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ORIGINAL

Severe pneumonia in Young smokers in the province of Buenos Aires

Neumonía grave en jóvenes tabaquistas de la provincia de Buenos Aires

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ABSTRACT

Introduction: smoking is related to morphological alterations of the bronchial mucosa epithelium. In Argentina, 33,4 % of the population between 18 and 64 years of age are smokers, with a predominance in the lower income areas of the country. According to the World Health Organization (WHO), 1,6 million people die of pneumonia every year, with smoking being a major risk factor for its development.
Method: a prospective observational descriptive study was carried out at the Eurnekian Hospital in Ezeiza to describe the evolution of young adult patients with severe pneumonia. Data was collected through anamnesis and review of physical medical records of patients admitted with a diagnosis of pneumonia.
Results: thirty-eight young immunocompetent patients hospitalized with pneumonia were analyzed. The average age was 40 years, with a predominance of males (70,7 %). The average number of years of consumption was 20, and 20 patients (55,2 %) of the total were minors at the beginning of their smoking habit. With regard to the presence of previous pathologies, 7 patients (18,2 %) were diabetic, 9 were hypertensive, 3 had suffered an acute myocardial infarction, 4 had suffered a cerebrovascular accident; 3 had advanced heart failure, 1 had renal failure and 3 had suffered tuberculosis for which they had received full treatment. With regard to oxygen saturation on admission to hospital, 8 patients had saturation levels of between 80-84,9 %, 21 between 85-90 % and 9 >90 %. The average length of stay in hospital was 5,8 days, with only 9 patients being hospitalized for between 10-14 days.
Conclusion: the results show that the onset of smoking habit is prior to the age of majority. We believe it is advisable to carry out more campaigns for the prevention of addictions and smoking cessation in adolescents and young adults, with an emphasis on primary health prevention.

Keywords: Pneumonia; Tobacco Use; Inmunocompetent Patients; Young Adult; Severity.

RESUMEN

Introducción: el tabaquismo está relacionado con alteraciones morfológicas del epitelio de la mucosa bronquial. En la Argentina el 33,4 % de la población de entre 18 y 64 años son tabaquistas, teniendo un predominio en las zonas con menores ingresos del país. Según la Organización mundial de la salud (OMS) 1,6millones de personas mueren al año de neumonía, siendo el tabaquismo un factor de riesgo importante para el desarrollo de la misma.
Método: se llevó a cabo un estudio descriptivo observacional prospectivo en el Hospital Eurnekian de Ezeiza para describir la evolución de los pacientes adultos jóvenes con neumonía grave. Los datos fueron recogidos mediante anamnesis y revisión de historias clínicas físicas de los pacientes admitidos con el diagnóstico de neumonía.
Resultados: se analizaron 38 pacientes jóvenes inmunocompetentes cursando una internación por neumonía. El promedio de edad fue de 40 años, con un predominio del sexo masculino de 70,7 %. El promedio de años

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de consumo fue de 20, y que 20 pacientes, (55,2 %) del total eran menores de edad al comienzo de su habito tabáquico. Con respecto a la presencia de patologías previas, 7 pacientes (18,2 %) eran diabéticos, 9 eran hipertensos, 3 tuvieron un infarto agudo de miocardio, 4 presentaron un accidente cerebrovascular; 3 presentan insuficiencia cardiaca avanzada, 1 insuficiencia renal y 3 padecieron tuberculosis con tratamiento completo. Con respecto a la saturación de oxigeno de ingreso hospitalario 8 pacientes saturaban entre 80-84,9 %, 21 85-90 % y 9 >90 %. El tiempo de estancia hospitalaria el promedio fue de 5,8 días habiendo solo 9 pacientes con internaciones de entre 10-14 días.
Conclusión: los resultados reflejan que el comienzo del habito tabáquico es previo a la mayoría de edad. Creemos conveniente realizar más campañas de prevención de adicciones y de cese tabáquico en adolescentes y adultos jóvenes haciendo énfasis en prevención primaria de la salud.

Palabras clave: Neumonía; Jóvenes Inmunocompetentes; Adultos Jóvenes; Habito Tabáquico; Severidad.

