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Value of Sputum Differential Count in Chronic Obstructive Airway Disease

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ABSTRACT

Background: Sputum differential count is a useful tool to evaluate airway inflammation in chronic airway diseases. Since COPD (chronic obstructive airway disease) is so common in our setting this simple tool can be used to initiate and follow up treatment and progression of disease process.

Methods: A prospective cross sectional study was done in Department of Medicine, in a Teaching Hospital from June 2011 to June 2012. All patients admitted with acute exacerbation of chronic airway disease to the Department of Medicine were included in the study and their sputum was sent for differential count.

Results: Predominant cause of chronic airway disease was COPD 61 (85.9%). The sputum of these patients predominantly showed neutrophilia in the differential count with a mean neutrophil count of 82.06%. This was significantly high than the stated 60% in stable COPD. None of the COPD patients had eosinophilia or lymphocytosis. One patient with asthma showed eosinophil count of 12%. In these patients the peripheral blood smear differential did not show correlation with sputum neutrophilia ($r2 \geq 002$, $p \geq 0.05$).

Conclusions: Sputum differential has an important role in management of chronic airway diseases.

Keywords: COPD exacerbation; sputum differential; sputum neutrophilia.

INTRODUCTION

Chronic respiratory diseases are the most common cause of hospital admission throughout the year, in Nepal and have an overall prevalence of 33%.[1] During winter season, the number of patients admitted with exacerbations of COPD, asthma or bronchiectasis collectively known as obstructive airway disease, increases dramatically. Acute exacerbation of COPD is characterized by increase sputum production and increased shortness of breath along with purulent sputum.[2] The percentage of neutrophil are increased in sputum in COPD and may increase from above the usual value in acute exacerbation.[3,4] It is established fact that the sputum differential can give valuable information regarding type of airway inflammation. Studies have shown that in asthma there can be eosinophilic sputum.[5,6] There can also be eosinophilic bronchitis without asthma.[7] Knowing the type of airway inflammation will be helpful in planning the treatment strategy,[8] and also predicting disease severity. Sputum differential count can thus be considered to be the marker of inflammation of the airway.[3] Although, sputum gram staining has become routine, sputum differential is hardly done in our setting.

This study was done to sensitize the clinicians towards the usefulness of doing sputum differential count. It was also done to estimate the extent of neutrophil percentage during exacerbation of COPD and to ascertain the pattern of cells in our patients with chronic obstructive airway disease admitted with acute exacerbation.

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METHODS

A prospective cross sectional study was done in Department of Medicine of Kathmandu Medical College Teaching Hospital from June 2011 to June 2012. Total 100 patients with chronic obstructive airway disease admitted with the diagnosis of acute exacerbation of chronic bronchitis, acute exacerbation of chronic persistent asthma and infective exacerbation of bronchiectasis were included in the study. Patients whose diagnosis was not confirmed as per guidelines, patients with acute respiratory conditions and patients with other co-morbidities were excluded from the study. At the end of the study, out of the 100 included only 71 patients underwent sputum evaluation. Ethical approval was taken from ethical review board of KMCTH.

Acute exacerbation of COPD was defined as patients diagnosed as COPD as per Gold guideline,[2] with evidence of increased shortness of breath, with increased oxygen requirement to maintain usual level of saturation along with increased amount and purulence of sputum and clinical evidence of airway obstruction in the form bilateral polyphonic wheeze. Acute exacerbation of asthma was defined as patients with reversible airway obstruction (spirometry evidence) with recent increase in chest discomfort and shortness of breath needing admission. Bronchiectasis was defined as patients with radiological evidence of dilated bronchioles and small cystic airspaces filled with fluid in dependant portion of the lung with recent requirement of admission with increased sputum production, wheezing and coarse crackles in the chest. All the patients were given sputum collection bottle and this was sent to the laboratory early morning for sputum differential. Due to unavoidable reasons sputum total count was not done. Difficulty in generation of sputum was encountered in asthmatics for which saline nebulization or N-acetyl cysteine nebulization/oral was given to promote sputum production collected within day two ofadmission. If sputum could not be sent within this time it was excluded.The first record of the differential was noted. A simultaneous record of total blood leucocyte count and differential count was also noted. A repeat sputum differential of these patients was asked for during follow up. Since very few came with a follow up report follow up data had to be excluded.

Data was entered and statistical processing was done using SPSS 14 version. Results were expressed as statistically significant if p≤0.05. Continuous variables were expressed as mean ±SD. Comparison of means of different groups was done by oneway ANOVA and within groups by doing post hoc test.

