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Burden and Trends of COPD Exacerbations in France Before and During the Pandemic



Results

Selection of the study population

In 2015, 186,963 COPD patients were included. Of these, 63.0% were men, and median age was 69 years old.



Introduction and objectives

Airborne infections, the main trigger of chronic obstructive pulmonary disease (COPD) exacerbations, are characterized by a seasonality well known by clinicians with an increased number of exacerbations during winters before the 2020 COVID-19 pandemic.

However, the infection control protocols implemented during the pandemic have led to a decrease in these pulmonary infections.



For all the subsequent time series analysis, exacerbations showed a seasonal pattern, with peaks at the beginning of the calendar year and dips in the middle of the year; this seasonality is well known in the literature. For all exacerbations (moderate and severe combined), there was a significant reduction in the exacerbation rate between 2020 and 2021 (Covid period). This decrease was confirmed by the trend curve, which was decreasing over this period. We therefore saw a reduction in the exacerbations rate over this period. However, after analyzing seasonality, the residuals were strongly negative over the Covid period.

In this study, we examined whether these preventive measures reduced the number of COPD exacerbations and analyzed their trend before and during the pandemic in France.

Methodology

A retrospective observational study was conducted using the French National Claims Database (SNDS). Individuals with a unique social security number who met the following criteria were included between January 1, 2015, and December 31, 2015 :

- Patients aged \geq 40 at index date.
- Patients treated with triple therapy in 2015 (long-acting ß2-agonist (LABA), long-acting anticholinergic (LAMA) and inhaled corticosteroids (ICS)) for at least 90 continuous days prior to this event.



The mean number of exacerbations by patient (moderate, severe and total) was described by month. The total number of death was also described monthly.

Severe exacerbations were those leading to hospitalization as defined according to an algorithm previously described in the literature¹. Moderate exacerbations were defined as the reimbursement of a glucocorticoid with an

Figure 1: Percent of patient with at least one exacerbation by month



For severe exacerbations (i.e. hospitalized exacerbations), there was also a significant reduction in the exacerbation rate between 2020 and 2021 (Covid period).

This decrease was confirmed by the trend curve, which was

antibiotic within 7 days (before or after).

In order to study the dynamics of these evolutions, we used the Seasonal-Trend Decomposition (STL) method over the follow-up period using LOESS method. Series were divided into trend, seasonal part, and remainder.

Seasonal-Trend Decomposition (STL) method

Objective of the STL method :

describe the variations of a series around a trend and seasonality

Explain the average value: the trend

- Presence of patterns
- Slow and long-ended variations

Explain the variations:

- Periodicity, called seasonality
- Correlated with other available variables

There are unexplained variations : **the residuals**

- Random fluctuations and external factors
- Correlated with unavailable variables (e.g., COVID-19)





Figure 2: Percent of patient with at least one severe exacerbation by month





decreasing over this period.

We therefore saw a reduction in the severe exacerbations rate over this period.

However, it should be noted that after analyzing seasonality, the residuals were strongly negative over the Covid period.

For death rate, there was also an important decrease in mid-2020 during the Covid period, however, this trough was preceded by a bullish peak which was not found for exacerbations.

The trend line was always downward. And residuals were relatively stable over the Covid period, but this bullish peak was

Conclusion

Given the seasonality of exacerbations seen in the analysis of temporal data prior to the COVID epidemic, and the potential impact on hospital services with winter spikes, it would have been expected that in 2020 and 2021 the number of exacerbations would show the same kinetics of significant increase in winter. However, there was a notable decrease in the rate of all exacerbations (moderate and severe) between 2020 and 2021. Despite this overall reduction, the analysis of seasonality indicated strongly negative residuals during the Covid period, suggesting that individual proactive measures lead to exacerbation rates lower than what would be expected seasonally.

This study offers insightful results of the trend of COPD exacerbations in France before and during the pandemic, showing a significant reduction in the exacerbation rate and seasonality. Further analysis with post pandemic data will be of interest to analyze post pandemic trends.



also found at the beginning of the Covid period.

So this STL decomposition seemed to suggest that, at the start of the Covid period, the total death rate had risen slightly, but had quickly returned to expected levels.

Figure 3: Number of death by month

Bibliography

1 - Molinari N, Chanez P, Roche N, Ahmed E, Vachier I, Bourdin A. Rising total costs and mortality rates associated with admissions due to COPD exacerbations. Respiratory Research. 2016 Nov 14;17(1):149.

Data sources

SNIIRAM study registered with the HDH on 06/30/2022 and authorised by the CNIL on 05/09/2022. (DR-2022-194(request 922190)) - CNAM agreement signed on 07/12/2023.

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