SUMMARY

The objective of this study was to define the morbidity and mortality of bronchiectatic patients. All records from the years 1993–2004 of patients with asthma, chronic obstructive pulmonary disease (COPD) and bronchiectasis as the primary diagnosis were extracted from the Finnish Hospital Discharge Register. The data of these patients' deaths until the end of the year 2004 were acquired from Statistics Finland. These materials were analyzed in order to find each bronchiectatic patient of this period an asthma or COPD control subject who was of the same age and sex and had also been hospitalized in the same year. Their numbers of pneumonia and prognoses were compared with each other during the study period.

59.4% of all bronchiectasis treatment periods in absolute numbers were for people aged 65 years or over. The occurrence of pneumonia in bronchiectatic patients was 1.03 (95% CI 0.82–1.24) per follow-up year, while the corresponding rate in the COPD control subjects was 1.22 (95% CI 0.92–1.53) and in the asthma control subjects 0.38 (95% CI 0.22–0.54). The mean survival times for the bronchiectatic patients were 8.33 (95% CI 8.16–8.50), for the COPD control subjects 6.26 (95% CI 6.07–6.45) and for the asthma patients 8.93 (95% CI 8.76–9.10) years.

Bronchiectasis-related hospitalization in Finland is primarily focused on aged people. A bronchiectatic patient has a higher risk of pneumonia and a worse prognosis than an asthmatic, while the situation is opposite when compared to a COPD patient.

Key words: bronchiectasis, pneumonia, hospitalization, mortality, prognosis

Address for correspondence: O. Säynäjäkangas, Lapland Central Hospital, Department of Pulmonary Diseases, Ounasrinteentie 22, 96440 Rovaniemi, Finland. E-mail: olli.saynajakangas@lshp.fi, olli.saynajakangas@pp1.inet.fi

INTRODUCTION

While bronchiectasis remains a concern in the developing world, it is less common in developed countries. Infections are still the most common causes for it both among adults (1) and children (2). It has been estimated that COPD patients have a fourfold and asthma patients one-and-a-half-fold risk to contract pneumonia requiring hospitalization if compared to basic population (3). Mortality among COPD patients is remarkably higher than among asthmatics (4). The risk of pneumonia and the prognosis have been documented more poorly among bronchiectatic patients.

The purpose of this study was to study, by means of the Discharge Register of Hospitals and the Cause of Death Register of Statistics Finland, bronchiectasis-related hospitalization and the risk of pneumonia among these patients and its prognosis when compared to asthma and COPD patients.

MATERIALS AND METHODS

All treatment data from the year 1993 to 2004 in which the primary or secondary diagnosis was a chronic obstructive pulmonary disease (COPD, "491", "492", "496", ICD 9 during 1993–1995 and "J41–J44", ICD 10 from the year 1996 onwards), asthma ("493", ICD 9 and "J45–J46", ICD 10) and bronchiectasis ("494", ICD 9 and “J47”, ICD 10) were extracted from the Hospital Discharge Register maintained by the National Research and Development Centre for Welfare and Health. A total of 510,303 treatment periods of this kind were found for 159,744 patients. The trends of hospitalization of bronchiectatic patients (the disease as a primary or secondary diagnosis) were classified by age groups according to sex in proportion to population in 1993–2004. Furthermore, each bronchiectatic patient was found an asthma or COPD patient of the same sex as a control subject, who was hospitalized in the same year and whose age on the admission day was as near the bronchiectatic patient’s age as possible. This age was 63.7 years in bronchiectatic patients and 64.4 years in both of the control groups. In the bronchiectasis cases, it was possible that asthma or COPD was a primary or secondary diagnosis during a treatment period, but the asthma control subjects did not have any bronchiectasis or COPD diagnoses or the COPD control subjects did not have any asthma or bronchiectasis diagnoses.

