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STUDY THE CORRELATION BETWEEN CONGESTIVE HEART FAILURE AND B TYPE NATRIURETIC PEPTIDE

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Definition of Congestive heart failure:

The main clinical symptoms of heart failure are pulmonary crackles, peripheral edema, dyspnea, ankle swelling and weariness). The main structural and functional lesions of HF are the elevation in intracardiac pressure and the insufficiency of cardiac output even in the rest. The diagnosis of HF depends on the etiology of the underlying heart failure since the particular pathology dictates the course of treatment. Most usually, HF results from myocardial dysfunction—either systolic, diastolic, or both. But the heart rhythm along with conduction abnormalities, disease of the valves, pericardium, and endocardium, can also lead to or aggravate HF (1). The incidence of heart failure adjusted rate may be declining in affluent nations, presumably reflecting improved care of CV illness, but due to aging the general incidence is rising (2-4). In Europe, the HF incidence is about 3/1000 person-years (all age-groups) or maybe 5/1000 person-per year in adults (5, 6). The percentage of 12% is the most predominant one between adults (2, 7-9).

The actual prevalence is probably greater (10), since studies only typically include known/diagnosed HF cases. From about 1% for those under 70 years to 10% in those aged 70 years or more, the prevalence rises with age (11, 12). Based mostly on studies in hospitalized patients, The ratio between fractions of reduced ejection to preserved ejection, (HFrEF) and (HFpEF) respectively, is roughly 50% in patients have HF fraction. In contrast, 60%, 24% and 16% in HF patients who are half of them females (2, 15) have HFrEF, HFmrEF and HFmrEF respectively (14).

1-3 Congestive Heart Failure Classifications:

Problems Damage to the pericardium, myocardium, endocardium, or heart valves can lead to the clinical manifestations of heart failure. Nevertheless, the majority of patients experience symptoms related to impaired left ventricular myocardial performance. Regardless of the ejection fraction, dysfunctions in both systolic and diastolic functions occur simultaneously. The left ventricular ejection fraction (LVEF) has been pivotal in differentiating heart failure with reduced ejection fraction and evaluating its causes and treatment effectiveness since its initial adoption, making it crucial for classification.(16). In this group, research has demonstrated a survival advantage. Heart failure syndrome characterized by a left ventricular ejection fraction of 40% or lower is identified as HFrEF; conversely, heart failure patients with an ejection fraction of 50% or higher are categorized under HFpEF. The European Society of Cardiology guidelines emphasize the need for clear evidence of structural or functional alterations along with elevated natriuretic peptide levels, regardless of heart failure indications or symptoms. Significant structural changes include enlargement of the left atrium or an increase in left ventricular mass; functional indicators of diastolic dysfunction entail E/e′ values exceeding 13 and a mean e′ septal and

lateral wall measurement below 9 cm/s. (17). Recently defined as a third type is HF with mid-range ejection fraction (HFmrEF), LVEF = 40% to 49%.

1-4 Heart failure diagnosis:

Tiredness, ankle edema, and dyspnea are the typical symptoms of patients with HF. CHF is more likely to seen in patients with cardiotoxic chemotherapy, chronic kidney disease (CKD), alcohol abuse, arterial hypertension and MI and patients with of CMP history.

For patient assessment with suspected chronic HF, the following diagnostic tests are advised:

1 ECG, the electrocardiogram. The diagnosis of HF is unlikely from a normal ECG. The ECG may show anomalies like AF, the presence of Q waves, left ventricular hypertrophy (LVH), and an expanded QRS complex all increase the probability of diagnosing heart failure and could also assist in guiding treatment decisions treatment (18).

If at all possible, NPs should be measured. Either a mid-regional pro-atrial natriuretic peptide (MR-pro ANP) level below 40 pmol/L or a plasma concentration of B-type natriuretic peptide (BNP) below 125 pg/mL renders a heart failure diagnosis improbable (19).

To differentiate between HF and other diseases and to provide information in terms of prognostic and guide possible therapy, serum blood count, creatinine, urea, electrolytes, liver and thyroid function tests.

The main study advised for evaluation of heart function is echocardiography. In addition to chamber size, concentric or eccentric LVH, echocardiography offer different wall motion abnormalities such as myocarditis, Takotsubo syndrome and underlying CAD, markers of diastolic function, valvular function, and pulmonary hypertension and RV function (20).

Along with the determination of the LVEF. 5 Investigating other possible causes of breathlessness—such as pulmonary disease—a chest X-ray is advised. It can also offer supporting data of HF (such as cardiomegaly or pulmonary congestion).

1–5 Background on Synthesis, Function, and Secretion of Pro BNP

The natriuretic peptide system consists of three distinct receptors: NP receptor-B, which can also be known as GC-B or NPR-B; NP receptor-A, alternatively referred to as guanylate cyclase A or NPR-A; and NP receptor-C, identified as the clearance receptor or NPR-C. This system includes atrial natriuretic peptide (ANP) and B-type natriuretic peptide (BNP). Even though these peptides are physically and functionally linked in their role of regulating circulatory equilibrium in vertebrates, they originate from separate genetic sources. Each peptide features a cyclic configuration composed of 17 amino acids, distinguished by the presence of a disulfide bond. (22).

