

REVIEW ΑΝΑΣΚΟΠΗΣΗ

The asthma epidemic and its socioeconomic impact on primary health care management “The relationship between public health and public policy”

Asthma is a global public health problem characterized by a chronic inflammation of the airways, affecting all age groups. It is estimated that 334 million people worldwide are currently concerned and the number could increase by an additional 100 million in 2025. While some analysts had speculated that the death rate from asthma would decrease, initial data indicates an increase which has led to significant morbidity, resulting in a measurable and sustained increase in emergency room visits, as uncontrolled asthma has been known to have serious consequences on patients' health and has been estimated to cause greater numbers of cases of disability in asthma patients. As supported by current medical literature, bronchial asthma affects all ages and has an increasing incidence in many developing countries, while asthma exacerbation is known to cause significant social, psychological problems to patients and increases health costs. Studies confirm that air pollution can worsen asthma symptoms, while epidemiological studies report that long-term exposure to air pollution is often associated with adverse symptoms such as wheezing, productive cough, accompanied by expectoration. This particular study highlights first, the social burden of the effects of asthma on society. Second, it also exposes the financial burden as an important measure of its impact on society. During the COVID-19 period, asthma costs have been shown overall to be increasing while various measures and cost savings measures have been implemented as disease control declines, through proper management of asthma patients, strengthening the link between public health and public policy. Targeted education of asthma patients is important in primary health care (PHC) and can be attributed to better compliance and treatment efficiency in PHC, leading to better compliance and treatment effectiveness.

1. INTRODUCTION

Asthma is known to be one of the most common non-communicable diseases, with a significant impact on health and well-being of the population. However, there is a higher prevalence in women during puberty, and the most severe cases of asthma are more common in women than men.¹ The morbidity and reduced quality of life of the people suffering of asthma is equally important. Asthma exacerbation consumes significant resources and leads to a large number of visits to emergency departments, while improved control of the disease leads to a reduction in healthcare costs.² Gender differences are arguably multi-

factorial and includes hormonal differences, environmental factors, cultural factors and biological gender differences that affect live genetics, immunity and lung function.³ A study showed that the lack of access to primary structures of care and the flawed adherence to preventive medication contributed significantly to deaths of a large proportion of patients. In addition, the patients assessed access to PHC as poor, as it was associated with exacerbation of asthma and admission to a hospital to resolve emergency situations.⁴

The Greek law 1397/1983⁵ on the “National health system (NHS) and other provisions” is the basic law that established the operation of the Greek NHS. The public

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E. Stamatopoulou,^{1,2}
A. Stamatopoulou,¹
E. Papageorgiou,¹
F. Chaniotis,¹
D. Chaniotis¹

¹Department of Biomedical Sciences,
School of Health and Welfare Sciences,
University of West Attica, Athens

²Emergency Department of Internal
Medicine, Infections Disease Office
and Outpatient's Examination Room,
“KAT” General Hospital of Attica,
Athens, Greece

Η επιδημία του άσθματος
και οι κοινωνικοοικονομικές
επιπτώσεις του στη διαχείριση της
πρωτοβάθμιας φροντίδας υγείας:
«Η σχέση δημόσιας υγείας και της
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Περίληψη στο τέλος του άρθρου

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health policy dialogue is part of the Greek Government's broader health care reform agenda, which is supported by the European Commission and the World Health Organization (WHO). Two of the key issues concern the creation of a public health package as part of the services offered by the new primary health care network.⁶⁻⁸ According to Law 4486/2017 on the reform of PHC,⁹ emergency regulations, the competence of the Ministry of Health and other provisions (article 1), it is stated that *"the state has the responsibility to provide free universal health coverage and quality services, with respect to the rights and needs of the population"*. The death rate from asthma has not decreased in recent years.¹⁰

It is widely accepted that the majority of deaths, as well as hospital admissions, are proportionally related to the prevention of risk factors.¹¹ For example, the good practices of the pulmonology clinic of the model Health Center (HC) of Peristeri, Attika, highlight the policy of re-orientation of PHC. The pulmonology clinic operated with high standards, with a vision of developing an organized dynamic system, according to the national health policy. Emphasis was placed on the quality of primary care, as respiratory problems concern a major public health problem for society. The pulmonology unit created a strategy both for prevention and for providing education on respiratory problems in the health sector. This strategy was implemented in collaboration with the Hellenic Center for Diseases Control and Prevention (HCDCP), today known as the Hellenic National Public Health Organization (EODY), the Municipality of Peristeri, the schools and the Ministry of Education. The measurement of improvement referred to the introduction of the concept of prevention and there has already been a 30% increase of patients visiting the HC of Peristeri for preventive measures. The dynamics of the pulmonology clinic in terms of innovation and quality of services provided in a short period of time revealed benefits for patients. This fact had significant financial cost reduction benefits for the health care system in terms of strengthening the role of primary care, and demonstrating the importance of quality innovative actions.¹²

