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# Profile of type B natriuretic peptides in diabetic patients in Brazzaville

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## Abstract

**Background and Objective:** Cardiovascular disease is the leading cause of morbidity and mortality in diabetic patients. The objective of this study was to determine the frequency of diabetic patients with a serum BNP level greater than 100 pg / ml and to establish the relationship between BNP and other variables. **Methods:** This is a cross-sectional study carried out in 50 diabetic patients admitted to the metabolic diseases department of the University Hospital of Brazzaville between May and October 2018. **Results:** A single type 2 diabetic patient presented a BNP = 187.4 pg / ml, a frequency of 2%. BNP level was associated with age (p = 0.005) and creatinine (p = 0.003). The small number of samples and an untargeted population did not allow us to profile BNP in diabetic patients. **Conclusion:** the mean BNP is high in diabetics in Congo Brazzaville despite a small sample size which does not allow the results to be generalized.

**Keywords:** Profile, BNP, Diabetics, Congo Brazzaville.

## INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in diabetic patients [1]. WHO estimates that by 2030, nearly 23.6 million people will die from CVD, mostly from heart disease and stroke. According to projections, these conditions will remain the first cause of death. Over 80% of CVD deaths occur in low- and middle-income developing countries [2].

The risk of heart failure is markedly increased in diabetes, not only because of the associated risk of coronary artery disease or high blood pressure, but also in diabetic cardiomyopathy [3-5].

The ventricles of the heart release B-type natriuretic peptide (BNP) in response to volume expansion and pressure overload [1]; therefore, the concentration of BNP can be used as a biochemical marker for heart failure. BNP levels are elevated in diabetics with left ventricular dysfunction. Thus, the BNP assay provides additional precision when the clinic is insufficient to diagnose this pathology [6-8].

The objectives of this study were to determine the frequency of BNP positive diabetic patients and to establish the relationship between BNP and other socio-demographic and biological variables.

## MATERIALS AND METHODS

This is a descriptive and analytical study carried out between May and October 2018. The selection of patients was made by random draw after their informed consent. All patients with any pathologies likely to cause an increase in serum BNP, including renal failure, acute myocardial infarction, cirrhosis, pulmonary embolism and severe hypertension, were excluded from the study. Venous blood was drawn from the elbow crease in fasting patients and centrifuged at 3000 rpm for 15 minutes. 200-500µl aliquots of serum and plasma were stored, respectively in dry and EDTA tubes at + 4 °C.

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The concentration of the serum BNP molecule was determined by a quantitative test based on the principle of immunodetection by sandwich (FinecareTM FIASysteme, Wondfo, China). The patient at risk (BNP positive) is the one whose concentration was higher than the normal value (BNP <100 pg / ml) [9].

The Architect C4000 machine (Abott, USA) was used for the determination of creatinine, urea, amino transferases and blood sugar. 200 µl of serum was taken for the assay of these biomarkers.

The glycated hemoglobin (HbA1C) assay was performed using the MultiCare HbA1C kit (SD BIOSENSOR, Korea) which uses reflectometry and immunoassay technique.

Data processing was carried out using R Studio version 1.2.1 software. The ANOVA test was used for comparison of proportions between groups. Multivariate logistic regression analyzes were performed to measure the association between the plasma BNP level as a function of socio-demographic (sex, age, level of education), biological (serum creatinine, uremia, transaminemia, glycemia, glycated hemoglobin) variables. Spearman's correlation analysis was used to determine the correlation between BNP and biological variables as well as age. The threshold of statistical significance was set at p <0.05.

**RESULTS**

Tables 1 present the socio-demographic characteristics of the patients. The mean age of the patients was 54 years, with extremes of 22 and 80 years (Figure 1.A). The proportion of women was 74% compared to 26% of men (Figure 1.A). The age group of 52–69 years was best represented, followed by that of 22–50 years (Figure 1.D).

The frequency of positive BNP was 2% representing a single 71-year-old type 2 diabetic patient (Figure 1.C) (Figure 1.B) who had a serum BNP concentration of 187.47 µg / ml.

