 р. ХОХЛ займе 5-е місце в світі за рівнем соціально-економічних збитків.

## **ХРОНИЧЕСКАЯ ОБСТРУКТИВНАЯ БОЛЕЗНЬ ЛЕГКИХ: ЭПИДЕМИОЛОГИЧЕСКИЕ АСПЕКТЫ**

*Л.В.Яковлева, А.А.Васильева, И.Э.Кузнецов, Н.А.Матяшова*

*Национальный фармацевтический университет*

*Ключевые слова: ХОБЛ; заболеваемость; смертность; убытки*

*В ходе исследования был проведен обзор основных эпидемиологических характеристик хронической обструктивной болезни легких (ХОБЛ) с помощью аналитического метода изучения баз данных доказательной медицины, а именно: ACP Journal Club, Cochrane Library, Clinical Evidence, PubMed и других. Результаты исследования показали, что основные эпидемиологические параметры ХОБЛ, такие как распространенность, заболеваемость, смертность сильно разнятся не только в отдельных странах, но и в подгруппах населения внутри одной страны и имеют прямую зависимость от распространенности табакокурения. В результате исследования установлено, что средняя распространенность ХОБЛ в общей популяции регистрируется на уровне 7,6%, в то время как среди курящих этот показатель достигает 15,4%. В Украине в период 2007-2011 гг. удельный вес ХОБЛ в структуре болезней органов дыхания составил около 11%. По данным ВОЗ ХОБЛ в 2011 г. заняла четвертую позицию среди ТОП -10 причин смерти в мире – количество случаев составило 5,8% от всех смертельных случаев 2011 года. В Украине на смертность от ХОБЛ приходится около 60% от общего количества случаев. ХОБЛ на сегодняшний день является одной из важнейших причин заболеваемости и смертности по всему миру, что приводит к существенному экономическому и социальному ущербу. По данным ВОЗ к 2020 г. ХОБЛ займет пятое место в мире по уровню социально-экономического ущерба.*

Address for correspondence:

12, Melnikov str., Kharkiv, 61002, Ukraine.

Tel. (57) 706-23-46. E-mail: FEKnfaU@ukr.net.

National University of Pharmacy

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