It has been found that, pig brain with stored BNP in atrial granules with ANP but not in granule form in ventricle (23). The primary secreter of BNP is the normal atrium (24).

In ventricle and when there is inadequacy of LV function and there is a strain in cardiac wall, BNP can be released in patient with maladaptive remodeling of left ventricle (LV) (25).

Volume overload, transmural pressure and tissue hypoxia can cause the transcription of NPPB gene in endoplasmic reticulum which leads to generate 134-aa prepro BNP (26). The most predominant proinflammatory factors are interleukin-6, Interleukin-1β and tumor necrosis factor-α which can induce the synthesis of BNP in cardiomyocytes leading to crucial role in immune system (27).

Apart from its purpose in the natriuresis, diuresis, and vasodilation, BNP directly affects cardiac (23). BNP could offer compensatory protection by blocking myocardial death and necrosis and by lowering cardiac hypertrophy and fibrosis (28). BNP might potentially control inflammatory and immunological

response to heart damage. BNP drives down natural killer cells, B lymphocytes, and monocytes in peripheral blood (29). By macrophages, BNP controls the movement of monocytes in response to chemical signals and the production of inflammatory substances (30). Following myocardial infarction (MI), BNP may induce cardiac neutrophil infiltration and metalloprotease-9 expression as well as directly affect matrix remodeling and wound healing (31). Kidney removes BNP and NT-proBNP are both broken down by NEP and NPR-C. BNP has a half-life of seventy minutes, which is shorter than that of NT-proBNP. As a result, BNP and NT-proBNP are preferred over other natriuretic peptides as the gold standard for heart failure (HF) diagnosis, according to clinical recommendations for rule-out tests. (32, 33). 1.6–6 Why can pro BNP help in Heart failure (HF) is a complex condition that affects the entire body. The American College of Cardiology Foundation/American Heart Association (ACCF/AHA) and the European Society of Cardiology (ESC) provide guidelines for its management. state that the most useful biomarkers for identifying cardiac dysfunction and HF are BNP and NT-pro BNP. They also guide the pertinent treatment plans, evaluate the degree of the severity, and project the course of cardiac disease (34–36).

I. Estessed the degree of cardiac failure:

The left ventricular dysfunction can be estimated by the linking between the levels of natriuretic peptide which could lower the stress of ventricular wall and the acuteness of ischemic heart disease (37). Cardiovascular events which are unfavorable can be assessed by both B NP and NT-proBNP. In patients with stable coronary heart disease (38). In acute myocardial infarction, the assessment of Cardiac troponin T (cTnT), myoglobin, creatine kinase MB (CK-MB), BNP, and NT-proBNP were evaluated as indicators. Unlike BNP, NT-proBNP is regarded as the most diagnostic biomarker. (39). In terms of prognosis and degree of the severity of ischemic heart diseases, BNP and NT-proBNP can be used as essential indicators (40, 41). Interestingly, patients with atrial fibrillation showed higher levels of BNP and NT-proBNP which was documented to be linked with arrhythmias and cardiomyopathies (42). Experimentally, it has been found that there is an increase in the BNP mRNA expression and the protein encoded that gene roughly after 10 min of transient lethal ventricular arrhythmias (43). The left ventricular end-diastolic dimension (LVEDD) and left ventricular volumes are inversely associated with the left ventricular ejection fraction (LVEF). The ratios of BNP to cTnT and BNP to CK-MB are useful in differentiating Takotsubo cardiomyopathy from acute myocardial infarction (AMI), providing greater accuracy than BNP alone. (46).

This suggests that the differential diagnosis of some heart disorders could be accomplished using the tests of BNP in concert with other biomarkers (47).

Not only are BNP and NT-proBNP highly important for the diagnosis of HF, but they also help to evaluate the degree of severity and prognosis of HF. Based on Doppler-echocardiography (48), BNP and NT-proBNP emerged as the most reliable independent predictors for HFpEF. In patients classified as NYHA classes I–IV, plasma BNP levels were observed to rise progressively. The New York Heart Association (NYHA) trial study indicated that plasma BNP concentrations increase in accordance with the severity of heart failure. (49In patients with cardiovascular diseases, the levels of plasma BNP and NT-proBNP serve as important predictors. Additionally, a reduction in BNP and NT-proBNP levels is associated with an improvement in clinical symptoms. The assessment of BNP or NT-proBNP levels is therefore significant. (36) and the death risk show a positive connection. After controlling for clinical factors, including EF (50). A study involving 521 patients with acute myocardial infarction (AMI) found that BNP and NT-proBNP levels can predict the risk of sudden cardiac death. In clinical practice, plasma BNP and NT-proBNP are utilized to guide the management of patients with heart failure and cardiac dysfunction. Additionally, these biomarkers serve as prognostic indicators, enabling clinicians to adjust treatment strategies and assess the effectiveness of therapies to enhance patient survival. (51, 52). III.