2. DEFINITION AND SYMPTOMS

Asthma is a chronic inflammatory disease of the airways which causes hyperactivity, resulting in the appearance of episodes of hissing, dyspnea, shortness of breath, discomfort in the chest and cough, resulting in bronchospasm. Inflammation causes bronchial hyperactivity, which is fully reversible either automatically or after treatment.¹³ In addition, recurring episodes of respiratory symptoms

appear such as coughing, wheezing, chest tightness and shortness of breath. The symptoms can be characterized as the top of an iceberg dominated by: (a) The blockage of airways, (b) bronchial hyper-responsiveness, and (c) the inflammation of the airways.¹⁴ Not all patients have the same symptomatology, which may vary depending on the different seasons of the year, or even be permanent. In particular, the intensity of the symptoms varies from mild to severe, significantly limiting the patient's daily activities.¹⁴ Symptoms usually occur episodically, and are sometimes reversible. They worsen at night or early in the morning, during spring and autumn, after viruses or after exposure to irritants in the environment, as well as after exercise.¹³

Most patients with asthma have one or more comorbidities. In >80% of asthma patients, rhinitis or nasosinusitis is reported and this relationship becomes stronger as the severity of the disease increases. The main symptoms of nasal polyps are nasal obstruction (varying degrees). When the disease is impaired, patients find that there is a gradual loss of odor and taste. Some patients suffer more from the loss of smell than from nasal obstruction. In a large number of patients, the symptom of chronic rhinitis (usually non-allergic) is preceded several years before the development of nasal polyps.¹⁵ The incidence of nasal polyposis is increasing due to an increase in respiratory diseases in westernized countries, the availability of more precise diagnostic instruments, and a greater awareness of the relationship between the upper and lower airways. In general, nasal polyposis is three times more common in males than in females, but the sex incidence is equal in patients with asthma.¹⁶ Furthermore, restoration of nasal function will usually improve the patient's asthma.

It is not only the upper airways which significantly affect asthma control, but also the risk can be increased by the sensitivity to food allergens. Recent evidence suggests a direct relationship between the skin barrier dysfunction of dermatitis and airway inflammation. A third important link between systematic inflammation and asthma is the neuro-immunological network.¹⁷ The respiratory system is under the effect of other comorbidities associated with the gastrointestinal tract (food sensitization, intestinal inflammation), the skin (eczema, dysfunction barrier), as well as the nervous system (neuro-immune-logical network, cognitive dysfunction). Stress and depression are common in patients with asthma and allergy. The neuroendocrine response to biological stress affects various bodily functions, including in the airways, which will be an important research field in the near future.¹⁷

According to recent studies, psychosocial problems can be attributed to inadequate asthma control. The psychoso-

matic problems are risk factors for exacerbation of asthma, even if the symptoms are adequately controlled. Psychological stress affects the appearance of bronchial asthma, while intense stress has been characterized as a causative factor exacerbation of the disease. Fifty percent of patients with asthma had been diagnosed with one of the following diseases: irritable bowel syndrome, dermatitis, depression, panic disorder. Common symptoms of asthma, as well as the separate effect of stress, in combination with strong feelings about asthma cause exacerbation, confirming the view that asthma can be considered as a psychosomatic disease.¹⁸ A bad mood or stress may affect asthma. For example, when a person shows anxiety or is in a bad mood there is a change in the state of health, such as (a) reduced ability to cope with the disease, (b) reduced asthma control and (c) increased anxiety or fear about asthma symptoms. The inadequate treatment of asthma, with the frequent consequence of onset of symptoms and delay in finding treatment, result in the most unfavorable outcomes, such as (a) the increase in symptoms, (b) the decrease in lung function, (c) exacerbations of asthma and (d) increased mortality. The aftermath of these is the negative course disease feedback and psychological disorder.¹⁹

3. EPIDEMIOLOGY

The 61st session of the World Health Assembly of the World Health Organization (WHO) reported that *“any discussion of health development should include chronic non-communicable diseases (including chronic respiratory diseases)”*, and that *“heart disease and cancer rank as major killers throughout the world, regardless of a country’s income status, while diabetes and asthma are increasing everywhere”*.²⁰ Additionally, it is stated that *“chronic non-communicable diseases cause a greater burden to patients, representing more than half of global mortality and global morbidity”*.²¹

