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Burden of Nontuberculous Mycobacterial Pulmonary Disease in Germany Based on Sick Fund Data

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BACKGROUND

- Nontuberculous mycobacterial pulmonary disease (NTMPD) is a rare but emerging global health concern, with important public health implications.[1,2]
- NTMPD can become a chronically progressive and debilitating disease.[3,4] It can lead to severe lung injury and cavitary lesions.[3,4] Patients with NTMPD have been shown to have a poor survival prognosis.[5-7]
- Current treatment requires a lengthy multidrug antibiotic regimen that can be poorly tolerated and have limited efficacy.[8]
- Robust epidemiological data and data on healthcare resource use associated with NTMPD are scarce.

OBJECTIVE

- This research aims to evaluate the incidence of and all-cause mortality and costs related to NTMPD in Germany.

METHODS

- Data from the German Health Risk Institute (HRI) health services research database was used to identify subjects with NTMPD based on the International Classification of Diseases code ICD-10. The HRI database contains anonymized health claims (sick fund) data from approximately 7 million persons covered by statutory health insurance and has been shown to be representative of the German population in terms of measures of morbidity, mortality, and drug usage.[9] The sick fund documents death events of the insured population, and these data represent a valid source of information for the analysis of death rates.
- Newly diagnosed patients with NTMPD in the years 2010 and 2011 were followed for a period of 3 years ($N_{(Index\ quarter)}$ = 125; $N_{(Year\ 1)}$ = 121; $N_{(Year\ 2)}$ = 109; $N_{(Year\ 3)}$ = 103).
- A control group without NTMPD was selected from all insured people, matched by age, gender, and Charlson Comorbidity Index (CCI) ($N_{(Index\ quarter)}$ = 1250; $N_{(Year\ 1)}$ = 1246; $N_{(Year\ 2)}$ = 1221; $N_{(Year\ 3)}$ = 1220). All-cause mortality and resource use were compared between the NTMPD group and the matched control group.
- Because patients with NTMPD frequently have underlying conditions, such as chronic obstructive pulmonary disease (COPD), cystic fibrosis, and bronchiectasis, mortality was also explored in patient with these conditions in addition to the control group. Patients with COPD (N = 390), cystic fibrosis (N = 122), and bronchiectasis (N = 140) were also matched to patients with NTMPD by age, gender, and CCI.

RESULTS

- Mean age of patients with NTMPD was 49.8 years and median age was 55 years, 50% of patients were male, and the mean CCI was 1.9. The matched control group was comparable with regard to these variables **(Table 1)**.

Table 1. Patient Characteristics for the NTMPD and Matched Control Groups

Variable	NTMPD Group (n = 125)	Matched Control Group (n = 1250)
	Mean [95% CI]	Mean [95% CI]
Age	49.8 [45.5, 54.0]	49.8 [48.4, 51.1]
Gender	50% male 50% female	50% male 50% female
Charlson Comorbidity Index	1.9 [1.5, 2.3]	1.8 [1.6, 1.9]

CI, confidence interval; NTMPD, nontuberculous mycobacterial pulmonary disease.

- Annual incidence rate for NTMPD (newly identified patients) was 2.3 per 100,000 persons under risk.
- In the period between the index quarter and the 3-year follow-up, 22% and 6% of patients died in the NTMPD group and the control group, respectively ($P < .001$). The mortality rate in the NTMPD group was also higher than in patients in the matched group with specific respiratory diseases (COPD, cystic fibrosis, and bronchiectasis) who did not have NTMPD. A particularly high mortality rate was observed for patients who had both NTMPD and COPD (N = 65) **(Figure 1)**.