INTRODUCTION

Pneumonia (CAP) is an infection of the lung parenchyma resulting from the proliferation of microorganisms in the alveoli and the host's response to them.[1] To this end, the lungs have a series of defense mechanisms. These include mechanisms responsible for protecting the airway, such as anatomical barriers, coughing, and the mucociliary apparatus. However, potentially harmful particles manage to overcome these elements, and the defense of the respiratory tree is based on a series of humoral and cellular factors that make up the immune and adaptive systems.[2]

The most important risk factor for community-acquired pneumonia is age—so much so that the incidence quadruples when the age is >65. The cause is unclear, but it is multifactorial, and one factor is smoking.

Tobacco use morphologically alters the bronchial mucosal epithelium, with loss of cilia, hypertrophy of the mucous glands, and an increase in goblet cells, which can promote the presence of germs in the bronchial tree and their spread, producing an inflammatory reaction in the airway with activation of macrophages and neutrophils that release proteases, triggering a situation of oxidative stress and cytokine release, giving rise to both an innate and adaptive immune response that in turn can make the patient more sensitive to the inflammatory aggression characteristic of the infection.[3,4]

In 2020, 22,3 % of the world's population consumed tobacco, with a predominance in males. This causes an average of more than 8 million deaths per year, according to the WHO.[5]

In Argentina, 33,4 % of people between the ages of 18 and 64 are smokers, with a predominance in the country's lower-income areas.[6]

According to a survey published by the Inter-American Heart Federation Argentina in April 2024, 38,7 % of adolescents surveyed have tried a tobacco or nicotine product, and 19,4 % of these currently use it. 35,3 % of adolescents are exposed to secondhand smoke in their homes, 32,2 % have seen schoolmates smoking, and 41,4 % of smokers said that the warnings on cigarette packets made them think about quitting, but 37 % did not succeed.[7]

The study "Proportion of community-acquired pneumonia cases attributable to tobacco smoking" by Jordi Almirall, PhD; Carlos A. Gonzales, PhD; Xavier Balanzo, PhD; and Ignasi Bolibar, MD, seeks to establish the risk attributable to tobacco use in the development of community-acquired pneumonia in adults, with the following results:

Among patients with pneumonia, 64,9 % were active cigarette smokers. The number of cigarettes smoked per day and the number of packs smoked throughout life showed a positive dose-response relationship with a significant trend. Smokers who smoked more than 38 pack-years were 3,15 times more likely to develop pneumonia than non-smokers.[8]

The most common microorganism causing CAP, regardless of the level of care and severity, is Streptococcus pneumoniae, which is also the most closely associated with smoking, especially in patients with chronic obstructive pulmonary disease (COPD). An in vitro study has shown increased adherence of Streptococcus pneumoniae to epithelial cells in the oral cavity of smokers, which persists even up to 3 years after quitting smoking, which may lead to a higher degree of oropharyngeal colonization and a higher likelihood of CAP.[9]

Studies that have demonstrated a special relationship between active smoking and pneumococcus have highlighted this relationship. These studies have demonstrated tobacco-induced alterations in the clearance and phagocytosis of Streptococcus pneumoniae in the lungs, as well as the inhibition of the anti-pneumococcal activity of some antimicrobial peptides of the innate immune system.[10] Therefore, tobacco alters immunity to infection, especially against certain microorganisms, including Streptococcus pneumoniae, and it seems well-established that active smoking itself increases the risk of pneumonia.

The cellular component of the innate pulmonary defense system consists of different groups of cells.

These groups of cells recognize microorganisms by detecting molecular patterns common to various groups of pathogens, known as pathogen-associated molecular patterns (PAMPs). The receptors responsible for detecting the different PAMPs are pattern recognition receptors (PRRs). When PRRs interact with the respective PAMPs, they trigger phagocytosis of the microorganisms or activate signaling pathways that induce the production of cytokines and increased expression of adhesion molecules and co-stimulatory molecules.[11]

Toll-like receptors (TLRs) are the most prominent PRRs and have the best-studied function in the respiratory system. They are transmembrane proteins responsible for recognizing different molecular patterns. Stimulation of TLRs by microbial products activates signaling pathways that induce antimicrobial genes and the production of inflammatory cytokines. In addition, TLR stimulation triggers the maturation of dendritic cells, which leads to the induction of co-stimulatory molecules and an increase in their antigen-presenting capacity. Therefore, microbial recognition by TLRs helps to develop the direct response of adaptive immunity against antigens derived from microbial pathogens.[12]

Regarding the innate and adaptive response, tobacco is known to inhibit some of its key functions, including the response of TOLL2 (TLR2) receptors, nuclear factor KB (NF-KB), CD4 cell proliferation (LTCD$), dendritic cell maturation, and opsonization and phagocytosis capacity. All of this increases susceptibility to bacterial infections.