Therapeutic Part in Cardiac Dysfunction: The dilatation of blood arteries and lowering the cardiac preload and afterload successfully have been linked to by the endogenous hormone which as BNP sequence amino acid and human brain natriuretic peptide (ehBNP). This was approved by the FDA that outlined that acute decompensated HF is treatable in 2001, the different biological activities of nesiritide is a successful rhBNP to the endogenous BNP with akin. This is include the decrease of pressure in pulmonary capillaries, diuresis, natriuresis, RAAS inhibition, heart output increase, and Enhancement of both cardiac diastolic and systolic function has been achieved. RhBNP has been widely utilized in the treatment of heart failure. Numerous sources confirm this as of today. (53, 54). The aim of this study is to assess the serum levels of pro BNP in patients with heart failure. It will also explore how these levels vary based on factors such as the underlying cause, type of heart failure, echocardiographic findings, and treatment status .

Patients and Methods2-1 Cross-sectional hospital based study with analytical components. Two to Two Research environment: Patients attending the Echo department in Ibn-Al-Nafees hospital and Iraqi cardiac center in Bagdad governorate underwent data collecting between the first of January and the first of May of 2022. Six days weekly, the data collecting took roughly five hours every day. 2–3 sample size and technique: Adopt a consecutive sample during the period of data collecting. The rationale for this sample size is the temporal span and COVID 19 epidemic; the patients with LV dysfunction who visited Echo department were asked to take part in this study dependent on clinical findings by cardiologist. Two to Four the study covers all LV dysfunction patients attending the Iraqi cardiac center of both sexes and all age groups as well as those attending Echo department in Ibn-Al-Nafees hospital. 2-5 Exclusion rules:

1. Patients on renal replacement treatment.
2. Patients experiencing arrhythmia of the suptive kind.
3. Patients fitted with implanted devices.
4. History of pulmonary embolism (excluded by Hx linked with the absence of echo symptoms of PE) - thrombus in transit, isolated RV dysfunction.
5. Background of Hypertrophic CMP.
6. Background of congenital heart disease.
7. Recent DC shock in electronics.
8. Recent trauma to the chest or heart surgery.
9. ACS subjects.
10. Patients with acute brain insult (by physical examination of gait power and refluxes, speech and memory, history).
11. Patients revealed by physical examination and history to have advanced COPD.
12. Burnish patient.
13. Anemia patient.
14. Patient apparently suffering with liver cirrhosis.
15. Thyroid disease's historical background.

Between two and six Tools for obtaining dates:Figure 2-1: The patient was requested to participate in the study by the doctor present in Echo unit and following patient with LV dysfunction conclude their

assessment by the doppler echocardiogram using Vivid E 9 M5sc transuder (2-5 MHz frequency). Data collecting was conducted using a self-constricted questionnaire form developed by a researcher and supervisor for age and sex. Etiology of HF was investigated either ischemia or non-ischemic when the patient without known history of IHD, no regional wall abnormality, no history of coronary angio or coronary angio done and revealed normal coronaries, also patients with primary valve lesions or DCM. NyHA (New York Heart Association) functional class recorded indicated the degree of heart failure:

- Class I: Not limited in terms of physical exercise. Regular physical exercise does not aggravate palpitations, tiredness, or dyspnea.

Class II: Little restriction on physical activity. At rest, comfortable; but, regular physical exercise causes palpitations, dyspnea, or exhaustion.

Class III: Clearly limited physical activity. At rest, comfortable; but, less than usual exercise causes palpitations, dyspnea, or exhaustion.

- Class IV: Not able to continue any kind of physical exercise without pain. One can find symptoms at rest. Any kind of physical exercise increases discomfort.

The patients regarded as without a chest infection are those without symptoms and signs of a chest infection (fever, expectoration) and neither during the time waves of COVID 19 infection stated by Iraqi ministry of health, nor during either waves of COVID 19, negative. Added to the criteria, history of interaction with patients displaying sign and symptoms of a chest infection and no sign of chest infection by CXR (only for patient who already did CXR). Patients noted as exhibiting symptoms of a chest infection using either PCR, CT, or CXR.

