



Levels of some cardiac hormones in patients with heart diseases in Tikrit city

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Abstract

Objective: The present study was designed to test the level of some cardiac hormones like endothelin-1 and Atrial natriuretic peptide (ANP) in serum of heart diseases patients compare with control group. This study was conducted on heart diseases patients in Cardiac Care Unit (C.C.U.) in Salah- Aldin General Hospital in Tikrit City-Salah-Aldin governorate. The study, began in 31 Desember 2018 to 1 st September 2019 and included 90 subjects divided in two groups ,the first group was (10) apparently healthy subjects 10 male and 10 female, while the second group was 80 patients with different heart diseases (20 Heart Failure (HF) 10 male and 10 female, 20 Myocardial Infarction (MI) 10 male and 10 female, 20 Unstable Angina (UA) 10 male and 10 female, 20 Stable Angina (SA) 10 male and 10 female, were attended from Salah - Aldin General Hospital. Blood samples was collected from patients and healthy subjects and then serum separated for testing. The results of this study showed there were a high significant increasing ($P \leq 0.01$) in the concentration of endothelin-1 and Atrial natriuretic peptide (ANP) in all Heart disease groups as compared with control healthy subjects and the highest concentration of endothelin-1 was found in heart failure group, while the highest concentration of ANP was found in myocardial infarction group. **Material and methods:** Venous blood samples were collected from the vein from all patients and healthy subjects at study entry and after a 20-min period and serum was separated by centrifugation at 1500 g for 10 min at 4 C° for hormonal testing. Endothelin-1 and Atrial natriuretic peptide (ANP) hormones concentration in serum of heart diseases patients was estimated depends on kit procedure is an Enzyme-Linked Immunosorbent Assay (ELISA) from Bioassay Technology, China. **Results:** There was a high significant increasing ($P \leq 0.01$) in the concentration of endothelin-1 in all heart disease groups as compared with control healthy subjects and the highest concentration of endothelin-1 was found in heart failure group, ANP There was a high significant increasing ($P \leq 0.01$) in the concentration of ANP in all Heart disease groups as compared with control healthy subjects ,the highest concentration of (ANP ng/ml) was found in Myocardial infarction group. **Conclusion:** Serum endothelin-1 and Atrial natriuretic peptide (ANP) hormone concentration were significantly increased ($P \leq 0.01$) in all Heart diseases groups as compared with control healthy subjects. This finding suggests that endothelin may be a marker of rapid coronary artery disease progression and may also have a pathogenic role in this process.

Keywords: heat diseases, Endothelin-1 (ET-1) , Atrial natriuretic peptide(ANP)

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INTRODUCTION

Heart disease (HD) is a term covering any disorder of the heart. Unlike cardiovascular disease, which describes problems with the blood vessels and circulatory system as well as the heart, heart disease refers to issues and deformities in the heart itself. According to the Centers for Disease Control (CDC), heart disease is the leading cause of death in the United Kingdom, United States, Canada, and Australia. One in every four deaths in the U.S. occurs as a result of heart disease (Sullivan, 2018).

Several studies have been done on heart diseases in Iraq and dealt with many factors important for the incidence of these diseases and causes of widespread infection in various regions and also how disease develops over time (AL Azzawy, 2018; Nyaika, et al, 2014, Abdul Kareem, 2012). The heart suffers from numerous diseases, stable angina, unstable angina,

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myocardial infarction and heart failure HD remains responsible for the deaths of one million persons a year, and five million persons with cardiovascular disease are hospitalized every year (Sanchis-Gomar, et al. 2016). There are many types of HD that affect on different parts of the organ and occur in different ways, Ischemic heart disease (IHD) refers to reduced blood supply to the cardiac muscle. This typically involves impairment of blood flow over the coronary arteries, most usually caused by atherosclerotic narrowing, but may due to arterial spasm the decrease in blood supply to the heart muscle can have effect in a number of diseases like Heart Failure (HF), Myocardial Infarction (MI), Unstable Angina (UA) and Stable Angina (SA). (Radico, et al. 2014). Several studies confirmed that heart as an endocrine organ with the discovery of atrial natriuretic peptide (ANP), cardiac hormone synthesized and secreted by cardiomyocytes in response to myocardial stretch (Garbers, et al. 2006) (ANP) is a cardiac hormone with cardiovascular and metabolic properties including vasodilation, natriuresis and suppression of the renin-angiotensin- aldosterone system. Moreover, ANP induces lipolysis, lipid oxidation, and adipocyte browning (Cannone, et al. 2019). Several studies indicate that the heart not only regulates blood pressure homeostasis but is also a regulator of whole body metabolism. Indeed, several studies revealed that ANP is a modulator of metabolism. More specifically, ANP induces lipid mobilization and oxidation (Coue,; Moro, 2016).

