



Original Research

The Impact of Exacerbations COPD on Respiratory Function and Quality of Life

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Abstract:

Introduction:

Exacerbations of COPD are serious complications occurring at all stages of disease severity. according to COPD severity

Patients and methods

This is a prospective and observational study of a cohort of COPD patients confirmed by spirometry according to GOLD recommendations, in whom the frequency of exacerbations and its impact on respiratory function and quality of life during a period of 3 consecutive years

Results:

Our study population is composed mainly of men, one hundred and thirty-two against three women with an average age of 61 years. These are 05% stage I COPD, 63.7% stage II, 27.4% stage III and 03% very severe stage. The average frequency of exacerbations in Exacerbations weigh heavily on the course of the disease: they accelerate the decline in lung function and contribute to the deterioration of quality of our COPD patients is 2.41 exacerbations per year and it is closely correlated with the stages of severity of the disease ($p < 0.05$). The mean annual decline in FEV1 in frequent exacerbators is 44.41 mL vs 34.22 mL in subjects with rare exacerbations ($T: 2.61, p : 0.008$). The quality of life attributed by the CAT questionnaire shows a higher score in subjects with frequent exacerbations compared to those with little known exacerbations with a significant difference ($p : 0.000$).

Conclusion

life. It is necessary to reduce the frequency and severity of these episodes by smoking cessation and influenza and pneumococcal vaccine therapy.

Keywords: COPD, Exacerbation, declin FEV1, quality of life

Introduction:

Chronic obstructive pulmonary disease (COPD) is characterized by peripheral flow limitation secondary to smoke or gas inhalation. Its natural history is interspersed with episodes of aggravation of symptoms called “exacerbation”. Its severity and negative impact are such that it is one of the criteria for defining COPD according to GOLD 2017[1].

However, the definition of exacerbation remains unequivocal, but the medical community during the Aspen [1] consensus opted for a clear and pragmatic definition by defining it as an episode of sudden increase in the symptoms of dyspnea, cough and / or sputum. , lasting more than 24 hours, and requiring a modification of the usual treatment

The occurrence of an exacerbation of COPD and the repetition of these episodes are factors of poor prognosis. In addition, COPD exacerbations are a source of deterioration in respiratory function and patient quality of life.

Through this work, our objective will be to evaluate the frequency of exacerbations according to the stage of severity, to identify the frequent exacerbator profile and also to evaluate its impact on the decline in the forced expiratory volume of the 1st second (FEV1). and on quality of life.

Patients and methods:

This is an observational, prospective epidemiological study of the cohort follow-up type with 135 patients in the pulmonology department. The follow-up of the patients will be carried out over 3 years. The diagnosis of COPD has already been confirmed by spirometry according to GOLD recommendations as well as a stratification according to the severity stage of COPD (I, II, III, IV). The follow-up of these patients is carried out on the practice of a spirometry after an exacerbation at least once a year, a 6-minute walk test and the score of a dyspnea scale (mMRC) will be collected. A quality of life questionnaire (CAT) translated into Arabic is completed by the patient after prior consent.

Inclusion criteria

- COPD subjects having exacerbation criteria according to the definition (Aspen consensus)

Exclusion criteria

- Acute dyspnea in COPD secondary to the occurrence of pneumothorax, pleural effusion, infectious pneumonia or pulmonary embolism, heart failure that can simulate an exacerbation of COPD
- Exacerbations due to respiratory pathologies (broncheactasis, interstitial lung disease and asthma).

Statistical analysis:

Data management and statistical analysis will be carried out using SPSS software (version 21). The descriptive analysis of the qualitative and ordinal variables will include the number and frequency of each modality with its 95% confidence interval. That of the quantitative variables will include the mean, the standard deviation and their confidence intervals as well as the median, the percentiles and the extreme values. A threshold of 3 exacerbations per year has been proposed, which characterizes a frequent exacerbator, with reference to the literature [2].

Results:

For this study, we used the Aspen consensus definition of exacerbation. It is based on respiratory symptoms; dyspnea, cough, sputum. The positive diagnosis was clinically only, however additional examinations were carried out (standard X-ray, D-Dimers, echocardiography) in certain situations to be able to eliminate the differential diagnosis (pneumothorax, pulmonary embolism, heart failure). Indeed, these confirmed cases were excluded from the study.

One hundred and thirty-five COPD patients were included: 132 men and 3 women with an average age of 61 years. Depending on smoking status, they were as many ex-smokers as smokers (49%). COPD subjects were of different severity depending on the Stages GOLD. The average distance traveled during 6MW was 366m and the average value of the BODE index was 2.78.

