Study of Association between Elevated Cardiac Markers with Cardiac Arrest

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Abstract:

The present study describes the relationship of different cardiac biomarkers with cardiac arrest. Four biomarkers i.e., Troponin, Aspartate aminotransferase, Creatinine Kinase and lactate dehydrogenase were selected. After different tests in experimental group and their comparison with control group, it was found that the value of different biomarkers is significantly higher. Increased value of biomarkers lead to different other diseases in cardiac patients. CK as a cardiac arrest marker gave significant variation when compared to control group. Z score for CK is -12.187. Z score for LDH is -11.819. AST as a cardiac arrest marker gave significant variation when compared to experiment group. Due to increase level of AST in blood there are some diseases that occur in patients. Z score for AST is -12.153. Troponin-I levels were significantly higher in cardiac patients, and can serve as individual diagnostic parameter. P value for Troponin-I was less than 0.05 and Z score for Trop-I is 12.150.

Introduction:

Myocardial infarction, often known as a heart attack, is a condition in which one or more sections of the heart muscle do not receive enough oxygen to function effectively [1]. In today's Pakistan, myocardial infarction is a leading cause of mortality. It happens when the coronary arteries do not get adequate blood flow to the heart, resulting in very sluggish blood flow. It's caused by thrombus, which is a blood clot that forms in the artery. Cardiac biomarkers have a crucial role in myocardial infarction diagnosis [2]. In the last two decades, the field of cardiac biomarkers has exploded. Heart function is assessed using cardiac biomarkers. They aid in the diagnosis and assessment of the condition. Cardiovascular illnesses, such as atherosclerosis and

heart tissue destruction following a myocardial infarction (MI), are the leading cause of mortality and disability across the world [3].

Around someone chests and shoulders, people might experience pressure, stiffness, discomfort, and perhaps a crushing and hurting feeling which might move towards their neck, jaw, and spine. Nausea, indigestion, heartburn, and abdominal discomfort, to name a few symptoms, breathing problems, sweaty palms, weakness, lightheadedness, and dizziness that comes on suddenly [4].

Materials And Methods

Sample Collection

Two hundred samples were collected, one hundred from male and female patients and one hundred from patients. Venous blood was collected into vacutainer tubes containing clot-activating gel at randomization, prior to the start of study therapy. Within 30 minutes, the blood was spun at 4000rpm for 5 minutes. Following that, the tubes were instantly frozen at -20°C . Patients' blood specimens were taken from the Shaikh Zaid Medical Complex's indoor sick people.

Separation of Serum

Serum from blood was separated from red blood cells by centrifugation to perform test to check cardiac biomarkers of the patients.

Immunoassay Analysis of Sample

Analysis of cardiac biomarkers were done by immunoassay analyzer machine, which gives the analysis of the cardiac biomarkers that is (Troponin, AST, CPK, LDH) was done by immunoassay analyzer machine for both the cardiac and non-cardiac patients.

Estimation of CK

Estimation of CK was done using Beckman Coulter Analyzers using the commercial kit Creatinine Kinase assay kit (MAK116 Sigma Aldrich) according to manufacturer's instructions.

The heparinized plasma samples devoid of hemolysis were used and allowed time for the specimen to clot. To avoid hemolysis and contamination of red cells by adenylate kinase, removed serum from cells as soon as possible.

Estimation of AST

Aspartate aminotransferase OSR6109 was used for the estimation of activity of aspartate aminotransferase (AST) quantitatively, on the Beckman Coulter AU2700/5400 analyzer.

Estimation of Lactate Dehydrogenase

The heparinized plasma samples devoid of hemolysis were used and allowed time for the specimen to clot. To avoid hemolysis and contamination of red cells by lactate dehydrogenase, removed serum from cells as soon as possible.

Results And Discussion

The goal of this research project was to conduct the potential causes cardiac arrest. Myocardial infarction, often known as a heart attack, is a condition in which one or more sections of the

heart muscle do not receive enough oxygen to function effectively. Myocardial infarction (MI) proportion of deaths have already been quickly rising in recent years, causing major economic damage. Biomarkers that are unique to the heart play a prominent part in the diagnosis of MI. The goal of this project is to compile information on the most commonly used cardiac biomarkers, as well as its diagnostic and prognostic relevance in AMI patients.