RESULTS

Total of 71 patients underwent sputum evaluation. Age of the study population was 67.79±11.03. Male and female ratio was 1.08:1. The distribution of patients in the three chronic obstructive airway diseases was as shown in (Figure 1). The mean percentage Neutrophil differential count in between the three groups of chronic obstructive airway diseases was as shown in (Table1). The mean neutophil differential count was statistically very significant in the sputum of COPD patients admitted with acute exacerbation as compared with the other two conditions (p≤0.05). Only 60 patients had eosinophils more than 0% in their sputum differential and the mean was only 2.22 with a standard error of mean of 0.311. The highest eosinophil count was 12% in a patient diagnosed as asthma. All the COPD cases had neutrophil percentage above 60%, and with a mean ±SD of 82.06±10.7.

Mean neutrophil percentage in blood was 79±11.9 andblood neutrophil percentage was notpositively related with sputum neutrophil percentage (r2=0.002, p=0.68). But the mean neutrophil differential percentage in the COPD group as compared with the other groups was statistically very significant with a p=0.001. Within the groups the difference in neutrophil percentage was significantly higher p=0.002 when COPD group was compared with asthma groupand bronchiectasis group. But when COPD was compared with bronchiectasis the difference in mean neutrophil percentage was not significant p=0.629.

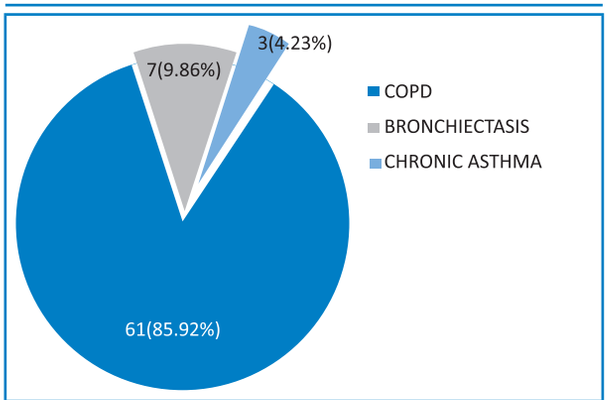

Figure 1. Percentage of cases in the three groups of chronic obstructive airway disease.

Table 1. Neutrophil percentage in the three groups of chronic obstructive airway disease during exacerbation.

Diagnosis	n	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
COPD	61	82.0656	10.68000	1.36743	79.3303	84.8008
Bronchiectasis	7	86.4286	8.75323	3.30841	78.3332	94.5240
Chronic asthma	3	56.6667	33.72437	19.4707	-27.1093	140.4427
Total	71	81.4225	12.88262	1.52889	78.3733	84.4718

Table 2. Difference of mean between the study groups (ANOVA).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2039.205	2	1019.603	7.239	0.001
Within Groups	9578.119	68	140.855		
Total	11617.324	70			

DISCUSSION

As already shown by various studies, our COPD patients also had significant increase in neutrophil percentage during exacerbation (82±10.7). Although the follow up data was not available to compare the neutrophil during stable period, other studies have shown it to be around 60%,[7] which shows that the increase during exacerbation was significant. Hence our finding of increased neutrophil percentage may be used to predict exacerbation with upgrading of anti-infective and anti-inflammatory therapy before the patient becomes very symptomatic.[8,9] We can also use this marker to show the severity of airway inflammation in COPD[8] and to predict prognosis.

Interestingly in our study, none of the COPD patients had eosinophilic inflammation as few studies have suggested.[10,11] Since majority of our patients were of COPD, the other groups were too small for any conclusion regarding predominant inflammatory cell in those conditions. But we can certainly investigate more in the COPD group. All our patients were severe COPD and were treated with bronchodilators and steroid inhalation along with anticholinergic with an addition of antibiotic during the inhospital stay for at least seven days. Repeat sputum would have definitely given us more incite about the control of inflammation and infection. Hence we want to emphasize the fact that routine evaluation and follow up evaluation of sputum in COPD cases can be a very helpful tool to show status of airway inflammation and planning of therapy.[12,13] It can be used to evaluate various types of airway disease, plan and start various anti-inflammatory agents and see their effect on the inflammatory cells and also to evaluate disease control.[14] Thus should be recommended.

CONCLUSIONS

Sputum differential has an important role in management of chronic airway diseases.

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