A follow-up time was defined for these patients which was the time between a patient’s admission date and the day on which (s)he died/31.12.2004. Their risk of pneumonia was defined by dividing the number of their pneumonia-related (codes "48*", "076", ICD 9 and "J11–J18", ICD 10) stays in hospital by the follow-up time. The difference between the numbers of pneumonias on annual level was compared in the SPSS 13.0 for Windows statistical programme with OneWay Anova. Furthermore, the
prognoses of these three patient groups were defined from the admission day until death/31.12.2004 by using Kaplan Meyers survival analysis and Log Rank test in the same programme.

RESULTS

Treatment Periods
Diagnosis of bronchiectasis was the primary or secondary diagnosis in 8,453 treatment periods for 3,051 patients. 55.1% of the bronchiectatic patients were women. At the beginning of bronchiectasis-related hospitalization periods, men were 63.8 years and women 64.9 years on the average (Fig. 1). Only 53 bronchiectasis treatment periods were for 32 patients aged less than 15 years during the whole study period. 59.4% of all bronchiectasis treatment periods in absolute numbers were for patients aged 65 or over. The number of bronchiectasis treatment periods decreased from 161 to 133 per million persons during the period 1993–2004. In men aged 65 or over, this decrease was 15.2% in proportion to population and in women of the corresponding age 20.0% (Fig. 2).

Risk of Pneumonia
Pneumonia was the primary or secondary diagnosis in 11.9% of the treatment periods of bronchiectatic patients, in 7.2% of the COPD and in 5.5% of the asthma control subjects. In the treatment periods including bronchiectasis, the follow-up time averaged 3.8 years, while in the treatment periods of the COPD control subjects it was 2.9 years and of the asthma control subjects 4.6 years.

Bronchiectatic patients had pneumonia 1.03 (95% CI 0.82–1.24) time per follow-up year on the average, while the corresponding rate in the COPD control group was 1.22 (95% CI 1.02–1.43) and in the asthma control group 0.38 (95% CI 0.22–0.54).

Survival
1,119 (36.7%) of the bronchiectatic patients, 1,546 (50.7%) of the COPD control subjects and 854 (28.0%) of the asthma control subjects had died during the years 1993–2004.

The mean survival times for the bronchiectatic patients were 8.33 (95% CI 8.16–8.50), for the COPD control subjects 6.26 (95% CI 6.07–6.45) and for the asthma patients 8.93 (95% CI 8.76–9.10) years. These differences between the bronchiectatic patients and the control groups were significant (p = 0.000, log rank test). The corresponding mean survival times in these patient groups were 7.84 (95% CI 7.58–8.10), 5.84 (95% CI 5.56–6.12) and 8.64 (95% CI 8.39–8.90) for men and 8.73 (95% CI 8.51–8.95), 6.61 (95% CI 6.36–6.87) and 9.15 (95% CI 8.92–9.37) years for women. Again, these differences in survival times between the bronchiectatic patients and the control groups were also significant by sexes (p = 0.000, Log Rank test).

Causes of Death
The bronchiectatic patients had more pneumonia diagnoses (6.3% of all the cases) as a basic cause of death than the dead asthma (5.9%) and COPD (4.3%) control subjects, and it was clearly the most common immediate cause of death (22.9%) in them (Table 1). The immediate cause of death had been recorded in 53.7% of the cases.

DISCUSSION
The data of the Finnish Hospital Discharge Register are considered to be reliable. According to the study by Keskimäki (5), the dates of admission and discharge had been recorded correctly in 96% of the treatment periods and similarly the primary diagnosis in 94.1% of the respiratory diseases. Comparison of the heart and blood vessel register with this register (6) has given similar results. The asthma and COPD diagnoses of the materials can be considered quite reliable, because in the Finnish health care system it is pulmonary physician who has mainly made these diagnoses because of practice of reimbursing medicines. Similarly, the diagnosis of bronchiectasis has been based on an examination made by a specialist, on bronchography until the
The results of the prognosis of bronchiectasis conformed to our earlier study which dealt with new bronchiectasis treatment periods during the years 1982–1992 (17). In the materials presented from the combination of bronchiectasis and COPD predisposing to hospitalization.