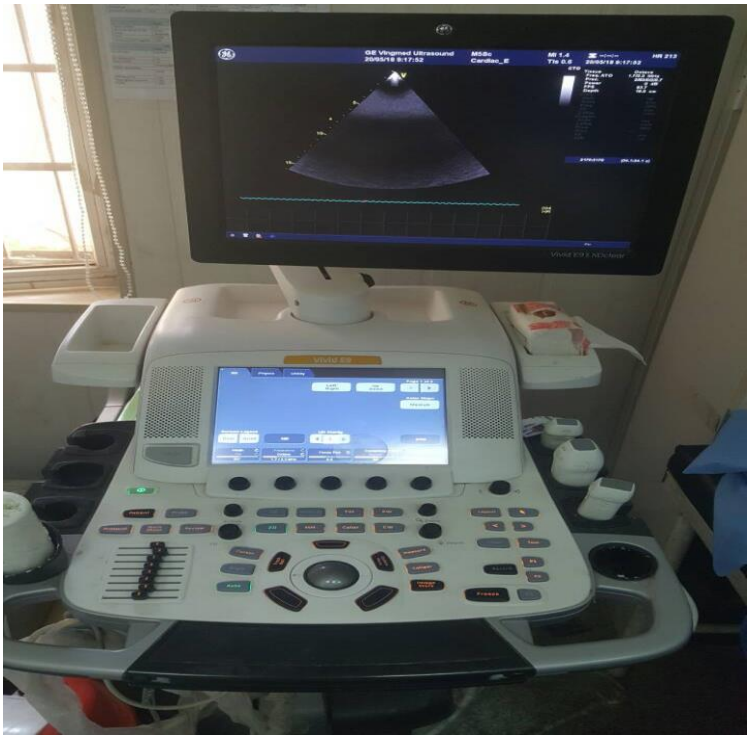

Figure 2-1: Vived E 9 echocardiograph.

Standard two-dimensional pictures were taken with ANP but not in the apical two- and four-chamber presentations as well as in the parasternal long and short dimensions. Detected at the tips of the leaflets were pulsed-wave Doppler recordings of mitral valve inflow. Evaluated using with ANP but not in the apical two- and four-chamber presentations as well as in the parasternal long and short dimensions.

Detected at the tips of the leaflets were pulsed-wave Doppler recordings of mitral valve inflow. Evaluated using a digital echocardiography workstation were the volumes of the left ventricle along with the Doppler recordings. All echocardiography assessments were performed by skilled operators who remained unaware of the BNP assay results; the left ventricular ejection fraction (LVEF) was derived using a modified version of Simpson's technique utilizing biplane apical (two- and four-chamber) views. Clinical manifestations were determined by both of these two conditions that indicated left ventricular systolic dysfunction:

In echocardiography, the left ventricle's enlargement with an LV end-diastolic diameter exceeding 55 mm. Echocardiography indicated a left ventricular ejection fraction below 50%. Mild left ventricular dysfunction was identified when EF was between 41% and 49%; moderate left ventricular dysfunction was characterized with EF between 31% and 40%; severe left ventricular dysfunction occurred with EF of 30% or less.

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Testing Plasma BNP: Every patient had tests right following the clinical and echocardiographic tests. Keeping venous blood samples at room temperature in EDTA tubes, they were examined four hours after the collection. After that, 250 ml of EDTA-anti-coagulated whole blood was added to a disposable device in a sandwich immunoassay called Triage BNP assay and triplicate analysis was conducted. The BNP concentrations were computed by use of a triage meter, which detects a fluorescent signal reflecting the The BNP content in the sample was analyzed as follows: After supplying 250 ml of whole blood to the device, a filter separated the cells from the plasma. The plasma, which contained BNP, was then placed in a reaction chamber with fluorescent-tagged BNP antibodies to form a reaction mixture. Following an incubation period of approximately two minutes, the reaction mixture was drawn by capillary action into a zone with immobilized antibodies designed to bind the BNP-fluorescent antibody complex. After about fifteen minutes, the device was inserted into the Triage meter, which recorded the fluorescence intensity of the BNP assay zone. The correlation between the Triage meter readings and the fluorescence measurements was related to the BNP concentration. accomplished using an internal calibration curve. The test took roughly fifteen minutes.

Cr Cl Coackroft Gault equation also allowed one to determine creatinine clearance: 2-8 Ethical consideration: Approvals of the Arab board of health specialized on ethics. To acquire their verbal permission, the researcher outlined the goal of the research. After being drived from every patient and uploaded into a Microsoft Excel data sheet of Windows, Data was analyzed using the Statistical Package for the Social Sciences (SPSS version 23). Descriptive statistics were presented in frequency tables, with continuous variables reported as mean ± standard deviation and categorical variables as counts and percentages. The Mann-Whitney test was employed for analytic statistics to identify relationships between variables. continuous and non-typically distributed categorical variables and continuous variables when correlation coefficient between 0.2 to 0.29 mean weak correlation, 0.3 to 0.39 mean moderate connection, 0.4 to o,69 mean high correlation and when correlation coefficient≥ 0.7 mean extremely strong correlation. Considered statistically significant was the P-value either lower or equal 0.05.

This study included 100 cases total with Congestive heart failure; the mean± SD age was 62.8 ±11.8 years, ranging between 38 and 85 years, table 3-1.

Table 3-1 Demographic characters of studied group.

