

B-TYPE NATRIURETIC PEPTIDE (BNP)

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INTRODUCTION

This chapter describes B-type Natriuretic Peptide (BNP) and its use as a tool to help clinicians identify asymptomatic individuals with left ventricular dysfunction or assist in triaging patients presenting with symptoms for further diagnostic testing.

ABOUT BNP

BNP is a neurohormone secreted predominantly by the cardiac ventricles in response to volume expansion or pressure overload. BNP acts as the body's defense against volume overload by virtue of its vasodilatory and renin-angiotensin-aldosterone system inhibitory properties that lead to natriuresis and diuresis.

Normal levels: BNP level of <100 pg/mL is considered normal and the half-life is 20 minutes.

Variations in BNP levels: Women tend to have higher level of BNP when compared to men and levels are also elevated in patients with renal insufficiency/failure. However, obesity is associated with lower plasma BNP in comparison to non-obese population.¹

CLINICAL USES

Diagnosis of Heart Failure (HF):

BNP levels are used routinely in the emergency room for the diagnosis of HF and play a key role in establishing etiology of dyspnea (cardiac vs. pulmonary) in patients presenting with acute shortness of breath.^{2,3} In the Breathing Not Properly trial, plasma BNP was markedly elevated in patients with clinically diagnosed HF compared to those without HF (mean 675 pg/mL vs. 110 pg/mL).⁴ In general, a BNP value of ≥ 100 pg/mL is diagnostic of HF with a sensitivity and specificity of 90% and 76% respectively. In contrast, a BNP level of < 50 pg/mL has a negative predictive value of 96% in excluding heart failure. BNP has a higher predictive value than other diagnostic tests, i.e., cardiomegaly on chest x-ray, or clinical evaluation including history of HF and rales on physical examination. In a prospective randomized controlled trial, 452 subjects who presented to the emergency room with acute shortness of breath were either assigned BNP bedside assay or received standard clinical assessment. The use of BNP reduced the need for hospitalization, intensive care admission, and time to discharge along with the total cost of in-hospital treatment.^{2,5} The American College of Cardiology/American Heart Association guidelines recommend that BNP or NT-proBNP (N-terminal pro-BNP) levels can be useful in the evaluation and risk stratification of patients presenting with symptoms in whom the clinical diagnosis of heart failure is uncertain.⁶

Asymptomatic Left Ventricular Dysfunction:

BNP has been shown to detect asymptomatic left ventricular dysfunction with sensitivity of 88% and specificity of 67% when BNP level of 50 pg/mL is used as a cutoff; it may be used as an initial low-cost modality to identify asymptomatic high risk individuals who would need further diagnostic testing.⁷

Predictor of Adverse Cardiovascular Outcomes:

BNP (>50 pg/mL) has been shown to be the strongest predictor of serious adverse cardiovascular outcomes in older individuals with preserved left ventricular systolic function. BNP level is generally increased in diastolic left ventricular dysfunction and correlates directly with left ventricular hypertrophy.^{8,9}

Pregnancy:

Pregnancy is a state of physiologic volume overload. Despite an increase in the left ventricular wall mass and end-diastolic dimensions during normal pregnancy, BNP levels remain stable throughout the gestation and postpartum period. In a longitudinal study of plasma BNP levels during pregnancy, when compared to non-pregnant, age-matched controls, the median level of BNP was noted to be 19 pg/mL during pregnancy vs. 10 pg/mL in the non-pregnant state.¹⁰ BNP levels stay well within normal range during an uncomplicated pregnancy; however, significant elevations are seen in patients with hypertensive disorders including preeclampsia.¹¹

- *Preexisting heart disease:* In pregnant women with preexisting dilated cardiomyopathy, serial measurements of NT-proBNP (N-terminal pro-BNP) are shown to be predictive of adverse cardiovascular outcomes.¹² In another study of 66 women with cardiac symptoms, all women who remained event free during pregnancy had BNP < 100 pg/mL.¹³
- *Pregnant women with cardiac symptoms:* BNP may play an important role in evaluation of pregnant women presenting with shortness of breath to determine both systolic and diastolic left ventricular dysfunction. BNP levels correlate with elevated left ventricular filling pressures in symptomatic pregnant women.¹⁴

SUMMARY

BNP is a simple, readily available, relatively inexpensive test that may assist clinicians in triaging patients who present with symptoms for further diagnostic testing. This test can be of particular value for obstetricians as most women exhibit some degree of fatigue, shortness of breath, palpitation and/or swelling during pregnancy. Adding BNP to routine evaluation of cases with symptoms out of proportion to pregnancy or to those patients presenting with symptoms suggestive of cardiac disease may reduce potential morbidity.

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