In our results, the bronchiectatic patients had a higher than twofold risk of contracting pneumonia if compared to asthma patients. Bronchiectatic patients had percutently more treatment periods including pneumonias than COPD patients, but the latter group’s risk of pneumonia per time unit was higher because of their shorter follow-up time arising from worse prognosis. Bronchiectasis is often preceded by pneumonia (9) and damaged bronchi are easily colonised with bacteria, which adds the possibility of infections. Hospitalized child patients often have both of them, which can be seen in these materials and usually associated with prolonged smoking. It is true that one patient can have both of them, which can be seen in these materials as well, and which may have partly affected the results. Similarly, if children with asthma have a bad response to inhalation steroid, another cause 41.6% 33.6% 23.9%

<table>
<thead>
<tr>
<th>Basic cause of death</th>
<th>B</th>
<th>A</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulmonary cancer</td>
<td>5.3%</td>
<td>5.7%</td>
<td>11.91%</td>
</tr>
<tr>
<td>Asthma</td>
<td>2.0%</td>
<td>4.9%</td>
<td>0.2%</td>
</tr>
<tr>
<td>COPD</td>
<td>17.1%</td>
<td>0.5%</td>
<td>27.6%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>6.3%</td>
<td>5.9%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Circulatory disease</td>
<td>27.8%</td>
<td>49.4%</td>
<td>32.1%</td>
</tr>
<tr>
<td>Another cause</td>
<td>41.6%</td>
<td>33.6%</td>
<td>23.9%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immediate cause of death</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>0%</td>
<td>0.2%</td>
<td>0%</td>
</tr>
<tr>
<td>COPD</td>
<td>0.7%</td>
<td>0%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>22.9%</td>
<td>12.6%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Circulatory disease</td>
<td>15.3%</td>
<td>20.3%</td>
<td>16.6%</td>
</tr>
<tr>
<td>Another or missing cause</td>
<td>61.2%</td>
<td>66.9%</td>
<td>67.9%</td>
</tr>
</tbody>
</table>

There has not been an essential decrease in bronchiectasis-related hospitalization during the last ten years in Finland. In their childhood in the 1940’s and 1950’s, the large age groups suffered end of the 1980’s and after that on high-resolution computed tomography (HRCT) of lungs. Changing over from version 9 to version 10 of ICD classification of diseases at the beginning of the year 1996 may have affected the results to some extent. This registry study deals with hospitalized patients only, and that is why there are more bronchiectatic patients in reality. Although these results are inpatient only, the risks found may apply to the whole community with the disease including those not yet requiring admissions for treatment. At the beginning of the study period, there were 5.1 million inhabitants in Finland, at the end of the period 5.2 million.

There has not been an essential decrease in bronchiectasis-related hospitalization during the last ten years in Finland. In their childhood in the 1940’s and 1950’s, the large age groups suffered
now, pneumonia was more marked as a basic and especially as an immediate cause of death of bronchiectatic patients, if compared to asthma and COPD patients (Fig. 3). In the middle of the study period, women’s average expected lifetime in Finland was eight years longer than men’s, which was reflected as women’s better prognoses both among bronchiectatic patients and control subjects.

**CONCLUSIONS**

Aged people are still hospitalized because of bronchiectasis unlike children among whom it is very rare in Finland. A hospitalized bronchiectatic patient has a higher risk of contracting pneumonia and a worse prognosis than an asthmatic, while the situation is reverse if compared to a COPD patient.

**Conflict of Interest Statement:** None of the authors have a conflict of interest to declare in relation to this work. Ethical approval: This study has been approved by the Finnish data register authorities.

**REFERENCES**


Received November 7, 2008
Accepted in revised form April 26, 2009