Total 200 blood samples in which 100 cardiac patients were selected from Shaikh Zayed Hospital, Lahore (Punjab) and 100 control samples were obtained centrifugation of samples was done and sample were subjected to auto analyzer for determining concentration of different cardiac biomarkers (LDH, AST, CK and troponin) presents in blood sera of cardiac patients. Cardiac markers raised in all patients admitted in ICU. The P value was 0.05 which is significant, the results provided biochemical evidence regards involvement of biomarkers as a potential contributor covered cardiac arrest. The present study is significant to determine the risk of cardiac arrest in Punjab population.

P value less than 0.05 and i.e. 0.0001 for CK and CK levels were significantly higher in cardiac patients, and can serve as individual diagnostic Results of CK were significantly higher for cardiac arrest patients. To further analyze deviation from control group, Z-test was performed. CK as a cardiac arrest marker gave significant variation when compared to experiment group. **Z score for CK is -12.187** (z-score can be placed on a normal distribution curve. Basically, it gives an idea of how far from the mean a data point is).

The Mann Whitney test were used for independent samples of cardiac arrest patients, but this comparison will be somewhat too convenient. It is nonparametric test of the null hypothesis for cardiac arrest patient's data selected values. In which two independent groups were involved one was control and other experimental groups and there were no statistical relationship and significance exist in control and experimental data of cardiac arrest patients. Due to increase level of LDH in blood these are some diseases that occur in patients. In CK the value of Z-test was -12.187 that clearly shows there were significantly difference between control and experimental groups due to increase in cardiac biomarkers there were strong significance of cardiac arrest. Similar kind of results were found by Lindahl *et al.*, 1995 and Akasha *et al.*, 2015.

LDH levels were significantly higher in cardiac patients, and can serve as individual diagnostic P value for LDH was less than 0.05 and their results were significantly higher in the patients suffering with cardiac arrest.

Z score for LDH is -11.819. The Mann Whitney test was used for independent samples of cardiac arrest patients, but this comparison will be somewhat too convenient. The results clearly showed that there were significant difference between control and experimental groups due to increase in cardiac biomarkers there were strong significance of cardiac arrest. Akasha *et al.*, 2015 described that markers such as LDH remain unchanged in first few hours of attack but serum levels raised sharply after 24 hours reaching an increase of about 263 % over the upper reference limit for LDH.

AST levels were significantly higher in cardiac patients, and can serve as individual diagnostic P value for AST was less than 0.05 and their results were significantly higher the concentration of markers for cardiac arrest patients. To further analyze deviation from control group, Z-test was performed. AST as a cardiac arrest marker gave significant variation when compared to experiment group. Due to increase level of AST in blood there are some diseases that occur in patients. Z score for AST is -12.153. The Mann Whitney tests were used for independent samples of cardiac arrest patients, but this comparison will be somewhat too convenient. The results clearly show there were significantly difference between control and experimental groups due to increase in cardiac biomarkers there were strong significance of cardiac arrest. Similar results were found by Boriani *et al.*, 2000.

Troponin-I levels were significantly higher in cardiac patients, and can serve as individual diagnostic parameter. P value for Troponin-I was less than 0.05 and their results were significantly higher the concentration of markers for cardiac arrest patients.

To further analyze deviation form control group, Z-test was performed. Troponin-I as a cardiac arrest marker gave significant variation when compared to experiment group. Z score for Trop-I is 12.150. The Mann Whitney tests were used for independent samples of cardiac arrest patients, but this comparison will be somewhat too convenient. In troponin-I the value of Z-test was -12.187 that clearly shows there were significantly difference between control and experimental groups due to increase in cardiac biomarkers there were strong significance with cardiac arrest. Similar results were found by Boriani *et al.*, 2000.

In experimental group ranges are elevated in all biomarkers like LDH (81-234), CK (35-232), AST (<37) and troponin (0-0.017) and raised from these range like LDH (3633 or above than 234), CK (229 or elevated from 232). AST (1488 or raised from <37) and troponin (26.557 or increased from 0). All these patients were fall in experimental group and have cardiac arrest that is why they admitted in ICU.

Questionnaire Statistic

Data Analysis

The most important phase of research is data analysis after collecting data. At first all the variables were coded for computer analysis and all the record were rechecked to ensure correct data entry. The data was entered by using SPSS version 21.00 for analysis.