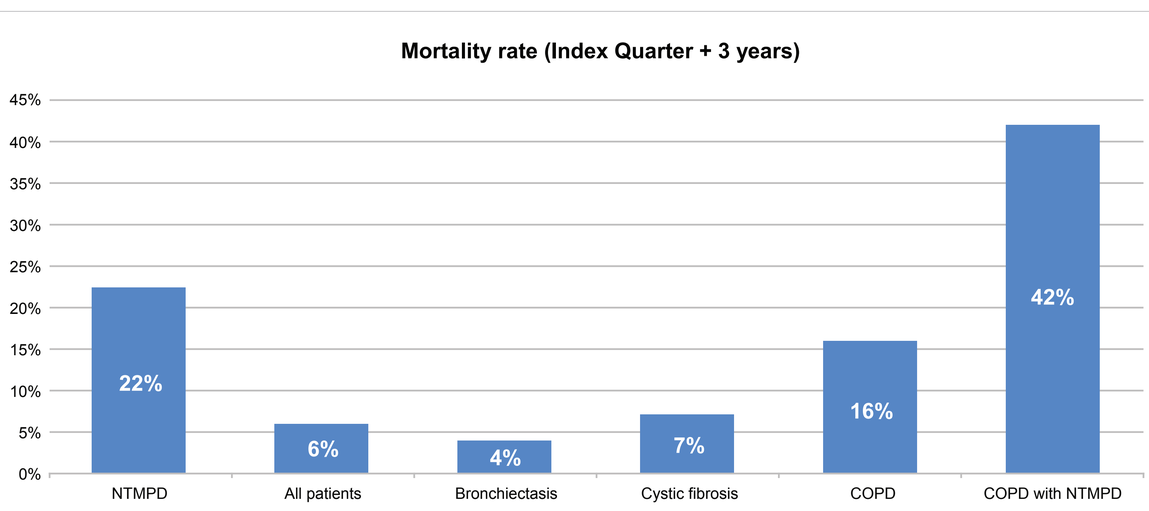

Figure 1. Mortality rates (quarter 0-12) in patients with NTMPD and in matched groups.

Note. Patients with bronchiectasis and cystic fibrosis, both without NTMPD, were matched to all patients with NTMPD; patients with COPD (but not NTMPD) were matched to patients with NTMPD who also had COPD.

COPD, chronic obstructive pulmonary disease; NTMPD, nontuberculous mycobacterial pulmonary disease.

- Total cost, including inpatient and outpatient care, drugs, dialysis, supportive care, medical aids, and sick leave, in the first year following diagnosis was more than 4 times higher in the NTMPD group vs. the control group (€14,166 vs. €3070, $P < .0001$). Total cost in the NTMPD group, however, decreased in Years 2 and 3 to €10,921 and €8652, respectively, mainly due to fewer hospitalizations. These reductions could be partly due to some patients having had their infection successfully treated. The majority of the costs in the NTMPD group throughout the follow-up period were attributable to inpatient stays **(Figure 2)**.

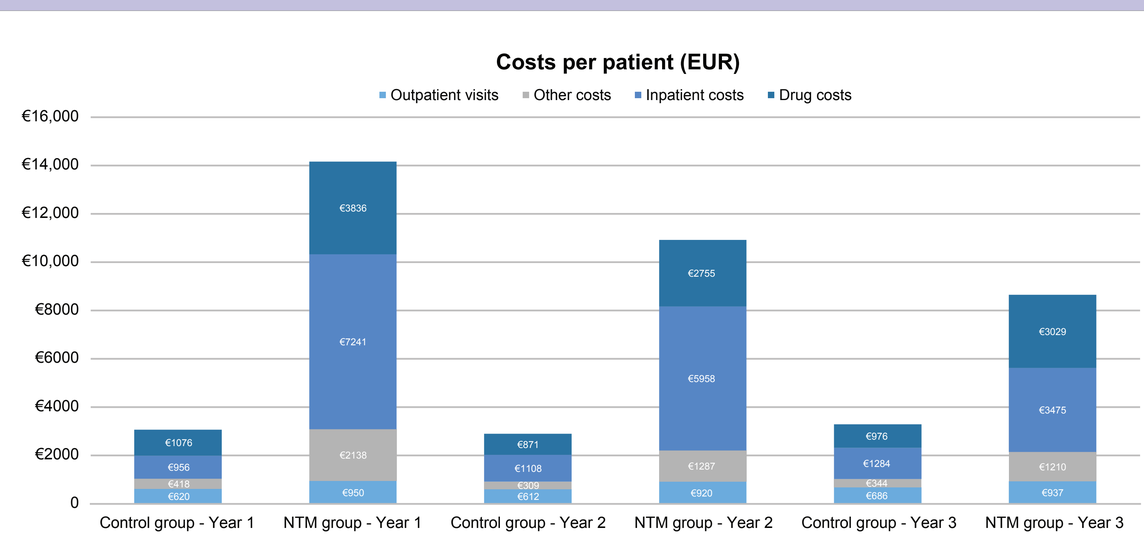

Figure 2. Total costs in Years 1, 2, and 3 following diagnosis of NTMPD.