The highest prevalence rates of asthma in adults aged 18–44 years are reported in Sweden (a percentage of 20.62%) followed by the United Kingdom (17.84%) and the Netherlands (15.41%).²² It is estimated that 7–10% of people suffer from asthma, but the frequency varies significantly between countries. In western countries it is more frequent, but an important role is played by genetic, social and environmental factors. A higher percentage is reported in countries with an average or low income, while asthma symptoms are more common (up to 20%) in Great Britain, in Ireland, Australia, and New Zealand and less common (2–3%) in eastern Europe, Indonesia, Uzbekistan, India and Ethiopia.²³ By 2025, asthma sufferers are expected to have

increased by 100 million.²⁴ The highest admission rates in hospital for adult men and women with asthma, aged ≥ 15 years, have been observed in Slovakia (163.29%) followed by Spain (89.72%) and the United Kingdom (77.74%).²²

Asthma affects people of all ages and both genders and is the most common disease of the lower respiratory tract. In many countries, its impact increases especially in children and particularly more often in boys in childhood and in women after adulthood. Asthma affects the performance of children at school, as well as their parents at work due to a decrease in productivity. About 10% of asthma cases occur due to or in the workplace. It is a major cause of absence from school or work due to the loss of working hours and learning. In a schoolroom of 30 students, it is possible that three will develop asthma. The global incidence of asthma is 300,000,000 people, while it is increasing by 50% every decade, with the percentage today being at 7–10% and 250,000 people dying from asthma every year.¹⁴ The frequency of asthma increases with age. In the 0–9 age group the frequency is 3.79%, in the 10–18 age group 7.89%, in the 18–44 group 8.80%, in the 45–69 group 9.12%, while in the >70 years age group the frequency rises to 11.76%. This increase can be attributed to possible underdiagnosis of asthma in childhood, but also in the overdiagnosis of asthma in the older age group, where it is possibly confused with chronic obstructive pulmonary disease (COPD).²³ For the elderly, it is a serious illness, as it causes limitations to daily life, especially if it remains without medical treatment.²⁴ It is argued that mortality is not related to the incidence of the disease. The symptoms are often more intense during the night, resulting in the awakening of patients, and usually recede automatically by inhaling a pharmaceutical. In other cases the symptoms may worsen in hours or even minutes, leading to a more severe obstruction of the air-flow and a deterioration of asthma, which is relieved only with additional drugs.²²

Asthma is observed in all countries, regardless of the level of development and income. The prevalence of the disease in Greece is more frequent in Attica and in Crete (percentage 10–15%), followed by the northern regions and islands (5–10%). Differences may be due to climate of the various areas, but also to the different exposure of people to its irritants and environmental allergens. A recent nationwide epidemiological study, in which 2,632 people participated, showed that 8.6% of the general population in Greece suffers from asthma.²³ Asthma still constitutes a large problem in terms of hospitalizations and deaths. An asthma responsibility group, comprised of doctors, trained nurses and pharmacists in PHC plays an important role in asthma care.²⁵

Asthma deaths could be avoided with better basic care.²⁶ The primary aim is to understand the circumstances of asthma deaths, in order to identify the factors that can be avoided and make recommendations to improve care and reduce their number.²⁷ Regarding patients' perceptions of risk factors, it is reported that (a) patient self-management should be encouraged, (b) a history of smoking or exposure to passive smoking should be documented in medical records of all persons with asthma, (c) parents and children, as well as those who care for patients or teach, should be trained in asthma management, and (d) emphasis should be placed on efforts to minimize exposure to allergens, especially in young people with asthma. Three out of five patients are still not receiving basic asthma care. The provision of basic care by health professionals helps stop asthma seizures, as patients are not required to seek hospital care.²⁷

The annual asthma care survey in United Kingdom reports that 3.24 million people still do not receive the basic level of care. In particular, the uncontrolled asthma for the years 2014–2018 had amounted to 81%. The level of asthma control is a good measure for determining how it has affected people's lives. The prevalence of emergency treatment (due to exacerbation) over the last 12 months is 25% on average for all age groups.²⁶ Asthma care needs to be improved with innovation and collaboration. Wales has the lowest level of basic asthma care (32% rate), whereas Northern Ireland has the highest (50%).

The evidence shows that the effort to prioritize respiratory diseases has led to some improvement in the lives of people with asthma, as this practice appears to exceed 50% of the basic level of health care. Given that many asthma attacks require emergency admission in hospital, only 37% of adults and 19% of children had the ability to self-manage exacerbation of asthma. The existence of people suffering from asthma and are less able to self-manage it highlights the need for a more effective intervention of health professionals.²⁶

According to the Asthma and Allergy Foundation of America, the top risk factors for asthma are poverty, lack of health insurance, air pollution, poor indoor air quality (poor housing quality), pollen, smoking (cigarettes, cigars, vapes), lack of access to specialists, asthma quick-relief medicine use and asthma control medicine use, as well as high numbers of prescriptions for asthma medicines can indicate a larger population managing persistent asthma or more frequent severe or uncontrolled asthma.²⁸