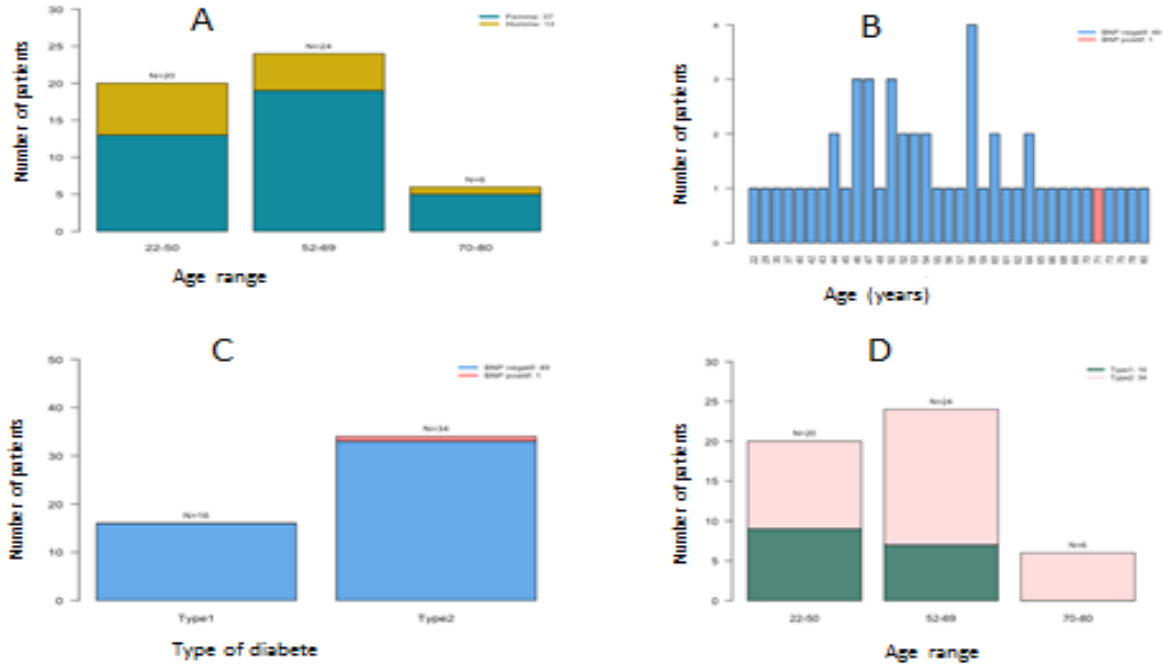


**Figure 1:** Distribution of patients. A. Distribution of patients by age group and sex. N = total number of patients by age group. B. Distribution of patients by age according to the BNP test (BNP positive for a serum level> 100 pg / ml). C. Type of diabetes as a function of serum BNP level. Only a 71-year-old female patient had a positive BNP concentration of 187.47 pg / ml. D. Distribution of age groups according to type 1 and 2 diabetes. The 52-62 age group is the most affected with type 2 diabetes.

Linear regression analyzes showed an association between serum BNP and age as well as serum creatinine (Table 1). A significant correlation between BNP, age and creatininuria was demonstrated (Table 2).

**Table 1:** Sociodemographic characteristics of diabetic patients

| Variable | Value (n=50) |
|---|---|
| Mean ± SD age (years) | 54.44±12.14 |
| Gender (%) | |
| Male | 13(26.0) |
| Female | 37(74.0) |
| Study level (%) | |
| Promary | 34(68.0) |
| Secondary | 11(22.0) |
| High | 5(10.0) |
| Type of diabete (%) | |
| Type 1 | 16(32.0) |
| Type 2 | 34(68.0) |

**Table 2:** Linear decrease test between BNP and other biological and age variables

| Variables | p-value |
|---|---|
| Age (years) | 0.005 |
| ALAT | 0.2 |
| ASAT | 0.2 |
| Creatininemia | 0.003 |
| Glycemia | 0.1 |
| HbA1C | 0.8 |
| BMI | 0.5 |
| Weight | 0.7 |

## DISCUSSION

The present study reports a prevalence of 2% of positive BNP. In view of these results, we must point out the limits linked to the BNP assay. The most important is the existence of a gray area between 100 and 500 pg / ml [10] where the dosage does not allow a precise diagnosis to be concluded. The explanation for this area is linked to several factors interfering with the interpretation of the dosage, such as kidney failure, age and severe hypertension. A study has shown that more than 25% of women aged over 75, free from cardiovascular pathologies, had BNP levels greater than 100 pg / ml [11]. In our study, the patient with a positive BNP assay was a 71-year-old woman with a BNP of 187 pg / ml; blood pressure figures were 15 cm Hg for systolic and 9 cm Hg for diastolic, serum creatinine was 14.3 mg / ml. Finally, the diagnostic interest of the assay lies mainly in its strong negative predictive value with a BNP threshold of 100 pg / ml [10].

In our study population, there is the predominance of the age group between 50 and 70 years (48%), which seems to be consistent with the study by Sprafka *et al* [12]. On the other hand, other studies report a lower average age with an average age of 58 years and extremes ranging from 40 to 59 [13].

The diabetic patients in our study are predominantly female (74%). This study is consistent with that of Mansour *et al* [13] which had a female predominance amounting to 73.17%. This predominance is probably explained by the high attendance of women by health programs directly dedicated to them.