Endothelin is a vasoconstricting peptides produced primarily in the endothelium having a key role in vascular homeostasis. Endothelins are implicated in vascular diseases of several organ systems, including the heart, lungs, kidneys, and brain (Schinelli, 2006). Endothelins are peptides with receptors and effects in many body organs (Davenport, et al. 2016., Maguire, et al. 2014). Endothelin constricts blood vessels and raises blood pressure. but when overexpressed, they contribute to high blood pressure (hypertension), heart disease, and potentially other diseases (Davenport, et al. 2016).

MATERIAL AND METHODS

This study was achieved by collecting 90 blood samples included (80) patients (40 male and 40 female) diagnosed with Heart disease and (10) subjects as Control (5 male and 5 female) patients study carried out in Cardiac Care Unit (C.C.U.) in Salahad Din General Hospital in Tikrit City from 31 Desember 2018 to 15 September 2019 on study population age ranged from (38-75) years old.

A total number of 90 subjects were participated in the present study, distributed as follow:

Group 1: (10) Ten subjects, apparently healthy as controls (5 male and 5 female).

Table 1. The Mean values and Standard Deviation of (Endothelin-1 ng/ml) in control group, Heart Failure, Myocardial Infarction, Unstable Angina, and Stable Angina

| Groups | Mean \pm SD | P \leq value |
|-----------------------|------------------|----------------|
| Controls | 33.2 \pm 4.2 e | |
| Heart Failure | 99.6 \pm 7.4 a | 0.01 ** |
| Myocardial Infarction | 79.5 \pm 6.1b | 0.01 ** |
| Unstable Angina | 65.5 \pm 5.6 c | 0.01 ** |
| Stable Angina | 54.5 \pm 5.1d | 0.01 ** |

** High significant, *Significant, N.S no significant

Group 2: (80) Patients with heart disease distributed into 4 subgroups :-

- Heart Failure patients (20), (10 male and 10 female) .
- Myocardial Infarction patients. (20) (10 male and 10 female)
- Unstable Angina patients (20) (10 male and 10 female)
- Stable Angina patients (20) (10 male and 10 female)

RESULTS

Endothelin-1 (ET-1) Hormone

Table 1 shows the concentrations of endothelin-1 ng/ml in a heart disease groups. There was a high significant increasing ($P \leq 0.01$) in the concentration of endothelin-1 in all heart disease groups as compared with control healthy subjects and the highest concentration of endothelin-1 was found in heart failure group (99.6 \pm 7.4 ng/ml), followed by myocardial infarction group (79.9 \pm 6.1 ng/ml), and followed by unstable angina group (65.5 \pm 5.6 ng/ml) while the lowest group is stable angina group (54.5 \pm 5.1 ng/ml). Results of this study agreed with (Tang, et al. 2010. Eitel, et al. 2010) study they refers to that circulating ET-1 has been shown to be a prognostic marker in patients with HF and acute myocardial infarction (MI). and may predict risk for incidence of pulmonary hypertension, mortality, and HF in community-based subjects (Jankowich, et al. 2016). Beyond these findings, Results of this study agreed with (Gupta, et al.) who refers to biological effects of ET-1 concentrations, ET-1 may play a central role in the pathogenesis of heart and vascular disease, including both heart failure (HF) and coronary artery disease (CAD). While another study refere to increased ET-1 concentrations independently predict incident HF and death and are associated with more near-term cardiovascular events (Ibrahim, et al. 2018). Endothelin may also play a pathogenic role in Acute Coronary syndrome ACS (Unstable angina UA, Myocardial Infarction MI) and coronary artery disease CAD, the association between plasma endothelin levels and rapid coronary artery disease progression in patients with chronic stable angina pectoris (Zouridakis, et al. (2001). In recent studies it has become apparent that inflammatory mechanisms involved in the atherogenic process may lead to plaque disruption, stenosis

