International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

The Value of Serum Apelin Measurement in Acute Coronary Syndrome Patients

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Abstract: ***Introduction**: Acute coronary syndrome refers to any group of clinical symptoms compatible with acute myocardial ischemia including unstable angina (UA), Non–ST segment elevation myocardial infarction (NSTEMI), and ST segment elevation myocardial infarction (STEMI). Apelin is an endogenous peptide with inotropic and vasodilatory properties, it was recently reported that serum measurements of apelin were similar to its immunohistochemical data in vessels and heart tissues. **Aim of the study**: To detect the value of the serum levels of apelin in patients with Acute Coronary Syndrome related to severity of presentation. **Patients and methods**: 59 patients with Acute Coronary Syndrome (ACS) were included in the study during the period from January until July 2016, as 30 patients with UA, 15 with NSTEMI, and 14 with STEMI. Also the study included 28 apparently healthy persons as control. Blood samples were obtained for measurements of Apelin by ELISA method. **Results**: Serum apelin levels were significantly decreased in whole group of patients with ACS (1846.1±320.9) ng/ml compared to control (2719.4±272.5) ng/ml ($p < 0.05$). Regarding patients' subgroups; serum apelin was lowest in STEMI (1729.0±480.0) ng/ml, NSTEMI (1816.0±289.0) ng/ml, and UA (1916.0±224.4) ng/ml when compared with control; respectively. **Conclusions**: The value of serum apelin levels significantly reduced in all patients groups especially STEMI, so it could be considered as a biochemical marker for evaluation of ACS.*

Keywords: Acute Coronary Syndrome, Unstable angina, ST segment elevation MI, Non ST segment elevation MI, Apelin.

1. Introduction

Acute coronary syndrome (ACS) is defined as sudden coronary obstructions resulting in unstable angina (UA), myocardial infarctions (MI), or ischemic deaths. Most of the time, ischemia develops as a result of endothelial damage and subsequent obstructions of coronary arteries with thrombus formed in atherosclerotic plaque ruptures (1). ACS usually occurs as a result of one of three problems: ST elevation myocardial infarction (STEMI), non ST elevation myocardial infarction (NSTEMI), or unstable angina (UA) (2). These types are named according to the appearance of the electrocardiogram (ECG) as Non-ST segment elevation myocardial infarction and ST segment elevation myocardial infarction (1). In addition to clinical and ECG findings, several Biochemical markers are assessed in patients with chest pain to diagnose myocardial ischemia; such as cardiac enzymes (CK-MB) and cardiac troponins; others are still under research (3, 4). Apelin is an endogenous peptide with inotropic and vasodilatory properties (5). It was immunohistochemically shown to be synthesized in smooth muscle cells and fibroblast cells of coronary arteries (6) Similarly, it was recently reported that serum measurements of apelin were similar to its immunohistochemical distribution in vessels and heart tissues (7, 8).

2. Patients and Methods

This study was conducted at the Internal Medicine and Cardiology departments/Intensive Care Units, during the period from January until July 2016. Fifty nine patients with ACS were included and divided into three groups:
Group (1): included 30 patients with UA.
Group (2): included 14 patients with STEMI.
Group (3): included 15 patients with NSTEMI.

The diagnosis of ACS in each patient was done by clinical presentation and history of ischemic heart disease, which was confirmed by ECG and qualitative cardiac troponins. Also the study included 28 persons apparently healthy served as control. Blood samples were obtained for measurements of serum Apelin for all participants by ELISA method; using the RayBio kit which is an in vitro quantitative assay for detecting Apelin C-terminus peptide based on the principle of Competitive Enzyme Immunoassay (9).

Statistical Package for Social Sciences (SPSS) version was applied for data entry and analysis. The results presented as Mean ± SD. P value < 0.05 was considered statistically significant.

3. Results

During the period from January until July 2016, 87 subjects; 59 patients and 28 controls with the mean and standard deviation of their age was 57±8.7 for patients and 50.3±9.06 for control. 54 % of study subjects were males while 46% were females. Serum Apelin levels were significantly decreased in sera of the total patients with ACS (1846.1±320.9 ng/ml) as compared to control group (2719.4±272.5 ng/ml) ($p < 0.05$). In addition serum Apelin was significantly decreased in UA, STEMI and NSTEMI subgroups compared to control group (Table 1) (Figure 1). When comparing the levels of serum Apelin among patients' subgroup, there was no statistically significant difference in its levels among patients with UA, STEMI and NSTEMI; respectively (Table 1).