METHOD

A prospective descriptive observational research study was conducted on young adult smokers with severe pneumonia. The study population included all patients hospitalized for pneumonia at the Eurnekian Hospital in Ezeiza from May to July 2024.

The inclusion criteria were:

- Patients between 18 and 55 years of age who smoke
- Tobacco use for more than 5 years
- Diagnosis of bacterial pneumonia

The exclusion criteria were:

- Immunosuppressed patients
- Tobacco use for less than 5 years
- Chronic drug abuse
- Patients with tuberculosis or pulmonary mycosis,
- Positive viral panel for respiratory viruses,
- Over 55 years of age
- Under 18 years of age.

The following variables were used: age (measured in years), sex (female/male), comorbidities, years of smoking, average length of hospital stay, saturation on admission, saturation after 3 days, requirement for ARM, blood pressure on admission measured in millimeters of mercury, heart rate on admission, blood culture (count of bacteria in the cultured colony), and antibiotic treatment required.

RESULTS

Of the 38 patients analyzed, the average age was 40, and 70,7 % were men. All patients were smokers, with an average of 20 years of smoking, but their smoking burden is unknown, as this information was not recorded in their medical records. Of all these patients, only one had previously consulted a physician specializing in pulmonology. It should be noted that 20 (53 %) of these patients began smoking before reaching the age of majority.

Regarding the presence of previous pathologies, 7 (18,2 %) patients were diagnosed with diabetes, 9 (23,4 %) with high blood pressure, 3 had a history of acute myocardial infarction, 4 (10,4 %) had a cerebrovascular accident, 3 of which were ischemic and one hemorrhagic; 3 (7,8 %) had advanced heart failure, 1 (2,6 %) had renal failure, and 3 (7,6 %) had tuberculosis with complete treatment. It should be noted that only one case was interpreted as nosocomial pneumonia.

Regarding the patients' conditions upon admission to the hospital, 8 had a saturation between 80-84,9 % with a FiO2 of 0,21; 22 had a saturation between 85-90 %, and 8 had a saturation of more than 90 % (figure 1).

Three of the patients admitted had low blood pressure, 11 had normal blood pressure, and 24 had high blood pressure. About heart rate, only 6 of the patients had between 60 and 100 beats per minute, while the remaining 32 were admitted with tachycardia. It should be noted that one patient had a second concomitant diagnosis of acute pulmonary edema in addition to pneumonia on admission. Another patient with a history of diabetes was diagnosed with diabetic ketoacidosis on admission.

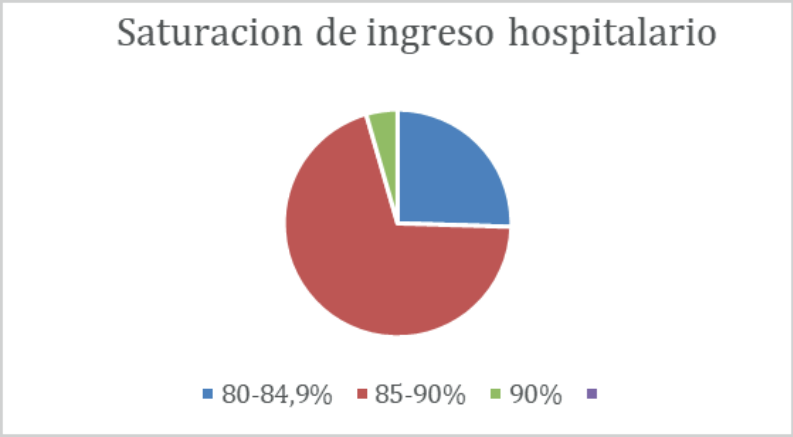

Figure 1. Hospital admission saturation

Imaging studies revealed that 3 (7,8 %) of the patients had pleural effusion, with 2 of them meeting the criteria for exudate and 1 meeting the criteria for transudate. About the acid-base status of the patients, 3 had a PCO2 greater than 60 millimeters of mercury (mmHg). Of the blood cultures performed, only 7 (18,2 %) were positive for Streptococcus pneumoniae, except for one positive case for methicillin-resistant Staphylococcus aureus (MRSA). The latter patient had a history of severe COVID-19 infection requiring orotracheal intubation in 2020.