Demographic characters		Number	Percentage
Age	<60 years	44	44%
	60-69 years	24	24%
	≥70 years	32	32%
	Mean± SD	62.8 ±11.8 years	
Gender	Male	55	55%
	Female	45	45%
Total		100	100%

Heart failure severity by NYHA classification shown that 52% of patients had grade II, and only 11% of patients had grade IV, figure 3-1.

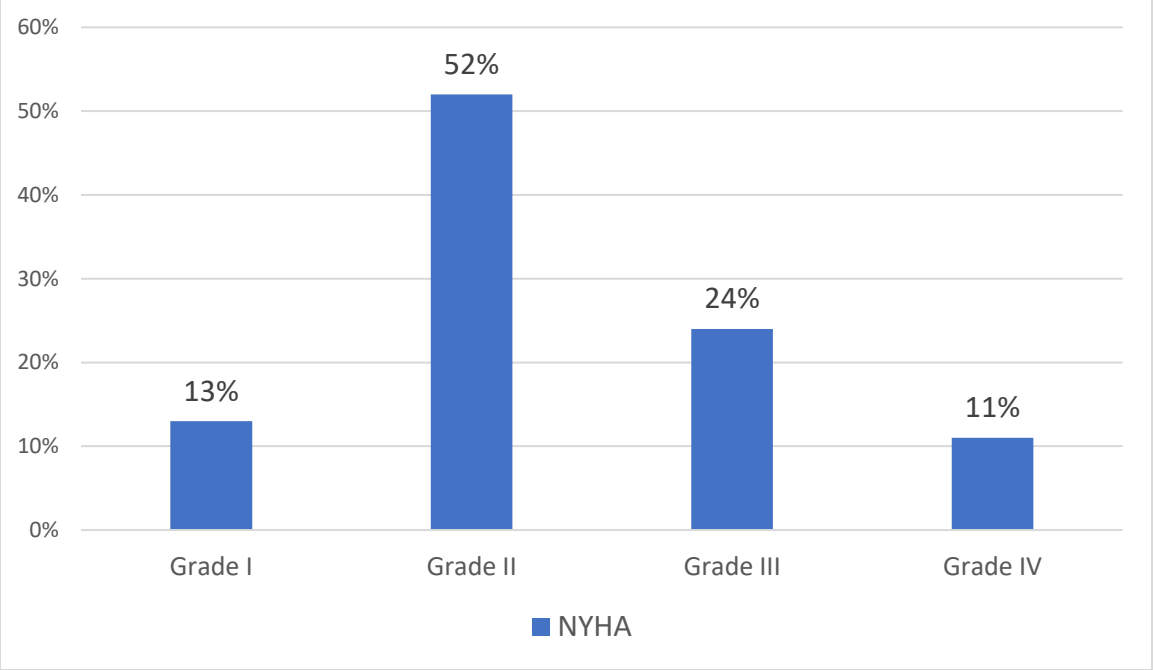

Figure 3-1 NYHA classification of studied group.

The causes of LV dysfunction were ischemic heart disease in 72% of patients and 63% of patients were on treatment, table 3-2.

Table 3-2 Causes of LV dysfunction and type of HF among studied group.

Variables		Number	Percentage
Causes of LV dysfunction	IHD	72	72%
	Non ischemic	28	28%
Type of HF	Chronic	63	63%
	Acute	37	37%
Total		100	100%

The echo finding shown that: 21% of patients had rt ventricular dysfunction and only 7% of patients had sever LV dysfunction, table 3-3.

Table 3-3 Echo finding among studied group.

Echo finding		Number	Percentage
Right ventricular dysfunction	Yes	21	21%
	No	79	79%
Valvular dysfunction	MR	36	36%
	AR	9	9%
	MR TR	25	25%
	MR AR	8	8%
	MR AR TR	22	22%
EF %	Mild LV dysfunction	45	45%
	Moderate LV dysfunction	48	48%
	Sever LV dysfunction	7	7%
Total		100	100%

Only 19% of patients showed evidence of a respiratory illness; from those: Figure 3-2 shows six patients recorded COVID-19 by CT scan, two patients recorded COVID-19 by PCR, two patients recorded COVID-19 by CXR, seven patients recorded COVID-19 by PCR and CT and two patients had non-COVID-19 respiratory illness.