Study Variables

The questionnaire was designed to collect data regarding these variables.

- ★ Age
- ★ Gender
- ★ Cardiovascular history
- ★ Family history

- ★ Lifestyle
- ★ Diet
- ★ Experience of abnormal body conditions

3.4.3. Descriptive Statistics

Descriptive statistics are used to present quantitative descriptions in a manageable form. In a research study we may have lots of measures. Or we may measure a large number of people on any measure. Descriptive statistics help us to simplify large amounts of data in a sensible way. A descriptive statistic is a summary statistic that quantitatively describes or summarizes features from a collection of information, while descriptive statistics is the process of using and analyzing those statistics. We apply descriptive statistics on n-100 data of patients.

In Cross tab dependent variable explains that how many patients of different age groups, gender, having different cardiovascular, family history, lifestyle and following different kind of diet, have ischemic heart diseases and how many of them have no any heart related problem. Cross tabulation is used to quantitatively analyze the relationship between multiple variables. We apply this because we are explained the different variables of different cardiac arrest patients

Chi-square test explains the P-value which should be less than i.e, <0.05 indicates significance association.

The results show that all the variables, Age, Gender, cardiovascular history, family History, lifestyle, diet and other body conditions and all their codes are significant factors associated with. A chi-squared test is a statistical hypothesis test that is valid to perform when the test statistic is chi-squared distributed under the null hypothesis, specifically Pearson's chi-squared test and variants there of the father history affects the variants.

3.5. Decision making

In developed or even in developing countries like the United States, Pakistan or India there has been an emerging risk in the incidence of vascular diseases like coronary heart disease (CHD) cerebrovascular disease, and peripheral vascular diseases, but CHD is the major cause of death. The major risk factors are elevated CK, reduced LDH, smoking, hypertension, insulin resistance with or without overt diabetes mellitus, age, and family history of premature CHD. The findings from our current studies helped us in diagnosis and disease management decision, whether to keep patient in ICU or what kind of treatment he/she required or long term management or prognosis. The hallmark of cholesterol in CHD is, to increased plasma cholesterol concentrations increase the risk of CHD and decreasing plasma cholesterol levels decreases the risk of CHD.

3.6. Conclusion

This study described the direct relation of elevated cardiac biomarkers with myocardial infarction. No doubt, there are many other causes of coronary artery diseases but myocardial infarction is also a major cause. All the variables, which were understudy, indicates that there is a strong relation of myocardial infarction and cardiac biomarkers. Patients' demographics and their

cardiac panel test indicates that P value is less than 0.05, which shows strong significant association.

This study described the direct relation of myocardial infarction and elevated cardiac biomarkers. The frequency of cardiac biomarkers in myocardial infarction patients was very high. Troponin level were significantly high as compared to AST and CK.

These range of cardiac arrest patients and non-cardiac arrest patients with their normal ranges of all cardiac biomarkers. In which when the ranges fall around 81 and in between till 234 these were showing the range of LDH were control – and patients were non-cardiac and same goes for CK, AST and troponin-I as mentioned above.

On the other side experimental group were present and their ranges are elevated in all biomarkers when the ranges are elevated from normal ranges like LDH (81-234), CK (35-232), AST (<37) and troponin (0-0.017) and raised from these range like LDH (3633 or above than 234), CK (229 or elevated from 232). AST (1488 or raised from <37) and troponin (26.557 or increased from 0). All these patients were fall in experimental group and have cardiac arrest that is why they admitted in ICU.

Table 1: *Mann-Whitney Test for LDH.*

LDH	Experimental Group	Control Group
Avg	767	184
Sd	843	40

Table 2: *Mann-Whitney Test for AST.*

AST	Experimental Group	Control Group
Avg	186	22
Sd	454	7

Table 3: *Mann-Whitney Test for troponin.*

Troponin	Experimental group	Control Group
Avg	1.922	0.008
Sd	4.269	0.016

Table 4: Cardiac panel test results for all the cardiac biomarkers for both control and experimental groups.