Note. "Other costs" include dialysis, supportive care, medical aids, and sick leave.

NTM, nontuberculous mycobacteria; NTMPD, nontuberculous mycobacterial pulmonary disease.

DISCUSSION

- The study evaluated the burden of NTMPD in Germany in terms of incidence rate, mortality, and costs. The incidence rate that we found of 2.3 per 100,000 population slightly exceeded the rate previously reported based on registry analysis in Denmark of 1.08 per 100,000 population.[5]
- The all-cause mortality rate in the NTMPD group was significantly higher vs. other matched groups and was particularly high in patients who had NTMPD with coexisting COPD, almost triple the mortality rate observed for patients with COPD but without NTMPD. For patients with NTMPD who also had cystic fibrosis or bronchiectasis, analysis was not possible due to the small sample size.
- Direct annual costs associated with NTMPD far exceeded those for the matched control group and were higher on a per patient level compared with that reported elsewhere for other common respiratory conditions, such as asthma, COPD, or tuberculosis.[10]
- The study has several strengths: i) the data source used is representative of the German population; ii) identified costs represent what health insurances actually paid; iii) all medical costs, for both inpatient and outpatient management, are included; iv) a matched control group, adjusting for the impact of age, gender, and various comorbid conditions, was used.
- The limitation of health claims data based on ICD-10 codes is that these data may not accurately estimate the true number of patient cases due to the complexity of NTMPD diagnosis. The sensitivity and specificity of the ICD-10 code for NTMPD in the German healthcare system are namely unknown.[9] In addition, the ICD-10 code does not discriminate between disease severity stages and subspecies of nontuberculous mycobacteria. Also, only the overall mortality rate could be determined and not cause-specific mortality.

CONCLUSIONS

- In Germany, patients with NTMPD had a high mortality rate, exceeding that for patients with COPD, bronchiectasis, or cystic fibrosis, and the management of their disease was associated with substantial healthcare resource use.
- With the increasing prevalence of NTMPD in Germany[9] the costs of caring for these patients could become increasingly burdensome on the healthcare system, calling for more effective management strategies and more effective therapies.

REFERENCES

1. Griffith DE, Aksamit TR. *Curr Opin Infect Dis*. 2012;25(2):218-227.
2. Adjemian J, Olivier KN, Seitz AE, et al. *Am J Respir Crit Care Med*. 2012;185(8):881-886.
3. Weiss CH, Glassroth J. *Expert Rev Respir Med*. 2012;6(6):597-613.
4. Winthrop KL, McNelley E, Kendall B, et al. *Am J Respir Crit Care Med*. 2010;182(7):977-982.
5. Andréjak C, Thomsen VØ, Johansen IS, et al. *Am J Respir Crit Care Med*. 2010;181(5):514-521.
6. Hayashi M, Takayanagi N, Kanauchi T, et al. *Am J Respir Crit Care Med*. 2012;185(5):575-583.
7. Griffith DE, Brown-Elliott BA, Langsjoen B, et al. *Am J Respir Crit Care Med*. 2006;174(8):928-934.
8. Johnson MM, Odell JA. *J Thorac Dis*. 2014;6(3):210-220.
9. Ringshausen F, Wagner D, de Roux A, et al. *Emerg Infect Dis*. 2016;22(6):1102-1105.
10. *European Lung White Book*. Chapter 2. The economic burden of lung disease. 2015. European Respiratory Society. Available at: http://www.erswhitebook.org/chapters/the-economic-burden-of-lung-disease/. Accessed September 19, 2016.

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DISCLOSURES

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