Comorbidity factors were present with a predominance of cardiovascular damage (20.7%). The characteristics of the cohort are summarized in table 1

Table 1: Characteristics of the study population

	Frequency
Average age (years)	61±9
Man Woman	03/132
Smoking status	
Smoking	66(48.9%)
Former smoker	66(48.9%)
Non-smoker	03(2.2%)
Dyspnea (mMRC)	1.8 ± 0.7
Average BMI (kg/m2)	22.1±3.7
Mean FEV(%)	58.25 ± 15.29
Stage I	7(5.1%)
Stage II	86(63.7%)
Stage III	37(27.45)
Stage IV	5(3.7%0
Mean TM6(m)	366 ± 107
Average BODE index	2.78 ± 1
Comorbidity factors	87(64%)

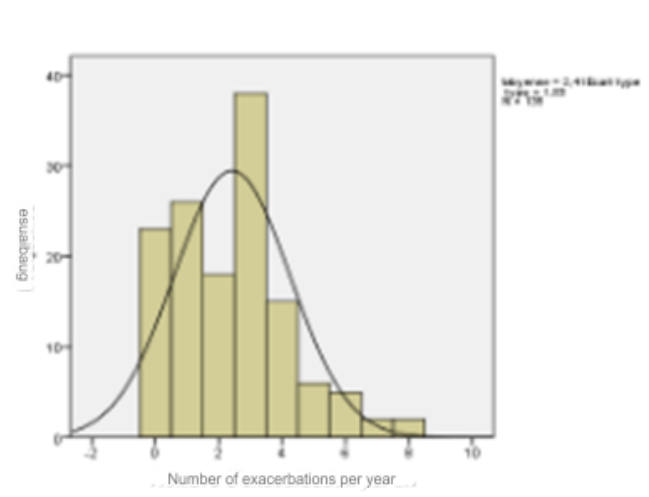
Values are expressed as mean ± confidence interval

During our follow-up, we identified all the exacerbations recorded in the department's on-call register and those reported by the patients who were taken care of by the peripheral health centers.

The average frequency of exacerbations is 2.41 ± 1 exacerbations per year, with a minimum value of 0 and a maximum of 8 (fig: 1)

Seventeen percent of COPD patients have had no exacerbations and 50.4% are frequent exacerbators (more than 2 exacerbations per year).

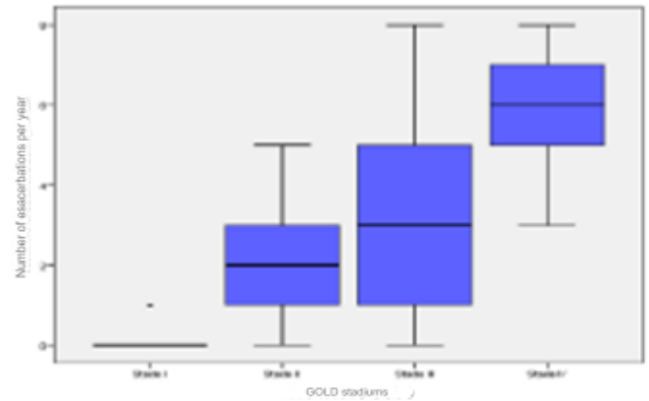
Figure 1: the frequency of exacerbations in a series of 135



In our study population, COPD subjects with severe and very severe stages of the disease were found to experience frequent exacerbations (more than 3 per year) compared to COPD subjects with mild to moderate disease. (Fig:2). The median value of exacerbations increased with the evolution of the GOLD stages.

The frequency of exacerbations is highly correlated with the stages of severity with a DS $p<0.000$. More than half of the frequent exacerbators are stage III COPD subjects and 100% stage IV.

Figure 2: The boxplots show the distribution of exacerbations according to GOLD stages. The central black lines represent the median



The more one progresses in the stages of severity of the COPD disease, the more the frequency of exacerbations increases (table 2)

Exacerbations are complications that accelerate the progression of the disease. the two categories: frequent exacerbators $\geq 3EX/year$ and those with fewer exacerbations $< 3EX/year$.

Table 2: Distribution of the frequency of exacerbations according to GOLD stages

Average frequency	Stage I (n:7)	Stage II (n:86)	Stage III (n:37)	Stage IV (n:5)
exacerbations/year	0.14	2.07	3.08	5.80

Table 3: The mean decline in FEV1 according to the frequency of exacerbations

	Frequencies of exacerbations	Mean decline FEV1	T	P	P<0.05	95 % CI
COPD	<3ex/year	34.22 ±24	-2.61	0.008	**	[-17.8,-2]
	≥ 3ex/year	44.41±20				

Shown are the correlation coefficients (= t)** p < 0.005; significant – 95% CI: confidence interval. FEV: maximal expiratory volume during the 1st second.EX: Exacerbation

Analysis of the data by the T test shows that the decline in FEV1 in frequent exacerbators is 44.41ml , higher than that of COPD with fewer exacerbations 34.22ml. The difference between these two categories of COPD is very significant (T:-2.61, P <0.05)(Table:3).