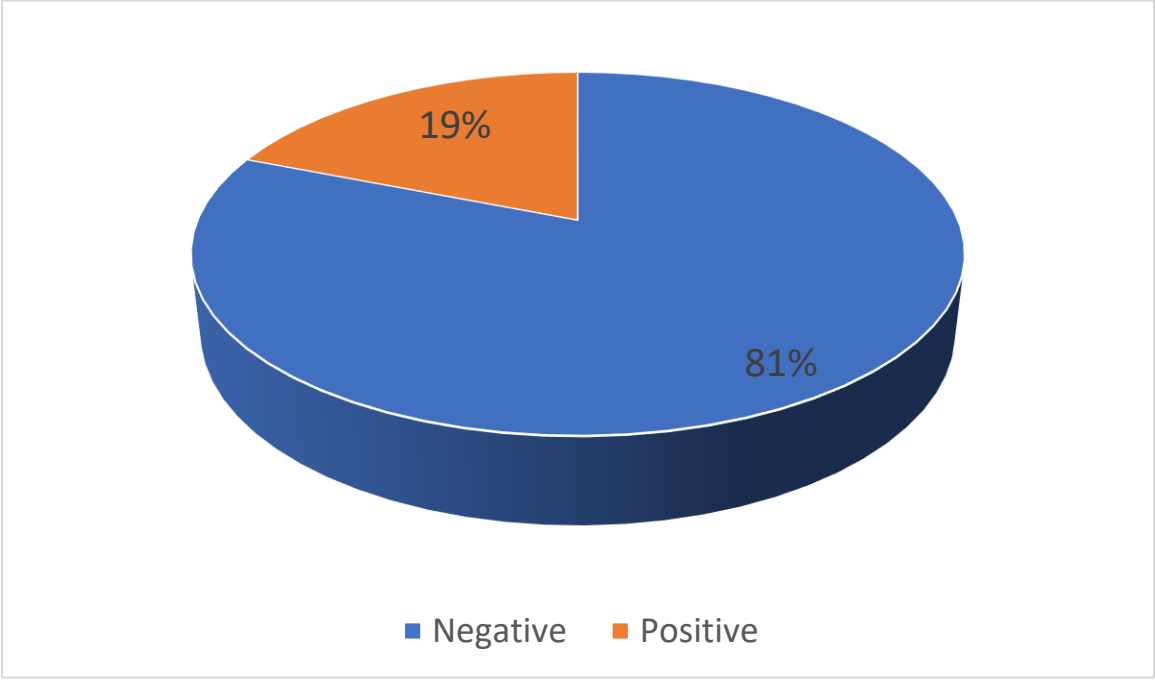

Figure 3-2 Evidence of respiratory chest infection among studied group.

The median pro BNP was 987.9 pg/ml with difference in the measurement of pro BNP was shown in figure 3-3.

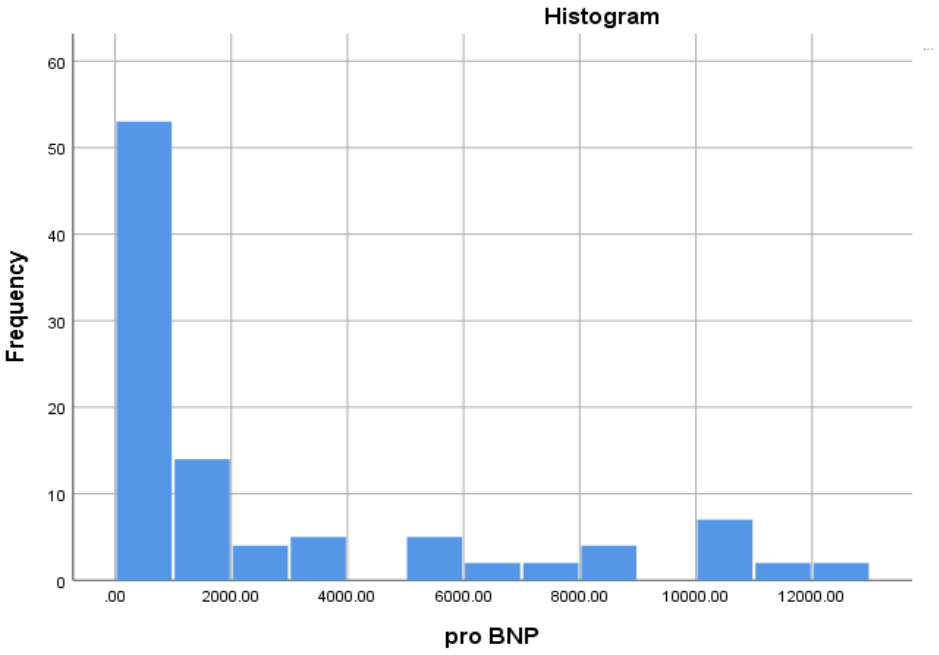

Figure 3-3 Measurement of pro BNP.

The mean rank of pro BNP shown significant difference with age (p< 0.001) where highest mean rank of pro BNP was found among patients with age ≥ 70 years. The mean rank also shown a significant difference with gender (p<0.001), where highest mean rank of pro BNP was found among female. The mean rank was significantly higher among patients with chest infection (p<0.001) table 3-4.

Table 3-4 Relation of demographic characters with pro BNP.

Demographic characters		Mean rank of pro BNP	P value
Age	<70 years	42.4	<0.001*
	≥70 years	67.7	
Gender	Male	45	0.038*
	Female	57.1	
Chest infection	negative	43.1	<0.001*
	Positive	81.7	

*Mann-Whitney test, significant ≤0.05.

