

Role Of Point Of Care B-Natriuretic Peptide Assay In Differentiating Cardiac From Pulmonary Causes Of Acute Dyspnea- An Observational Study

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ABSTRACT:

Background: Acute dyspnea is a common medical emergency during clinical practice. Correct differentiation of cardiac and pulmonary causes of acute dyspnea carries important role in the management of these patients. **Objective:** We ought to study whether a point of care B-Natriuretic Peptide (BNP) assay is helpful in differentiating cardiac failure from pulmonary causes of dyspnea. **Methods:** BNP levels were measured in 107 patients visited the Emergency department with acute dyspnea. Physician diagnosis was made based on clinical examination, ECG, CXR and ECHO studies and relevant consultation with the specialty department. BNP levels were compared among the patient group with congestive heart failure against a group with pulmonary causes of acute dyspnea. **Results:** Of 107 patients, 45 patients were diagnosed to have congestive heart failure as final physician diagnosis; 54 Patients were diagnosed to have a pulmonary cause of dyspnea [COPD exacerbation-26; Asthma exacerbation-18; Pneumothorax-3; Pneumonia-4; Acute respiratory distress syndrome-3] and 8 patients were diagnosed to have Non Cardiac, Non pulmonary cause of dyspnea [Hyperventilation-3; Anaphylaxis-2; Sepsis-3]. The average BNP levels in the CHF group were 786 pg/ml against the average BNP values of 82 pg/ml in the pulmonary group. **Conclusion:** Point of care BNP assay in the ED is highly useful to differentiate dyspnea due to congestive heart failure from dyspnea of respiratory origin.

Key-words: Acute dyspnea, Natriuretic peptide, Cardiac dyspnea & Pulmonary dyspnea.

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INTRODUCTION

Acute dyspnea is a common medical emergency encountered in acute care settings. Early diagnosis of the etiology of acute dyspnea is very important as delay in diagnosis can be life threatening. Congestive heart failure and pulmonary diseases are the most important causes of acute dyspnea in clinical practice. We usually encounter difficulties in differentiating the two conditions as the clinical features can overlap, ECG and CXR features may be nonspecific^{1,2} and also due to the limited availability of echocardiography in the acute care settings.

Studies from western population have shown that Plasma BNP levels assessed at the point of care settings can successfully identify patients with congestive heart failure.³ B-type Natriuretic peptide is a neurohormone secreted by cardiac ventricles in response to volume expansion or pressure overload.^{4,5} BNP levels in the blood are elevated in patients with left ventricular failure and correlates well with severity as well as prognosis. But there is a paucity of studies from Indian population and our experience with Rapid BNP assay is limited. In this context, the present study was aimed to evaluate the

utility of Point of Care BNP assay in differentiating congestive heart failure from pulmonary causes of acute severe breathlessness and its usefulness in acute care settings.

METHODS

The study was approved by the Institutional ethics committee of the Pushpagiri Institute of Medical Sciences, Tiruvalla, Kerala. The study was conducted at the department of Emergency Medicine, Pushpagiri Medical College Hospital during the period from May 2014 to December 2014. The inclusion criteria included those patients presented to the Emergency Medicine Department with acute severe breathlessness as their predominant symptom. Exclusion criteria included those patients with Trauma, those patients with acute coronary syndrome in whom dyspnea is not a predominant symptom and those patients with chronic kidney disease or on maintenance hemodialysis. We interviewed the patients and those patients with possible heart failure or pulmonary diseases were recruited for the study. Consent was taken and Blood sample was sent for Rapid BNP assay at our ED [Point of Care diagnostics; Allere stat lab]. The patients were re-

evaluated by the emergency medicine consultant with detailed clinical, laboratory, radiological and point of care echocardiography. Diagnosis of congestive heart failure was confirmed by the cardiologist consultation. The patient was diagnosed to have pulmonary disease based on the evaluation by the pulmonary physician, CXR features, echocardiography studies. The patients were grouped as (a) Having Congestive heart failure (b) Having pulmonary disease (c) Having Non cardiac, Non pulmonary diseases for acute dyspnea. The average value of BNP was calculated in each patient group and compared.

RESULTS

A total of 107 Patients were enrolled in the study based on inclusion and exclusion criteria. The demographic characteristics and Co morbidities of the study population are shown in Table-1. 65% of the patients were males [n= 70] and the rest were females [n=37]. Diabetes mellitus, Hypertension, Obstructive airway disease, Coronary artery disease was the main co-morbidities in the study group. Around 57% of the patients were on inhaled or oral broncho-dilators also.

Table 1. Patient Characteristics	
1. Sex distribution	
Males	n= 70 [65%]
Females	n= 37 [35%]
2. Co-morbidities	
Diabetes Mellitus	n=74 [70%]
Hypertension	n=65 [60%]
Coronary artery disease	n=55 [52%]
History of CABG	n= 21 [20%]
Chronic obstructive pulmonary disease	n= 42 [40%]
Bronchial asthma	n=20 [20%]
Old/ On going Tuberculosis treatment	n= 10 [10%]
3. On inhaled or Oral bronchodilators	n= 62 [57%]

A final diagnosis of CHF was made in 45 patients [42%] by a physician based on the corroborative clinical, laboratory, radiological and echocardiography evaluation and confirmed by consultation with the cardiologist. The average BNP value of this study group was 786 pg/ml. Pulmonary cause of dyspnea was diagnosed in 54 patients [51%]. Of these the main cause included acute exacerbation of

chronic obstructive pulmonary disease; acute exacerbation of asthma, pneumonia, adult respiratory distress syndrome and pneumothorax. The average BNP value was 82 pg/ml in this subgroup. Thus, it is observed in our study that BNP levels are at significantly higher levels in patients with congestive heart failure than in patients with pulmonary diseases [Figure-1].