4. INCIDENCE AND COST

Each year in the United Kingdom (UK) there are approxi-

mately 75,000 emergency admissions for asthma attacks. In 2020, 33% of the patients had a follow-up appointment, compared to 34% in 2019. It is noteworthy that this level of care was maintained in today's unprecedented conditions, where the people with asthma had an incredibly difficult year due to the threat of COVID-19. Living with stress under lockdown conditions, is a challenge for their mental health, as their care has been disrupted. The COVID-19 pandemic has caused an unprecedented restriction to care from the National Health Service (NHS). Except for primary care appointments that are done remotely, patients' scheduled appointments in hospitals were also affected. For people with asthma, their routine monitoring was cancelled, as they had to adapt to the changing conditions of the pandemic. More than half (57.2%) of patients with asthma had a telephone appointment with a general practitioner, and 18% had a phone appointment with the hospital. The pandemic requires the acceleration of efforts to establish distance care; however, almost half of the patients with asthma (rate 47.7%) stated that the care that received from a distance was not of the same quality as the care by physical presence.²⁹

Recent data from the United States of America (USA) showed that the medical expenses attributed to asthma were higher for patients with markers of uncontrolled disease, compared to those who did not had asthma. People with uncontrolled asthma, compared to those without asthma, had up to 4.6 times greater frequency of hospitalization ($p < 0.01$), up to 1.8 times higher number of emergency department visits incidents ($p < 0.01$) and lower productivity (unemployed, more days absent from work and more activity limitations) ($p < 0.01$). In the 28 countries of the European community, it was estimated that there are >30 million asthmatics aged 15–64 years, representing a total expenditure of >20 billion €. ³⁰

Managing patients with severe asthma during the coronavirus pandemic is a challenge. COVID-19 affects people with underlying conditions, and severe asthma is no exception. Recent reports claim that in the US asthma is much more common in children and adults with COVID-19 compared to China and Europe. Patients with COVID-19 show respiratory symptoms from mild to severe, while a significant percentage of patients present with an acute syndrome respiratory distress. Asthma and COPD may not be common comorbidities. In the US, of the 24 patients with COVID-19 that were admitted to an intensive care unit (ICU), 14% had asthma as a co-existing disorder. There is no clear evidence that patients with asthma are undergoing a greater risk of contracting SARS-CoV-2. However, patients with controlled asthma may present exacerbation of the disease in the context of a viral infection.³¹

It is claimed that annually in the US, between 2002 and 2007, each person with asthma cost about \$ 3,300 in medical expenses, lost productivity, as well as premature deaths,³² while the average duration of hospitalization for asthma amounted to 4.3 days.³³ According to other studies, in 2008, asthma was responsible for 10.5 million missed days of school and 14.2 missed days of work. The estimated total cost of lost productivity due to missed days of school or labor is \$ 3.8 billion in the US per year, while it amounts to \$ 2.1 billion per year the cost of premature deaths. On a global level, asthma is ranked 14th in terms of disability-adjusted life years (DALYs), which is the number of years lost due to bad health, disability or death are attributable to asthma. According to a European study, the estimated total cost of asthma was € 19.3 billion for people aged 15–64.^{34,35}

According to an American study, it was estimated that 8.2% of US adults had asthma and out of these, 49.1% had exacerbation asthma. During the period 2011–2016, 6.8% of adults (11 million) employed at any time in the last 12 months had asthma, of them, 44.7% experienced an asthma exacerbation and 9.9% visited the emergency department last year.³⁶ Asthma is also associated with some of the more common otorhinolaryngological diseases, such as allergy and obstructive sleep apnea. The situation leads to significant morbidity, such as an increase of occurring visits to the emergency department and reduction of productivity due to lost working days.³⁷

In addition, the disease of asthma has an important impact in terms of both direct and indirect cost. In Europe the disease costs € 19,000 millions per year. The cost is higher in patients with severe, uncontrolled asthma, and remains higher when reduced productivity, due to absence from work, is taken into account.³⁸ During the period 2008–2013, asthma appeared to account for losses of \$ 3 billion due to lost work and school days, \$ 29 billion due to deaths and \$ 50.3 billion due to medical expenses.³⁹ Patients with uncontrolled asthma showed an increase of 1.8 times in emergency department visits compared to patients without asthma,² while the pediatric population comprised approximately half (44%) of all hospitalizations and asthma was the third most frequent cause of hospitalization in children.³³

Asthma has been identified as responsible for almost 7,000 other deaths per year, many of which are considered preventable with proper management and care. The elderly population (age 65 and above) accounts for approximately 60% of deaths that associated with asthma. More women die from asthma (65% of mortality) compared to men (35%).⁴⁰ Although some countries have seen a decrease in

hospitalizations and deaths from asthma, the disease continues to pose an important burden on health care systems through the loss of productivity in the working field, and pediatric asthma especially due to the disorganization and the turmoil that it brings to the whole family.⁴¹

