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Oral health and risk of pneumonia in asthmatic patients with inhaled treatment☆

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ABSTRACT

Introduction and objective: Asthma is a chronic disease requiring inhaled treatment and in addition it is a risk factor (RF) of pneumonia. In the oropharyngeal cavity there are numerous species of bacteria that could be dragged to the bronco-alveolar level.
Objective: To decide whether oral health is a community acquired pneumonia (CAP) RF in asthmatic patients who are taking inhaled treatment, and determining whether the frequency of use of inhalation devices and the type of inhaled drug are CAP RF.
Patients and method: Case–control study in asthmatic population with inhaled treatment. We recruited 126 asthmatic patients diagnosed with pneumonia by clinical and radiological criteria (cases) and 252 asthmatics not diagnosed with pneumonia during the last year (controls), matched by age. The main factor of study was the General Oral Health Assessment Index (GOHAI) score.
Results: Bivariated analysis showed a statistically significant association of CAP with a GOHAI score ≤ 57 points (poor oral health) (OR 1.69), anticholinergic treatment (OR 2.41), 6 or more inhalations (3.23), chamber use (OR 1.62), FEV_1 (OR 0.98), altered functionality (OR 2.08) and psychiatric disorders or depression (OR 0.41). The multivariated analysis shows an independent association of performing 6 or more inhalations per day (OR 2.74) and functional impairment (OR 1.67).
Conclusions: The results suggest that poor oral health may be a CAP RF.

Salud bucodental y riesgo de neumonía en pacientes asmáticos con tratamiento inhalado

Palabras clave:
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RESUMEN

Introducción y objetivo: El asma es una enfermedad crónica que precisa tratamiento inhalado y que, a su vez, es factor de riesgo (FR) de neumonía. En la cavidad orofaríngea existen numerosas especies de bacterias que podrían ser arrastradas a nivel broncoalveolar. Objetivo: determinar si la salud bucodental es un FR de neumonía adquirida en la comunidad (NAC) en pacientes asmáticos que realizan tratamiento inhalado y determinar si la frecuencia de utilización de los dispositivos de inhalación y el tipo de fármaco inhalado son FR de NAC.
Pacientes y método: Estudio de casos y controles en población asmática con tratamiento inhalado. Se seleccionaron 126 pacientes asmáticos diagnosticados de neumonía por criterios clínicos y radiológicos (casos) y 252 asmáticos no diagnosticados de neumonía durante el último año (controles), emparejados por edad. El principal factor de estudio fue la puntuación del *General Oral Health Assessment Index* (GOHAI).

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Resultados: El análisis bivariado muestra una asociación estadísticamente significativa de la NAC con un índice de GOHAI ≤ 57 puntos (mala salud bucodental) (OR 1,69), el tratamiento anticolinérgico (OR 2,41), realizar 6 o más inhalaciones al día (OR 3,23), el uso de cámara (OR 1,62), el FEV_1 (OR 0,98), una alteración de la funcionalidad (OR 2,08) y los trastornos psiquiátricos o la depresión (OR 0,41). El análisis multivariante muestra una asociación independiente de realizar 6 o más inhalaciones al día (OR 2,74) y de las alteraciones de la funcionalidad (OR 1,67).
Conclusiones: Los resultados evidencian que una mala salud bucodental podría ser un FR de NAC.

Introduction

Asthma is a multifactorial aetiology chronic inflammatory airway disease.[1] Its annual estimated cost per patient in Spain is between €1726 and €1533.[2] The most effective asthma treatment is inhaled long-acting beta-agonists in combination with glucocorticoids.[3] To this end, devices have been designed to overcome natural barriers and ensure that particles can reach the distal areas of our respiratory system.[4]

On the other hand, it is known that the oral cavity is colonized by a great diversity of microorganisms. Up to 500 different species of bacteria have been identified. Most are non-pathogenic, but certain circumstances can alter the balance among them and favour the proliferation of pathogens.[5] Community-acquired pneumonia (CAP) occurs when pathogenic microorganisms are inhaled by avoiding the defence mechanisms of the respiratory tract and multiplying and proliferating in the lungs of a susceptible person. It has been shown that inhaled treatment can be a risk factor for CAP due to the possible "drag effect" of the oropharyngeal flora, although it is very difficult to discern whether the effect is due to the underlying disease and its severity or due to the inhaler.[6,7]