All patients started antibiotic treatment with ampicillin-sulbactam + clarithromycin, except for the patient who had bacteriological rescue from MRSA and who received initial treatment with empirical vancomycin due to high clinical and tomographic suspicion.

Regarding patient outcomes, the average length of hospital stay was 5,8 days, with only nine patients hospitalized for 10 to 14 days. Of the patients, 4 required orotracheal intubation, three due to type 2 respiratory failure, and one due to poor respiratory mechanics.

DISCUSSION

Tobacco use is a prognostic factor for the severity of pneumonia.

The study “Proportion of community-acquired pneumonia cases attributable to tobacco smoking” by Jordi Almirall, PhD; Carlos A. Gonzales, PhD; Xavier Balanzo, PhD; and Ignasi Bolibar, MD, shows that the pack-year index has a positive dose-response relationship. The risk of pneumonia in smokers who consumed more than 38 pack-years was 3,15; the risk for former smokers was similar to that of current smokers, but after 5 years of smoking cessation, the risk of pneumonia was reduced. Given the importance of the pack-year index, we must not forget to include this question in the medical history and clinical record.

Another factor to consider is the lack of medical consultations with a specialist by the smoking patients analyzed; only one (1) of the patients underwent medical check-ups with a pulmonologist. This implies a lack of follow-up and diagnostic studies for acute and chronic respiratory diseases and the progressive deterioration of the condition due to the lack of treatment, if necessary, and how this predisposes patients to other diseases such as pneumonia.

It is essential to highlight the early onset of smoking among the patients studied, 20 of whom were under the age of 18 when they started smoking. This raises questions about why minors have access to tobacco and what factors in their environment encourage them to smoke, as well as the need to enforce regulations.

It is worth mentioning that 30 patients studied were admitted with values greater than or equal to 140/90 mmHg; only 8 of them had a diagnosis of high blood pressure, which makes us wonder whether this is an isolated episode secondary to the infectious condition or whether it is due to a lack of monitoring by the patients.

According to data obtained by the FICa in adolescents aged 13 to 15, 52,5 % of those surveyed reported that they had used tobacco at some point in their lives.

Considering these data, we believe it is advisable to carry out more addiction prevention and smoking cessation campaigns among adolescents and young adults. It is also important to facilitate access to health centers by conducting medical check-ups emphasizing primary health care.

CONCLUSIONS

This study provides compelling evidence of a direct relationship between tobacco use and the severity of community-acquired pneumonia (CAP), especially in young adults. By altering the structure and function of the respiratory epithelium, smoking significantly compromises the body’s immune response to lung infections, facilitating the colonization of pathogens such as Streptococcus pneumoniae. This immune deterioration

manifests itself not only in a higher incidence of CAP but also in more severe cases requiring prolonged hospitalization and even invasive ventilatory support.

Among the 38 patients analyzed, it is noteworthy that the majority began smoking while underage, highlighting a worrying failure in regulation, control, and education regarding access to tobacco. In addition, the lack of specialized medical consultation, with only one patient under pneumological follow-up, reflects a clear need to strengthen the health system in terms of smoking prevention and control, particularly in vulnerable sectors.

Another relevant finding is undiagnosed high blood pressure in most patients, suggesting a lack of regular medical check-ups. This highlights the importance of implementing primary care strategies that include screening and follow-up for chronic noncommunicable diseases associated with smoking.

The study also shows that, although most patients had bacterial CAP, only a minority had positive cultures, possibly due to sample collection or processing limitations or to the early initiation of antibiotic treatment. Even so, the predominance of Streptococcus pneumoniae is consistent with reports in the literature as the primary etiological agent linked to tobacco use.

Based on these findings, it is essential to strengthen smoking prevention policies from an early age, promote smoking cessation programs, and improve access to regular medical checkups. It is also recommended that the pack-year index be included in the medical history to estimate the individual risk of developing CAP more accurately. Only through a comprehensive public health approach focused on prevention, education, and early diagnosis will it be possible to reduce the health burden of smoking and its respiratory complications.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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