Table 2. The Mean values and Standard Deviation of (Atrial natriuretic peptide ng/ml) in control group, Heart Failure, Myocardial Infarction, Unstable Angina, and Stable Angina

| Groups | Mean \pm SD | P \leq value |
|-----------------------|-------------------|----------------|
| Control | 921.5 \pm 7.8 d | |
| Heart Failure | 1290 \pm 42.1bc | 0.01 ** |
| Myocardial Infarction | 1590 \pm 52.7 a | 0.01 ** |
| Unstable Angina | 1332 \pm 35.6 b | 0.01 ** |
| Stable Angina | 1185 \pm 30.1 c | 0.01 ** |

** High significant, *Significant, N.S no significant

progression and acute coronary syndromes (UA,MI) (Libby 1995). Among numerous diseases potentially occurring from endothelin dysregulation are arterial hypertension, pulmonary hypertension, heart failure and other cardiovascular disorders (Kawanabe, Nauli 2011).

The endothelium regulates local vascular tone and integrity through the coordinated release of vasoactive molecules. Secretion of endothelin-1 (ET-1) from the endothelium signals vasoconstriction and influences local cellular growth and survival. ET-1 has been implicated in the development and progression of vascular disorders such as atherosclerosis and hypertension. Endothelial cells upregulate ET-1 in response to hypoxia, oxidized LDL, pro-inflammatory cytokines, and bacterial toxins (Mawji, et al. 2004).

The endothelium produces numerous biologically active substances that play an integral role in the regulation of inflammation, cell growth, thrombosis, and vascular tone. Dysregulation of this process may lead to vascular endothelial dysfunction, one of the earliest findings in the development of cardiovascular disease (Böhm,; Pernow, 2007).

Atrial Natriuretic peptide (ANP) hormone:

Table 2 shows the concentrations of Atrial natriuretic peptide in a heart disease groups. There was a high significant increasing ($P \leq 0.01$) in the concentration of ANP in all Heart disease groups as compared with control healthy subjects, the highest concentration of (ANP ng/ml) was found in Myocardial infarction group (1590 ± 52.7 ng/ml), followed by Unstable angina group (1332 ± 35.6 ng/ml), and followed by Heart failure group (1290 ± 42.1 ng/ml), while the lowest group is stable angina group (1185 ± 30.1 ng/ml). Results of this study agreed with (2) who indicated to high concentration of ANP in patients with MI and UA at the probability level

($P \leq 0.05$) compared with Heart failure HF patients. Thus, it appears that Myocardial infarction MI and unstable angina UA are the worst diseases by affecting the high concentration of ANP as for stable angina SA, it may have increased in concentration of ANP at the beginning of the injury and then decreased after the condition stabilized and as a result of using a appropriate treatment. In present study showed high level of ANP in patients with HF and this result agreed with (Goodfriend, Calhoun, 2004). They refers to pathologic conditions such as heart failure there is an increase in ANP production, due to excessive renin-angiotensin-aldosterone system (RAAS) activation, volume overload and consequently augmented myocardial stretch. Through its unloading properties, ANP functions as a compensatory response to the altered cardiovascular homeostasis. ANP serves as a key target for novel therapies for the treatment of heart failure.

Atrial Natriuretic Peptide also inhibits the sympathetic nervous system (Volpe, et al. 2016). Several years later (Macheret, et al. 2012). reported that subjects with pre-hypertension have significantly lower ANP values compared to normotensive individuals. Further, patients with hypertension do not display any increase in ANP levels that might exert a compensatory response to their heart and vascular pathological status. Probably the lack of adequate circulating ANP contributes to the onset of hypertension and increases the risk for heart and vascular diseases. In addition, recent epidemiological studies reveal an inverse relationship between aldosterone and ANP circulating levels in the general community and hypertensive subjects, with aldosterone being higher in the presence of lower ANP levels (Buglioni, et al. 2015. Cannone, et al. 2018).

CONCLUSIONS

Serum endothelin-1 and Atrial natriuretic peptide (ANP) hormone concentration were significantly increased ($P \leq 0.01$) in all Heart diseases groups as compared with control healthy subjects. This finding suggests that endothelin may be a marker of rapid coronary artery disease progression and may also have a pathogenic role in this process.

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