4.1. Atmospheric pollution and asthma

Based on WHO data from measurements in 1,600 cities in 91 countries, about nine out of ten people living in urban areas are affected by air pollution.⁴² Exposure of individuals to it (outside the home) is the ninth leading risk factor for mortality and is responsible for 3.2 million deaths annually.⁴³ Particulate matter appears to have a significant negative effect on premature mortality and, indeed, a recent review by found that PM₂₅ in particular can cause 3.3 million deaths worldwide each year.⁴⁴ In fact, atmospheric particles originating from vehicle traffic are responsible for 20% of deaths due to air pollution in Germany, the UK and the USA.⁴⁵

Regarding asthma, there have been many studies on the link between air pollution and asthma, most of which have been done in children. Hospital admissions may occur on the same day of exposure to pollutants⁴⁶ or with a time lag of 2 to 5 days.^{47–50} Long-term exposure to air pollution is associated with adverse symptoms such as wheezing, coughing, and phlegm.^{51,52} It has also been reported that short-term exposure to gaseous pollutants causes a decrease in respiratory function and bronchial hyperreactivity in children.⁵³

Poor ambient air quality due to high levels of ozone can be a triggering factor for exacerbation, as well as a generative cause of the development of bronchial asthma.⁵⁴ In fact, short exposure to ozone seems to be significantly associated with an increase in clinic admissions in childhood.⁵⁵ A significant statistical association was also found between O₃ and admissions in asthmatic children aged 5 to 14 years.⁴⁶ An association between ozone and bronchial asthma emergency department visits across the entire age range, but statistically significant at ages 5 to 14 years.⁵⁶

Other studies showed the following nine items: The first showed a 12% increase in pediatric asthma emergency department attendances in Helsinki, with each 25 mg/m³ increase in ozone in the warm season,⁵⁰ the second indicated increasing SO₂ has an effect on admissions for childhood asthma,⁴⁶ the third revealed a 5.98% increase in asthma admissions for every 10 mg/m³ increase in SO₂,⁵⁷ the fourth relating to CO appeared that there was a time lag from the day of exposure to the day of hospital admission for asthma in children, from one⁵⁸ to two days,⁵⁹ the

fifth uncovered a relationship between NO₂ and childhood asthma has been adequately investigated and in some it was positive.^{46,57,60} An association of NO₂ with admissions for childhood bronchial asthma only during the winter season⁶¹ and positive association was seen between increased NO₂ and hospital admissions in children with asthma.⁶² NO₂ has also been shown to increase bronchial symptoms among children with asthma⁶³ and reduce respiratory function in children who spend considerable time outdoors,⁶⁴ the sixth indicated also, particulate matter appears to be pathogenic for childhood with bronchial asthma,⁴⁶ the seventh showed that exposure to PM₁₀ and CO was associated with increased hospital visits,⁶⁵ the eighth confirmed that traffic-related air pollution (TRAP) containing PM₂₅ and NO₂ was associated with an increased prevalence of asthma up to age 12,⁶⁶ and another study conducted in California showed an increased incidence of childhood asthma,^{67,68} the ninth confirmed that TRAP exposure is associated with an increased risk of asthma, allergic sensitization, and reduced lung function in school-age children and is dependent on their residential proximity to major highways.⁶⁹ Also, it was shown that traffic pollution is associated with the overall development of bronchial asthma in children.⁷⁰

Additional studies concerning asthma in adults indicate that a cohort of women in the USA had exposure to PM₂₅, which has been shown to increase the risk of developing asthma.⁷¹ Another study followed 23,704 adults for 10 years in eight countries and showed that PM₂₅ from vehicular traffic increases the incidence of asthma in adults.⁷² The phenomenon is also observed in several studies correlating asthma admissions on desert dust days due to increased PM₁₀.^{46,73,74} This relationship can be explained because desert dust particles are in the range of coarse suspended particles known to affect the respiratory system.⁷⁵ Subsequent studies in the USA and Canada noted the association of particulate matter and O₃ as the main pollutants associated with admissions for bronchial asthma and other respiratory diseases.⁷⁷⁻⁸¹ In Seattle, USA, CO and PM₁₀ appear to be jointly associated with asthma admissions in adults.⁸² There is a positive association between outdoor air pollution and emergency room visits for asthma while the strongest correlations were for NO₂ and CO and less, but statistically significant, for O₃ and PM in another study.⁵⁶ Finally, biomass burning appears to increase asthma symptoms.⁸³

4.2. The six recommended steps for asthma control according to the American Lung Association

Below are six steps along with tips and resources to improve your asthma control, according to the American