The mean rank of pro BNP shown no significant difference with causes of LV dysfunction and type of HF (p value 0.1 and 0.58 respectively), while the right ventricular dysfunction shown a significant difference (p <0.001) with highest mean rank of pro BNP was found among patient with right ventricular dysfunction table 3-5.

Table 3-5 Relation of some variables with pro BNP.

Variables		Mean rank of pro BNP	P value
Causes of LV dysfunction	IHD	53.4	0.1*
	Non ischemic	42.8	
Type of HF	Chronic	51.7	0.58*
	Acute	48.4	
Right ventricular dysfunction	Yes	68.7	0.001*
	No	45.6	

*Mann-Whitney test, significant ≤0.05.

The NYHA classification shown a strong positive correlation with pro BNP, while the EF% and creatinine clearness shown a negative moderate correlation with pro BNP, table 3-7, figure 3-4.

Table 3-7 Correlation of EF% and Creatinine clearness with pro BNP.

Variables	Pro BNP	
	Correlation coefficient	P value
NYHA	O.78	<0.001*
EF%	-0.379	<0.001*
Creatinine clearness	-0.395	<0.001*

*correlation test, significant ≤0.05.

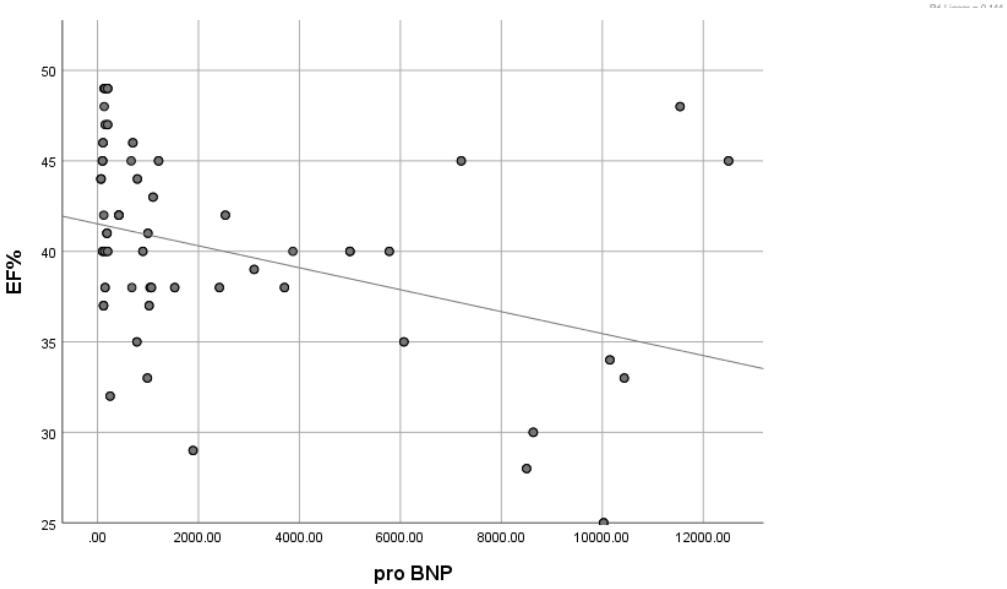

Figure 3-4 Correlation of EF% with pro BNP.

Discussion:

Currently major worldwide public health issues, heart failure (HF) and cardiac dysfunction affect more than 26 million individuals globally. As the population ages, the worldwide load of HF and heart dysfunction is fast and significantly rising (56–58). In both clinical and forensic medicine, the detection of HF and cardiac dysfunction is quite crucial considering great morbidity and death (59, 60). Different rules applied to the rule-out level for pro-BNP; for instance, the European Society of