BNP was associated with serum creatinine (P = 0.003) and age (P = 0.005). Our study reported some correlation with age (r = 0.38) and a strong correlation with serum creatinine (r = 0.87). The increase in BNP and age are along the same lines, so are the increase in BNP and serum creatinine.

## CONCLUSION

This study showed a BNP frequency greater than 100 pg / ml (BNP = 187.4 pg / ml) of 2% in a 71-year-old type 2 diabetic patient. Serum BNP level was associated with age and creatinine. The small number of subjects and the lack of a well-targeted study population (type 1 diabetics or type 2 diabetics) explains this very low frequency of positive BNP and did not allow us to establish the BNP profile in diabetic patients. In perspective, we propose to extend this survey to a larger population and also to clearly define this case-control study population by taking type 2 diabetics with and without vascular complications.

### State of current knowledge on the subject

In Congo, despite the frequency of cardiovascular diseases, data on the essential role of this biomarker in the management of heart failure in a population at risk are non-existent.

### Contribution of our study to knowledge

This work provides data on the hospital prevalence of positive BNP in the diabetic population at the University Hospital of Brazzaville (Congo). The low figures found in our study arouse the interest to continue this work by carrying out a case-control study taking type 2 diabetics with and without vascular complications, with the aim of clarifying the place of this biomarker in the management. heart failure, a common pathology in diabetics.

### Conflict of Interest

The authors declare no conflict of interest.


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None declared.


### Contribution's of authors

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## RÉFÉRENCES


1. Maeda K, Tsutamoto T, Wada A, Hisanaga T, Kinoshita M. Plasma brain natriuretic peptide as a biochemical marker of high left ventricular end-diastolic pressure in patients with symptomatic left ventricular dysfunction. American Heart Journal. 1998;135:825–32. doi:10.1016/S0002-8703(98)70041-9.
2. WHO. Cardiovascular disease. https://www.who.int/cardiovascular_diseases/about_cvd/fr/.
3. Dencker M, Stagmo M, Dorkhan M. Relationship between natriuretic peptides and echocardiography parameters in patients with poorly regulated type 2 diabetes. Vascular Health and Risk Management. 2010;6:373–82.
4. Galderisi M. Diastolic dysfunction and diastolic heart failure: Diagnostic, prognostic and therapeutic aspects. Cardiovascular Ultrasound. 2005;3:9.
5. Sudoh T, Maekawa K, Kojima M, Minamino N, Kangawa K, Matsuo H. Cloning and sequence analysis of cDNA encoding a precursor for human brain natriuretic peptide. Biochemical and Biophysical Research Communications. 1989;159:1427–34. doi:10.1016/0006-291X(89)92269-9.
6. Luchner A, Stevens TL, Borgeson DD, Redfield M, Wei C-M, Porter JG, et al. Differential atrial and ventricular expression of myocardial BNP during evolution of heart failure. American Journal of Physiology-Heart and Circulatory Physiology. 1998;274:H1684–9. doi:10.1152/ajpheart.1998.274.5.H1684.
7. Cardarelli R, Lumicao TG. B-type Natriuretic Peptide: A Review of Its Diagnostic, Prognostic, and Therapeutic Monitoring Value in Heart Failure for Primary Care Physicians. The Journal of the American Board of Family Medicine. 2003;16:327–33. doi:10.3122/jabfm.16.4.327.
8. Epshteyn V, Morrison K, Maisel A. Utility of B-Type Natriuretic Peptide (BNP) as a Screen for Left Ventricular Dysfunction in Patients With Diabetes. Diabetes Care. 2003;26:2081–7. doi:10.2337/diacare.26.7.2081.
9. Galinier M. BNP, nt-proBNP : Lequel choisir en pratique ? Repères pratiques: Examens complémentaires. https://www.realites-cardiologiques.com/wp-content/uploads/sites/2/2010/11/091.pdf.
10. LOGEART. Insuffi sance cardiaque et dosage du bnp en pratique clinique. SPECTRA BIOLOGIE. 2007.
11. Redfield MM, Rodeheffer RJ, Jacobsen SJ, Mahoney DW, Bailey KR, Burnett JC. Plasma brain natriuretic peptide concentration: Impact of age and gender. Journal of the American College of Cardiology. 2002;40:976–82.
12. Sprafka JM, Bender AP, Jagger HG. Prevalence of Hypertension and Associated Risk Factors Among Diabetic Individuals: The Three-City Study. Diabetes Care. 1988;11:17–22. doi:10.2337/diacare.11.1.17.
13. Mansour K. Étude des facteurs associés aux complications chez les diabétiques du rssb : Préfecture des arrondissements de Ben Msik : Année 2012. École Nationale de Santé Publique (ENSP), Rabat MAROC, 2013;35. http://bdsp-ehesp.inist.fr/vibad/index.php?action=getRecordDetail&idt=479567.