Lung Association: Step 1, visit your healthcare provider every 6–12 months or more often if you have symptoms; step 2, use a written asthma action plan to know the steps to prevent symptoms and to respond during an asthma episode; step 3, take your asthma medicines as directed; step 4, tell your healthcare provider what makes your symptoms worse; step 5, learn about creating healthy environments and step 6, monitor your asthma daily and treat symptoms quickly.⁸⁴

5. DISCUSSION

Asthma is a major public health problem both globally and nationally, and affects all age groups, presenting increasing incidence in many developing countries, with accompanying rising costs. It is a chronic disease which affects quality of life, productivity at work and school, as well as the use of health care, as it can potentially lead to death. Both incidence and prevalence of asthma are on the rise. Making informed decisions about the allocation of limited public health resources plays an important role in good asthma management practices. Its psychosocial cost constitutes an important measure for its impact on society. The cost of asthma treatment increases as disease control decreases, while significant cost savings could be achieved through proper management of asthmatic patients. Better asthma control can improve patients' quality of life and reduce the relative costs to national health systems and to society.

The EU acts in many ways to reduce exposure to air pollution, e.g. legislation, co-operation with national and regional authorities responsible for air pollution and non-government organizations. EU policies aim to reduce emissions, and set limit and target values for air quality, in order to reduce air pollution exposure. PHC is the foundation and focus of the national health system of the country. It was a government priority since the need for the development of a new public PHC system had become urgent. The pillars of the system are free universal health coverage for the population, provision of quality health services according to the needs of the population and emphasis on prevention, education and the promotion of community health.

The highest prevalence rates of patients with asthma are seen in the UK. In other epidemiologic studies of the Centers for Disease Control and Prevention (CDC), it is reported that the prevalence of asthma in the USA amounted to 3% in 1970, 5.5% in 1996 and in 7.8% between 2006 and 2008. This fact entails a huge financial burden, with asthma costing an estimated \$ 56 billion in the US in 2007. An increase

of 6% of the \$ 53 billion spent in 2002 is observed.³⁷ The prevalence of asthma is higher in the USA than in other countries. One study revealed a statistically significantly higher incidence of asthma among of children and adults born in the US.⁸⁵ It is further stated that over the years 1980–1999, asthma prevalence, morbidity and mortality increased among US adults. According to annual rates, these were higher in certain racial/ethnic minority populations compared to Caucasians. The racial populations/ethnic minorities reported greater use of emergency department services and more office visits for asthma treatment than with the Caucasians. A CDC report argued that between the estimated 16 million (7.5%) US adults with asthma, current self-reported asthma prevalence among racial/ethnic populations of minorities ranged from 3.1–14.5%, while that of Caucasians rose to 7.6%.⁸⁶

Asthma is a serious challenge for public health and has serious implications for both occupational health and school performance, as long as patients use hospital emergency services. Patients with allergic asthma and, more specifically, those who received immunotherapy, had better health-related quality of life (HRQoL). Asthma severity was negatively affected by the HRQoL. In addition, HRQoL was affected negatively in obese patients with high body mass index (BMI).⁸⁷ Eating fruits and vegetables is likely to protect children from getting asthma, as well and from allergic and other non-communicable diseases.⁸⁸

According to recent studies, reduced quality of life is associated with risk factors in adults with asthma, such as older age, smoking, lower income, comorbidities, physical inactivity, obesity, poor mental health, poor asthma control and its severity. Asthma patients were found to have symptoms or clinical diagnoses of anxiety or depression, which were seen to play a decisive role in understanding the association between asthma and quality of life. The 42.9% of patients with severe asthma presented alexithymia. Additionally, major depression was associated with dyspnea and higher BMI with worse self-efficacy asthma management, which resulted in reduced quality of life. Among patients with controlled asthma, about 85% had a good quality of life. Several studies have shown a correlation between asthma control and quality of life ($p < 0.001$), while insomnia has been reported in 45% of adults with asthma.⁸⁹

Other epidemiological studies show an increase of asthma prevalence in obese patients. A recent study on asthma and nutrition showed that adolescents with poor nutrition had more chances of experiencing asthma symptoms. Those that did not eat enough fruits and foods with vitamins C and E and omega-3 fatty acids had the highest

chances of having an affected respiratory function. Obese patients with asthma experience more hospitalizations and use more drugs compared to asthma patients who are of normal weight.⁹⁰ Early diagnosis can improve the quality of life of patients and reduce the overall social and financial burden associated with treatment. The diagnosis depends on the patient and the health professional.⁹¹

Corresponding to the social determinants of health, based on recent epidemiological intervention studies and the social determinants of health, including asthma, covering the period in 2014–2019 with the WHO's conceptual framework for action, the majority of studies and interventions to date focuses on intermediate determinants of health, such as housing. For this reason, structural policies for housing are proposed. The race/nationality remains a social factor for the inequalities in asthma, with risk from many overlapping determinants. Several effective interventions have been developed, though there remains a need for research and innovation for effective political management. Strong evidence supports the key role of structural determinants, which create social stratification and inequality in the development and progression of asthma.⁹²