Figure 3 shows that there is no overlap between the confidence interval of the average decline in FEV1 of subjects with frequent COPD exacerbators (≥ 3EX/year) and that of COPD with fewer exacerbations (<3 ex/year).

The quality of life of COPD patients is assessed by the sore CAT. This questionnaire includes different items on cough, expectoration, dyspnea and quality of sleep. Our survey shows that the score varies from 7 to 37 with an average of 16.42 ± 6.67, this reflects that the quality of life of our COPD is impaired on average. (fig: 4)

CAT scores were compared in the two populations of frequent and less frequent exacerbators.

Figure 4: The frequency of the CAT score on a series of 135 COPD

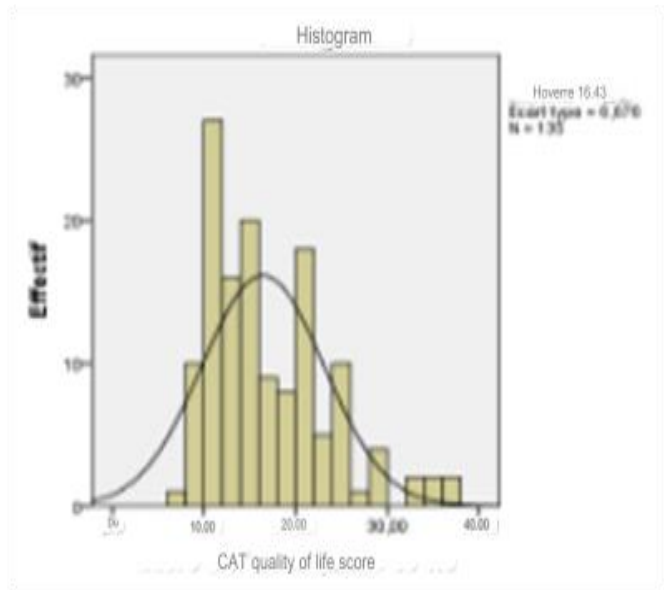
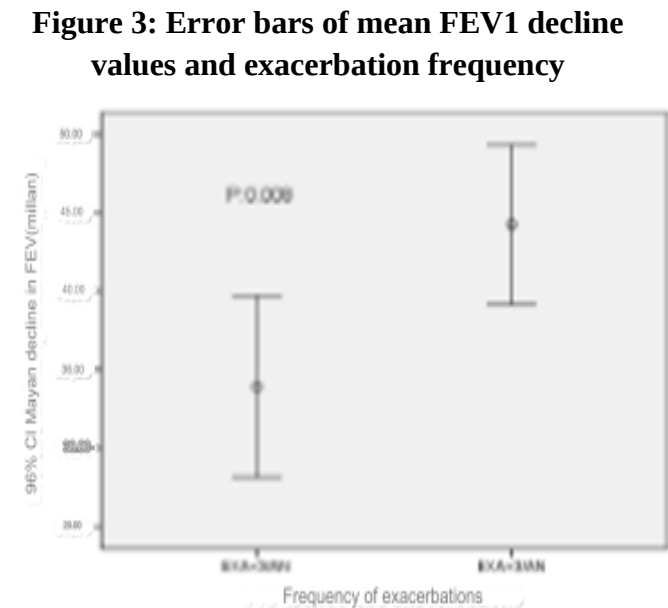
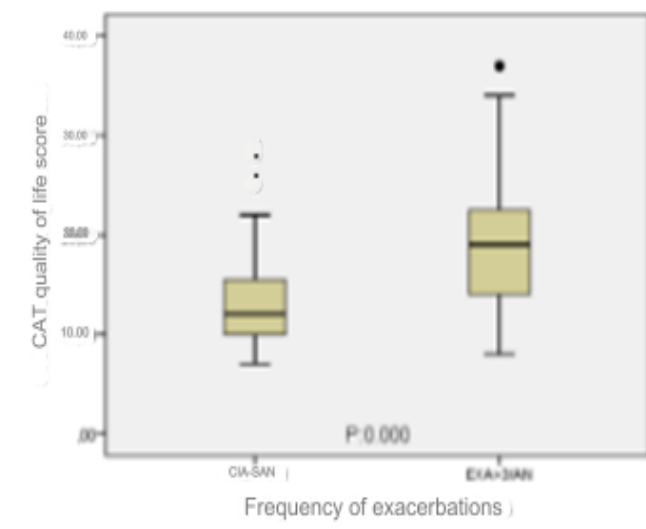


Figure 5: Box plots show the distribution of the CAT score according to the frequency of exacerbations. The black dots represent patients whose CAT score is higher than the average.