Table 1: Serum Apelin levels in all study groups

Serum Apelin (ng/ml)	UA	STEMI	NSTEMI	Control
Number	30	14	15	28
Mean ± SD	1916.0±224.4	1729.0±480.0	1816.0±289.0	2719.3±272.5
Range	1480.0-2409.0	512.0-2250.0	1350.0-2273.0	2004.0-3242.0
P Value compared to control	< 0.05	< 0.05	< 0.05	---
P Value compared to NSTEMI	> 0.05	> 0.05	---	< 0.05
P Value compared to STEMI	> 0.05	---	> 0.05	< 0.05
P Value compared to UA	---	> 0.05	> 0.05	< 0.05

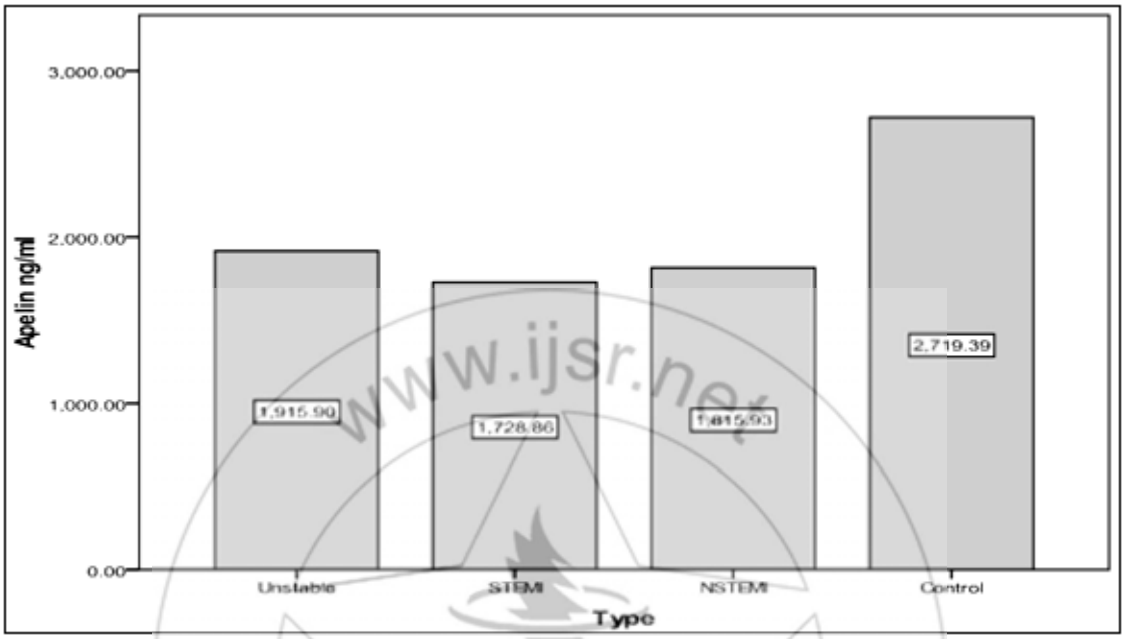

Figure 1: Apelin levels in all study groups

4. Discussion

Many markers have been proposed for cardiovascular evaluation in general population. Apelin is a peptide that has roles in cardiovascular functions and volume regulation; namely vasodilation, decreased blood pressure, and positive inotropic effects (10). Apelin receptors–APJ are present on endothelial cells, vascular smooth muscle cells, and cardiomyocytes. In preclinical models, apelin signaling exerts major effects on both vascular tone and cardiac contractility; being one of the most potent inotropic agents yet identified (11, 12). The result of this study showed that serum apelin level in acute coronary syndrome patients was lower than control. This result is in agreement with results of Kadoglou et al[13], Helske et al[14], and Wang[15] who stated that apelin concentrations were inversely associated with the severity of the phase of ACS, which suggests its involvement in the progression and destabilization of coronary atherosclerotic plaques. Apelin is largely produced and released from intact coronary endothelium and myocardial cells of the heart. Current studies suggest that apelin expression is at least maintained in mild, compensated chronic heart diseases but declines in severe acute heart disease (15, 16). Apelin stimulates the angiogenic response, a key adaptive mechanism in ischemic heart disease and a determinant of infarct expansion (17). Loss of apelin impairs the in vitro angiogenic response in human endothelial progenitor cells while apelin analogue stimulates angiogenesis (15) The integrative physiological role of the Apelin system strongly suggest that enhancing Apelin action may serve to minimize myocardial ischemic damage and the progression to advanced heart failure (18). Wang & colleagues showed by using genetic model experiments that loss of Apelin impaired the functional recovery, post MI remodeling and angiogenesis and exacerbate myocardial ischemia reperfusion injury (15). Accordingly, Apelin could be considered a good cytokine when considering ACS. It reduces atherogenesis, cardiomyocytes inflammation/ apoptosis, infarct extension, atrial fibrillation and future heart failure; on the other hand its absence would increase cardiac dysfunction (12).

5. Conclusion

There was a reduction in serum apelin levels in all patients groups especially STEMI, so it could be considered as a biochemical marker for evaluation of ACS. Though, serum Apelin did not correlate significantly with the severity of ACS, may be due to small sample size; thus further study is recommended.

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