National education and the implementation programs, which are mainly based on primary care asthma education, should be systematic as they are able to reduce morbidity and effect of asthma exacerbation with reduced cost. Research is necessary to determine the best management and the most effective strategies from the health team of the PHC.⁹³ The pioneering "Asthma School" was developed at the Model HC, where the investigation of asthmatic patients was performed through the courses in PHC. The mean asthma control score according to the Asthma Control Test (ACTTM) was 17.48 ± 3.73 (incomplete asthma control), as only 3% had a fully controlled asthma. Ninety-nine percent of asthmatic patients claimed that the program was very good. The aid to systematic services provided in the management of asthmatic patients in primary care is important, while also targeted patient education can play an essential role in primary care in terms of better compliance and its effectiveness treatment, helping to reduce visits to secondary health structures.⁹⁴

By raising local and national awareness activities for asthma and focusing the efforts of PHC to educate families and health professionals about effective methods of disease management and control, it is stated that the availability of effective treatments and international surveys are those that provide the constant indications for optimal asthma control in many countries.⁹⁵ Further investigation is needed to determine the interaction of multiple determinants,

applying innovative strategies for targeting structural determinants and for the treatment of asthma.⁹²

6. CONCLUSIONS

Prior to the COVID-19 pandemic, several good practices had started bringing positive results for asthma patients. These included: First, the self-management of asthmatic patients which is important and requires better access to health care by improving their education. Bridging the gap between ethnic and racial disparities in its treatment and management of asthma can help control the disease, and achieve better results and prevention of the continuous increase in costs through management of the progression of extensive disease. It is important that the patient with asthma be treated by the attending physician and the medical and nursing team and is guided by the experts as a psychosomatic entity, investigating and recording asthma symptoms and the patient's living conditions, with the ultimate goal of eliminating symptoms and limiting exacerbation, while maintaining a good level quality of life. Second, the local and national activities, in an effort to raise awareness about asthma, should focus their efforts on educating health professionals on effective methods of managing and controlling asthma. Aid for systematic services provided in the management of asthma patients in PHC is important, as well as targeted patient education can play an important role in PHC in terms of better compliance and treatment effectiveness by helping to reduce visits to secondary health facilities, thus strengthening social policy. Third, with the multifaceted activity of Hellenic Center for Disease Control and Prevention, the most effective and essential achievement of the goals that the Organization and the Ministry of Health had as a vision was realized, providing quality services to the citizens in the model HC of Peristeri, supporting public health. The benefits of the proper operation of the model HC with the contribution of Hellenic Center for Disease Control and Prevention,

Ministry of Health played a developmental role in upgrading public health by strengthening local government and contributing to the mobilization of positive developments in PHC policy. The model HC of Peristeri implemented this new strategy with remarkable efficiency in order to apply modern approaches by providing upgraded services to the citizens in a period of economic crisis. The main purpose of the operation of the model HC of Peristeri was to provide a high level of PHC services, with the aim of setting development conditions such as (a) "Standards" of providing quality services in PHC in the context of the single space of PHC and (b) additional and specialized outpatient care services, such as preventive medicine and applied health prevention programs aimed at preventing premature deaths, improving health status, and developing attitudes and behaviors that have a positive effect on health. Additional and specialized services such as palliative care, home care, rehabilitation and recovery were offered.

The above goals were achieved with effort, in the context of the model of "biopsychosocial" approach of the individual with a focus, both from the disease to health, and from treatment to prevention and appropriate care. With the PHC programs, it is important to improve the health of each individual in the population, to detect people with asthma, as it is difficult to self-manage the disease in daily clinical practice, affecting the quality of life of citizens and thus endangering their lives. Targeted patient education with asthma seems to play an important role in PHC as it can lead to better compliance and treatment effectiveness by helping to reduce visits to secondary health facilities.

With the experience gained from the COVID-19 pandemic and future predicted pandemic threats, we notice that additional research is needed to provide long-term solutions for asthma patients to increase the quality of care while reducing the financial burden and stress related symptoms and help guide governments in developing new social programs for health care.