The medians of the CAT scores are distinct between the two groups, it is higher in frequent exacerbators. These results reflect that the occurrence of recurrent episodes of exacerbation in COPD subjects contribute enormously to the alteration of their quality of life

Discussion:

The frequency of exacerbations varies according to the definition used, with an incidence twice as high if the symptom-based definition is used rather than the operational definition based on the use of systemic corticosteroid therapy and/or antibiotic therapy. They are indeed frequent, costly, and sources of morbidity and mortality. Moreover, they have been associated with a more rapid decline in respiratory function and quality of life, and even with long-term excess mortality. The main etiologies of exacerbations are more viral than bacterial tracheobronchial infections, which explains the frequency of the occurrence of exacerbations during the peak of viral epidemics between November and February. However, the absence of an identifiable cause is frequent in a third of cases.

During the study period, 322 exacerbations were recorded with an average rate of 2.4 ± 2 exacerbations per year. Twenty-three patients (17%) showed no exacerbation during follow-up.

Our results are similar to literature data which report a median exacerbation rate of 2.5-3 per year [3,4].

Exacerbations of COPD are recurrent accidents occurring at any stage of the disease, however, according to the literature, their frequency and severity increase with the severity of the disease [5,6,7]. This is consistent with our results and observation of a close correlation between the stages of severity and the frequency of exacerbations ($P < 0.05$). Thus, the average annual rate of exacerbations increased with the severity of the disease, the average rate for stage III was 3.08 higher than stage II 2.07.

All these data are consistent with the work of Donaldson et al [8] with a follow-up of two and a half years, showed that the annual rate of exacerbations in severe COPD was higher than those with moderate to severe COPD with respective values 2.7 and 3.4

The association of the frequency of exacerbations and the severity of COPD would probably be related to permanent bacterial colonization favored by severe bronchial obstruction, which maintains this state in a vicious circle so each exacerbation calls for another.

Given that the FEV(L) is the gold standard in monitoring the evolution of respiratory function, all our COPD subjects benefited from a spirometry carried out at least once a year, in a stable state.

According to our functional results, the decline in FEV1 is more marked in frequent exacerbators with a difference of 10ml compared to less frequent exacerbators. The same results have been obtained with other studies [9,10]. greater than 25 ml versus 46 ml found during a prospective trial [8] including 109 COPD followed for 04 years.

Conversely, a weaker effect is obtained in the ECLIPSE study [11] with a drop in FEV of 2 ± 0.5 ml per year.

However, other studies have not demonstrated any impact on respiratory function, because the population studied is essentially composed of mild to moderate stages and in whom exacerbations are less frequent. [12]

From a pathophysiological point of view, an exacerbation is an increase in the inflammation of the pre-existing airways which would be the cause of the bronchospasm. Thus these inflammatory processes recurring over time aggravate the bronchospasm and accelerate the decline of FEV1.

These consequences relate to both bronchial obstruction and thoracic distension. Thus, Parker et al [13] demonstrated that the increase in distension predominated during the evaluation of 20 COPD after a moderate exacerbation. During our work, measures relating to thoracic distension were not explored.

The CAT questionnaire was translated into dialectal Arabic to ensure a good understanding for patients with their prior agreement to participate in the questionnaire. For subjects with a low level of education, the questionnaire is completed by the doctor in collaboration with the patient.

Given that our population is mainly composed of patients with moderate to severe COPD, the average CAT score is high (16.42). It seems that the quality of life of our patients is already impaired at a moderate stage of the disease. Our results are similar to those of a study using the same quality of life assessment tool, carried out in 400 COPD subjects, all stages combined [14].

The present study demonstrated a very close correlation between the frequency of exacerbations and quality of life. ($r: 0.46, p < 0.01$). In fact, the very prolonged persistence of dyspnea and cough significantly reduce daily activity and alter the quality of sleep. The regression of exacerbation symptoms occurs very slowly, even weeks to a month after the episode. The consequences are even greater during recurrences, in this case in frequent exacerbators, the quality of life scores do not improve quickly. Thus Spencer et al [15] have shown, in a prospective study of 6 months, that the recovery time for the quality of life scores assessed by the Saint Georges questionnaire is only gradual over 6 months. Similarly, the occurrence of another episode of exacerbation, these scores were only corrected very slowly. So that at the 6th month, these patients still do not find their basic values,

unlike patients who have had only one exacerbation.

Conclusion:

Exacerbations weigh heavily on the course of the disease: they accelerate the decline in lung function and contribute to the deterioration of quality of life. The prevention of exacerbations is a major objective of the treatment of COPD, which we can hope will influence the natural history of the disease in a beneficial way. It is necessary to reduce the frequency and severity of these episodes by smoking cessation and influenza and pneumococcal vaccine therapy

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