Cardiology recommendations call for 125 pg/mL (61). These limits in the Canadian Cardiovascular Society guidelines are 125 pg/mL (62), while in the National Heart Foundation of Australia/Cardiac Society of Australia and New Zealand the analogous levels are 300 pg/mL (63). The study shown that median pro BNP was 987.9 pg/ml, with about half of patients had level above 1000 pg/ml, while other study like in Rorth et al study the median NT-proBNP was 2067 (IQR, 1217–4003) pg/mL (64), this difference may related to included criteria and sample size; where Rorth et al study involved 8399 patients in New York Heart Association functional class II to IV with a left ventricular ejection fraction (LVEF) ≤40%, Also Blanco et al study found the median value of pro-BNP was 4567 [1020 -5369] pg/ml (65) where this study involved a patients with first episode of acute HF and admitted to the cardiology ward or intensive care unit. This study found that patients beyond 70 years had a much greater level of pro BNP, which corresponds with the International Collaborative of NT-proBNP (ICON) study, where age-dependent cutoffs of NT-proBNP may be more helpful for the diagnosis of HF. One could exclude acute HF with a general age-independent cutoff of 300 pg/mL. HF should be diagnosed for patients less than 50 years old with NT-proBNP levels >450 pg/mL, patients between 50 and 75 years old with NT-proBNP levels > 900 pg/mL, and patients more than 75 years old with NT-proBNP levels > 1800 pg/mL (66), also similar to Italy study by Leto that shown Patients with BNP level higher than 300 pg/VEL Higher mean rank was identified among female patients, hence gender demonstrated a significant difference in pro-BNP; this was reverse to a systematic study by Oremus et al.; that noticed; no association between gender and pro-BNP(68). Also among research by Maisel, et al., Knudsen et al., Krauser et al. All three studies came to the conclusion that test performance was either very little or not affected by gender (69-71). The differences might have to do with the criteria for patient selection and the techniques for pro-BNP assays, which vary among the particular research. Based on type of Heart failure, the pro-BNP level displayed no appreciable variation; this may explain the patient with chronic HF not on optimal guideline directed medical therapy or because many patients lacked compliance on their medical treatment. The present study revealed even the mean rank of pro-BNP was higher in patients with ischemic cause of heart failure but the difference was non-significant this may relate to fact that this study was not included patients with acute ischemia, other study was shown that proBNP was significantly higher in patients with ischemic cause of heart failure like Karuppiah et al.; found elevated BNP levels are associated with older age, LVH, diastolic abnormalities and ischemic heart disease (72). RV systolic dysfunction serves as an independent prognostic indicator in patients with moderate to severe heart failure, closely linked to reduced exercise tolerance and the effectiveness of exercise training. and this noted also by many studies. The current study shown that patient with right ventricular dysfunction had significantly higher pro BNP level than patients without. The study revealed that patients with history of chest infection had much higher pro BNP; this result was in line with many studies that revealed Plasma concentrations of B-type natriuretic peptides increase during the acute phase of pneumonia, and the degree of this increase is linked with the degree of the infection (75). Recent studies by Huang et al. shown that patients with cardiac damage from COVID-19 always had higher BNP levels and increased hospital mortality than non-COVID-19 patients (76). And since pneumonia symptoms could hide cardiac malfunction, this would cause delay in therapy. Therefore, early monitoring of the risk of HF and the measurement of pro-BNP levels could be beneficial in severe cases of COVID-19 in terms of prevention and therapy of cardiac problems. Recent reports indicate that levels of N-terminal proANP and brain natriuretic peptide are higher in patients with severe functional impairment compared to those with no or mild symptoms of congestive heart failure. This finding aligns with the results of previous studies. where the current study shown a negative correlation between EF% and Pro BNP, also shown by strong positive correlation between NYHA functional classification and pro-BNP, this comparable with other studies like Nagaya et al study that found a BNP was correlated negatively with cardiac output and RV ejection fraction(77) The study by Silver et al. found that elevated peptide levels are directly correlated with prognosis, NYHA score, intra-ventricular pressure, and pulmonary pressure, while being

inversely related to cardiac output. (78). This was related to fact that the cardiac ventricles secreted by them in reaction to increasing End-diastolic pressure within the ventricle or volume overload triggers the secretion of BNP. The activation of the BNP gene in cardiomyocytes produces a precursor propeptide (proBNP108), which is then cleaved into the biologically inactive amino terminal fragment (NT-proBNP) and the active BNP. BNP decreases sodium reabsorption in the collecting duct, enhancing sodium excretion by downregulating the renin-angiotensin-aldosterone system. Additionally, it reduces peripheral vascular resistance and promotes smooth muscle relaxation, resulting in a vasodilatory effect. A key factor affecting the circulating levels of natriuretic peptide, as previously noted, is the estimated glomerular filtration rate (eGFR), which is closely correlated. This study demonstrates a significant negative association, indicating that the BNP ratio increases as renal function declines. especially in reference to fact that renal excretion removes proBNP mostly or solely from the circulation. This also fits with research such as Rorth et al.'s finding that eGFR (64) was adversely linked with both BNP and pro BNP. Restrain of research: Time frame and COVID 19 outbreak cause small sample size. Since the study was centered on a hospital, the results do not fairly reflect the population. Since the study was cross section, it is impossible to ascertain the temporal link—that of a cause-effect relationship. The research relies on private labs. In essence, In conclusion, the median pro BNP was 987.9 pg/ml; over half of the patients had level higher than 1000 pg/ml. The mean pro-BNP varied greatly depending on age, gender, existence of a chest infection, and right ventricular dysfunction. Pro-BNP's negative connection with EF% and GFR was evident. Pro-BNP and NYHA functional classification had a favorable connection.

Recommendations:

The study population included few patients in functional class IV. As reported by previous researchers, we merged patients with either no or mild symptoms into one group and compared them with a group of patients with moderate or severe symptoms to raise the statistical power. When patients are categorized as either mildly or severely disabled, this operation is on par with a clinical practice. Every patient with suspected LV failing or proven heart failure should have their level of pro BNP evaluated since it is crucial for diagnosis, prognosis, and fallow down determination.

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