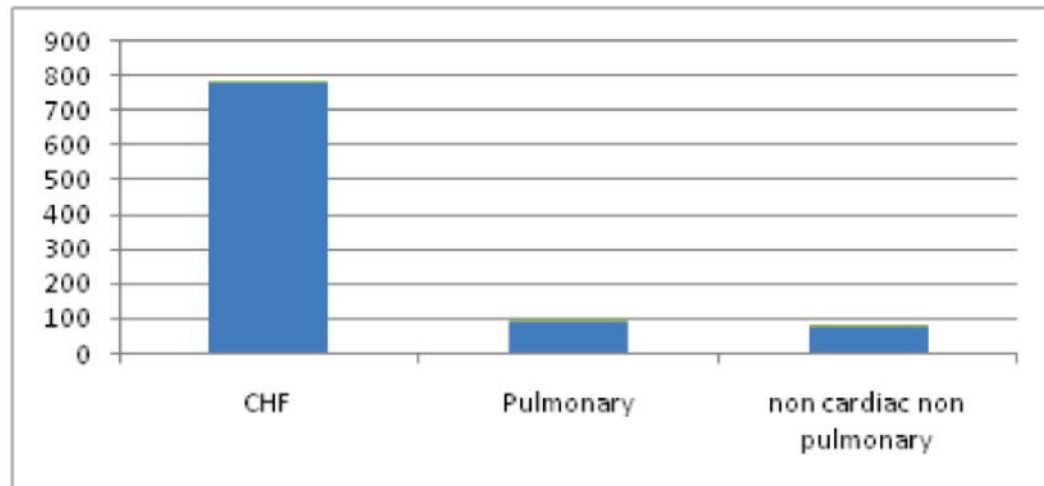


Figure 1. Average BNP levels in different patient subgroups
BNP levels in pg/ml in X axis

So we infer that the Rapid BNP assay is a very useful tool in the Emergency Department for rightly differentiating cardiac failure patients from respiratory causes of dyspnea, especially when used in conjunction with clinio-radiological evidence. We need further studies with larger populations to confirm our findings.

DISCUSSION

B-Natriuretic peptide is secreted from the Left ventricle in response to volume or pressure overload. Studies of the western population have already shown its usefulness in the evaluation of dyspnea in acute care settings^{3,4,5} but there is a paucity of studies in Indian population. We have undertaken a small observational study to evaluate the usefulness of BNP in our clinical settings.

Segregating cardiac dyspnea from pulmonary dyspnea is often encountered

with difficulties, especially in elderly patients or patients with bilateral lung infiltrates or patients with orthopnea. There are limitations in the diagnosis based on clinical examination as well as CXR and ECG. Echocardiogram of heart is a useful tool but its availability is limited in acute care settings, especially in a resource poor country like India. In this context, a simple blood test assay, it can successfully differentiate the two conditions, it will be very helpful. Definitely it will improve patient outcome, reduce cost of treatment and will help in faster disposition of patients from an emergency department.

In this study, we have included only medical cases with acute dyspnea and purposefully excluded trauma cases as where the causes of dyspnea is usually apparent in clinical examination. Patients with chronic kidney disease and/or maintenance hemodialysis were also

excluded as these patients have falsely elevated BNP levels, especially in the setting of fluid overload.⁶ Our main objective was to see whether the rapid BNP assay can differentiate mainly cardiac failure from the more common respiratory causes of dyspnea. This is important because many cases of cardiac failure were wrongly diagnosed as obstructive airway exacerbation as wheezing can be featured in cardiac failure also. Similarly, development of cardiac failure, in known COPD patients are also missed commonly. Thus, correct differentiation will definitely help in better patient management and result in better outcomes.

In our study, we observed highly elevated values for BNP in cardiac failure group [average BNP value 786 pg/ml]. This was substantially higher than the patients with pulmonary causes of acute dyspnea. The average value of BNP in pulmonary group [which included different conditions like COPD exacerbation, Asthma exacerbation, ARDS and pneumothorax] was as low as 82pg/ml. The results are in support of the studies in western population.^{4,7} It is particularly important to emphasize the negative predictive value of BNP in clinical conditions like acute dyspnea and bilateral lung infiltrates. Negative BNP levels in this context point towards a diagnosis of acute respiratory distress syndrome⁸.

We need studies in larger population to confirm our findings, and to set the cutoff points of BNP in Indian population. We hope that the incorporation of point of care BNP assay in Acute care settings will help in early identification of heart failure patients; rapid disposition of patients from ED; and better treatment outcomes.

CONCLUSION

We conclude that the rapid BNP Assay is a very useful tool in the emergency evaluation of acute dyspnea as it can easily differentiate congestive heart failure from pulmonary causes.

Conflicts of interest: Nil.

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