Cardiac biomarkers	Normal ranges	Control ranges	Experimental ranges
LDH	81-234 U/L	82-233 U/L	235-3633 U/L
CPK (CK)	35-232 U/L	34-231 U/L	36-3229 U/L
AST (SGOT)	<37 U/L	1-36 U/L	38-1488 U/L
Troponin-I	0-0.017 U/L	1-0.016 U/L	0.021-26.557 U/L

Table 5: Cardiac biomarkers mean and standard deviation shown in this table for both control and experimental group.

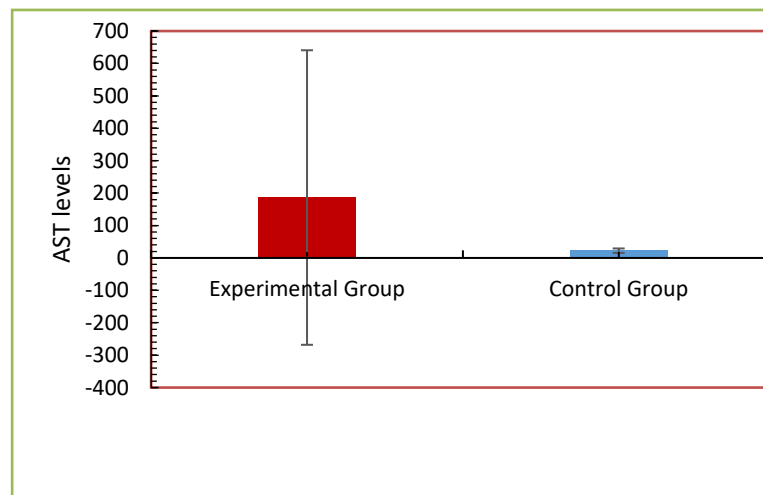| Cardiac biomarkers	Control group	Experimental group
	Mean+ SD	Mean + SD
LDH	184 ± 40	767 ± 843
AST	22 ± 7	186 ± 454
Troponin	0.008 ± 0.016	1.922 ± 4.269
CK(CPK)	107 ± 65	736 ± 648

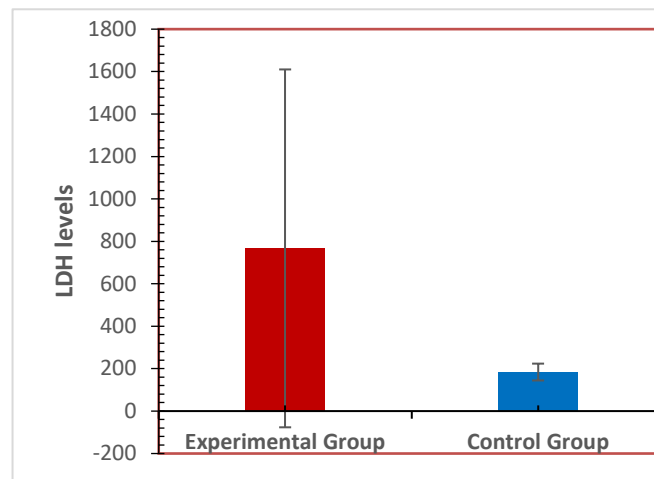Figure 1. The comparison graph of CK control and experimental groups.

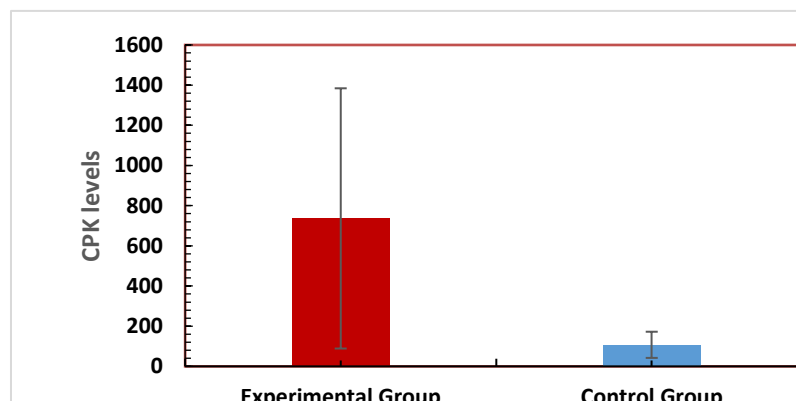Figure 2. The comparison peaks graph of LDH control and experimental group

Figure 3. Comparison between AST control and experimental groups.

4. References

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