There is scientific evidence linking oral health with CAP.[8] Thus, it has been reported that the presence of oral dysesthesia by heat or cold and the use of dental prostheses are independent risk factors for the development of CAP, while having visited a dentist within the previous year is shown to be a protective factor.[8]

The objective of the present study is to determine whether oral health and the characteristics of inhaled therapy are risk factors for CAP in asthmatic patients over 18 years of age receiving inhaled treatment.

Methodology

Design and study population

A case–control study was designed in asthmatic population over 18 years of age with inhaled treatment. The diagnosed cases of CAP were matched with same-age controls (±5 years) which had not had CAP in the previous 12 months. Inclusion criteria: people over 18 years of age diagnosed with asthma according to clinical criteria established in the Spanish Asthma Management Guidelines, receiving inhaled treatment, residents in the reference area of any of the 3 basic health areas (BHA) of the Consorci Sanitari del Maresme (CSdM) and who gave their informed consent to participate in the study. Exclusion criteria: presence of some serious psychiatric disorder with cognitive impairment, diagnosed with dementia that hinders their comprehension and/or verbal expression, and language barrier.

CAP cases diagnosed through symptomatology and radiology in the Emergency Department of the Mataró Hospital between November 2012 and June 2015 were selected. To this end, the list of pneumonia diagnoses performed at the Emergency Department of the CSdM, the only reference hospital in the area and of the 3 BHA mentioned, was reviewed monthly. Each case was matched with 2 controls of the same age (±5 years). For this, a list of all the asthmatic patients of the 3 BHA patients with inhaled treatment and who had not had pneumonia in the last 12 months was prepared. The controls were consecutively selected from the list of each BHA according to the age category. The study protocol obtained a favourable report from the CSdM's Clinical Research Ethics Committee (file 58/12).

Data collection

To assess oral health, the *General Oral Health Assessment Index* (GOHAI), which consists of 12 questions with a score of 1–5 per question according to the Likert scale and an overall score of 12–60 points. A result ≤57 points indicates poor oral health.[9,10] To determine the quality of life, the EuroQol-5D health questionnaire was used[11]; functional alteration was considered when any of the following EuroQol-5D domains was altered: mobility, personal care and/or daily activities.[11] Other study variables were: sociodemographic variables (age, sex, level of education and occupation), anthropometric variables (weight, height, body mass index), *forced expiratory volume in one second* (FEV_1) and pathological history. In relation to the inhaled treatment, the active ingredient was collected, the number of inhalations per day and the type of device used for inhalation.

Data analysis

Accepting an alpha risk of 0.05 and a beta risk of 0.2 in a bilateral contrast and assuming a prevalence of poor oral health in the control group of 35%, 129 cases and 258 controls (387 subjects in total) are required in order to detect an effect with a minimum *odds ratio* (OR) of 1.9. The Chi-square test was used for the comparison of categorical data between cases and controls. For the comparison of continuous variables, the Student *t* test was used for the variables that followed a normal distribution and the Mann–Whitney *U* test for those that did not. The OR was used to measure the effect of each variable on CAP. This was estimated using simple logistic regression. To assess the independent effect of the main study factors, a multivariate analysis was performed using multiple logistic regression, which included all the risk factors for CAP identified in the bivariate analysis (with $p < 0.05$). A stratified analysis was also carried out to assess whether oral health modified the effect of the number of inhalations per day on pneumonia. A p-value <0.05 was considered statistically significant.

Results

During the study period (November 2012 to June 2015), a total of 3960 reports issued by the Emergency Department of CSdM with the diagnosis of pneumonia were reviewed. Once the suspicions of unconfirmed CAP were excluded, patients under 18 years of age, non-asthmatic patients or those who did not comply with any other selection criteria, a sample of 126 cases of CAP in asthmatic adults with inhaled treatment was obtained. 252 asthmatic controls without previous pneumonia were selected from the community, matched by age with cases.