ΠΕΡΙΛΗΨΗ

Η επιδημία του άσθματος και οι κοινωνικοοικονομικές επιπτώσεις του στη διαχείριση της πρωτοβάθμιας φροντίδας υγείας: «Η σχέση δημόσιας υγείας και της δημόσιας πολιτικής»

Ε. ΣΤΑΜΑΤΟΠΟΥΛΟΥ,^{1,2} Α. ΣΤΑΜΑΤΟΠΟΥΛΟΥ,¹ Ε. ΠΑΠΑΓΕΩΡΓΙΟΥ,¹ Φ. ΧΑΝΙΩΤΗΣ,¹ Δ. ΧΑΝΙΩΤΗΣ¹

¹Τμήμα Βιοϊατρικών Επιστημών, Σχολή Επιστημών Υγείας και Πρόνοιας, Πανεπιστήμιο Δυτικής Αττικής, Αθήνα,

²Παθολογικό Ιατρείο Εμπύρετων Λοιμώξεων/Τμήμα Επειγόντων Περιστατικών/ Τακτικά Εξωτερικά Ιατρεία, Γενικό Νοσοκομείο Αττικής «ΚΑΤ», Αθήνα

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Το άσθμα είναι ένα παγκόσμιο πρόβλημα δημόσιας υγείας, το οποίο χαρακτηρίζεται από μια χρόνια φλεγμονή των αεραγωγών που προσβάλλει όλες τις ηλικιακές ομάδες. Επηρεάζει 334 εκατομμύρια ανθρώπους παγκοσμίως και αναμένεται αύξησή του κατά 100 εκατομμύρια έως το 2025. Ενώ ορισμένοι ερευνητές είχαν υποθέσει ότι το ποσοστό θνησιμότητας από άσθμα θα μειωνόταν, τα αρχικά δεδομένα δείχνουν μια αύξηση που οδήγησε σε σημαντική νοσηρότητα, με αποτέλεσμα μια μετρήσιμη και διαρκή αύξηση των επισκέψεων στα τμήματα επειγόντων περιστατικών, καθώς το μη ελεγχόμενο άσθμα είναι γνωστό ότι έχει σοβαρές συνέπειες στους ασθενείς και έχει υπολογιστεί ότι προκαλεί μεγαλύτερο αριθμό περιπτώσεων αναπηρίας. Όπως υποστηρίζεται από την παγκόσμια ιατρική βιβλιογραφία, το βρογχικό άσθμα επηρεάζει όλες τις ηλικίες και έχει αυξανόμενη επίπτωση σε πολλές αναπτυσσόμενες χώρες, ενώ η έξαρσή του είναι γνωστό ότι προκαλεί σημαντικά κοινωνικά και ψυχολογικά προβλήματα στους ασθενείς και αυξάνει το κόστος φροντίδας υγείας. Μελέτες επιβεβαιώνουν ότι η ατμοσφαιρική ρύπανση μπορεί να επιδεινώσει τα συμπτώματα του άσθματος, ενώ επιδημιολογικές μελέτες αναφέρουν ότι η μακροχρόνια έκθεση στην ατμοσφαιρική ρύπανση συχνά σχετίζεται με δυσμενή συμπτώματα όπως συριγμό και παραγωγικό βήχα συνοδευόμενο από απόχρεμψη. Η παρούσα μελέτη αναδεικνύει την επιβάρυνση των επιπτώσεων του άσθματος στην κοινωνία και εκθέτει την οικονομική επιβάρυνση ως σημαντικό μέτρο του αντικτύπου της στην κοινωνία. Κατά τη διάρκεια της πανδημίας COVID-19, ο μεγάλος περιορισμός στη φροντίδα από το Εθνικό Σύστημα Υγείας και η απαίτηση για παροχή εξ αποστάσεως περίθαλψης αφορούσε σχεδόν τους μισούς από τους ασθενείς με άσθμα, οι οποίοι δήλωσαν ότι η φροντίδα που έλαβαν από απόσταση δεν ήταν της ίδιας ποιότητας με τη φροντίδα με φυσική παρουσία. Το κόστος του άσθματος αυξάνεται καθώς μειώνεται ο έλεγχος της νόσου και θα μπορούσε να επιτευχθεί σημαντική εξοικονόμηση κόστους μέσω της σωστής διαχείρισης των ασθενών με άσθμα, ενισχύοντας τη σχέση μεταξύ δημόσιας υγείας και δημόσιας πολιτικής. Η στοχευμένη εκπαίδευση των ασθενών με άσθμα είναι σημαντική στην πρωτοβάθμια φροντίδα υγείας και μπορεί να οδηγήσει σε καλύτερη συμμόρφωση του ασθενούς και μεγαλύτερη αποτελεσματικότητα της θεραπείας.

Λέξεις ευρητηρίου: Άσθμα, Δημόσια πολιτική, Δημόσια υγεία, Επίπτωση και επιπολασμός άσθματος, Κόστος άσθματος, Πρωτοβάθμια φροντίδα υγείας, Σχολείο άσθματος

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Corresponding author:

E. Stamatopoulou, Department of Biomedical Sciences, University of West Attica, Aghiou Spyridonos street, 122 43 Egaleo, Attica, Greece
e-mail: estamatopoulou@uniwa.gr; elenastamatopoulou@gmail.com