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Original Research Article

Quantitative Measurement of Serum Calcium, Iron, Cholesterol and Triglycerides and their Relationships with Cardiac Diseases among the Peoples in Manipur: India

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Abstract:

Category of cardiac dysfunction, severity and follow-up of cardiac diseases are assessed by cardiac function tests mainly. Cardiac disease is referred to any condition which causes inflammation or tissue injury affecting functions of cardiac myocardium. The aim and objective of this study were the estimation of serum calcium and iron parameters among the patients with cardiac disease for the cardiac function test and evaluation of the relationship between serum calcium and iron among men and women as per the age among examined groups. So the aforementioned study was conducted to assess serum calcium, iron, triglycerides and cholesterol status in cardiac diseases. The serum samples were examined for calcium, iron, triglycerides and cholesterol level. The present study shows significantly decreased levels of serum calcium and iron and significantly increased levels of serum triglycerides and cholesterol among different age groups ($p<0.001$).

Keywords: Cardiac Disorders, Calcium, Iron, Cholesterol, Triglyceride.

Introduction

Nowadays, various researches involving intravenous iron agents among patients suffered from iron deficiency and cardiac disorders projected several new insights regarding the improvement of therapy. [1] Those experimental studies correlate with the understanding of iron metabolism. [1] Primary hypercholesterolemia is considered as the primary cause for important health issues like atherosclerosis and coronary heart disease. [2] Intravenous iron therapy is associated with the improvement of the workout capacity among patients with iron deficiency and systolic heart failure. [3]

The American College of Physicians implicated this guideline to provide the evidence and associated clinical recommendations for the treatment of iron deficiency and anemia among the adult patients with heart disorders. [4,5] Reactive oxygen species (ROS) of mitochondria have prospered as an important mechanism of redox signaling and disease inside the cardiovascular system.5 Anemia is considered as a major comorbidity in the failure of heart, which is accompanied by increased morbidity and mortality. [6] Iron deficiency is called as the most prevalent reason of anemia itself and for estimation of the occurrence of anemia among adult congenital heart disease subjects. [7] Low serum calcium level is associated with a higher incidence of cardiovascular disorder along with coronary heart disease. [8] Valid proof for an association between the tendency of cardiovascular death and calcium uptake remains with controversiality. [9]

Several biochemical parameters, which are presently associated with the determination in plasma- triglycerides, total cholesterol, calcium and iron for the diagnosis and screening of cardiac disorders, and to determine the changes which occurs during the metabolic process accompanied by the complications of cardiac disorders. The purpose of the aforementioned study is to establish biochemical parameters for the diagnosis and screening of cardiac disorders along with its complication with risk factors of serum iron, calcium, triglycerides and cholesterol parameters and for determination of the inter-relationship of cholesterol with other diagnosed parameters through them accordingly.

Material and Methods

The aforementioned study was performed at the Department of Biochemistry, RIMS, Imphal. The

study period of this study was from January 2017 to December 2017. All the laboratory investigations were considered as the source of data and were performed in the patients. The study group consists of 74 subjects from 5 to 90 years of age as per screening for the association of cardiac disease. Patients were screened in the Central pathway lab of Biochemistry section, RIMS.

The aforementioned institution was assigned for this study. Subject's history was obtained for all of the age groups. Smokers, alcohol users, HIV, suffering from other diseases and cancer patients have been excluded. Beside this, all those patients who consumed calcium and iron supplements or tablets were excluded in the study.

For the collection of samples, mainly venous blood was taken from every subject after 12 hours of overnight fasting. Around 3 ml of venous blood as sample was taken for routine diagnosis of the subjects and sterile vial was used as storage kit. Then the blood has been converted to a clot in room temperature. And the clot was centrifuged and serum was separated by low speed centrifugation and then sterile vial was used for its storage. Lipemic and hemolyzed samples of serum were discarded. For biochemical analysis; serum triglycerides, total cholesterol, calcium and iron were estimated.

Statistical analysis: Both Mean and Standard Deviation have been estimated for every variable among all groups. All of the results have been expressed as mean ± SD. Statistical significance of the result as per age and sex was determined by student's't' test.

Observation: This study was conducted with a target to screen the subjects of 05-90 groups of age in the state of Manipur for cardiac disorders. The serum calcium and iron level are obtained and have been correlated with various parameters.

Table 1: The obtained level of iron, calcium, triglycerides and cholesterol among various age groups:-

Variables	05-30 years	05-30 years	31-60 years	31-60 years	61-90 years	61-90 years
	Male (n=08)	Female (n=07)	Male (n=23)	Female (n=17)	Male (n=13)	Female (n=14)
Serum Calcium (mg/dl)	7.8±05.21	7.20±10.37	6.80±4.98	6.30±81.67	5.50±15.44	5.02±31.72
Serum iron (mg/dl)	78.73± 37.12	75.64±22.30	70.24±18.51	67.15±31.23	60.63±24.83	58.70±15.47
Total Cholesterol (mg/dl)	270± 12.26	250±70.74	285.08± 80.96	280.05±62.99	298.78±71.85	296.53±70.52
Serum Triglycerides (mg/dl)	190.28± 99.2	180.66± 22.85	271.45±38.25	260.33±29.00	294.69±54.69	290.42±38.62

Table 2: Statistical significance and correlation coefficient among the study group:-

Parameter	Correlation coefficient	P value
Triglycerides and serum iron	-0.53	P <0.0001
Triglycerides and serum calcium	-0.57	P <0.0001
Serum calcium and serum iron	+0.65	P <0.0001
Total cholesterol and serum iron	-0.70	P <0.0001
Total cholesterol and serum calcium	-0.54	P <0.0001

Results

The aforementioned study was performed with a target for screening of the subjects of 5-90 years of age in urban region for cardiac disorders.

The serum iron level was estimated and then was correlated with other various parameters. Descriptive values and diagnostic parameters are expressed in Table 1.

There we have found a statistically significant decreased level of serum iron and calcium, and increased serum triglycerides and cholesterol among all groups. On the other hand, table II describes about significance and correlation co-efficient with several diagnosed parameters among the study groups.

Discussion

Iron deficiency (ID) itself was a major uprising problem among patients associated with chronic heart failure (HF) and considered as a potential therapeutic target.

Iron deficiency was prevalent among patients with chronic HF that correlates to severity of disease, and an independent and strong predictor of outcome. [10] Women were most of the time used to have atypical cardiovascular symptoms as compared with men.

The exercise stress test was the initial test for females associated with known or suspected CAD. [11] There was presence of an invert and independent association between adult and coronary artery calcium. [12] There are presence of many prospective observational studies who had justified the inverse relationship between high density lipoprotein (HDL) cholesterol of coronary heart disease. [13] Increased low density lipoprotein (LDL) cholesterol and non-fasting remnant cholesterol were usually accompanied by ischemic heart disease (IHD). [14]

Iron deficiency was emerged as an important co-morbidity in patients associated with heart failure (HF). [10] Various experimental evidence portrayed that iron therapy among iron deficient animals may activate molecular charts which can also be cardio-protective. [15]

The involvement between total iron binding capacity or TIBC and coronary artery disease risk is very much prevalent presently. There is presence of a weak association between TIBC levels and decreased CAD risk. [16] Though we know anemia was an important comorbidity that was found regularly among patients with chronic heart failure (HF) [17] Iron deficiency and anemia were prevalent among patients with heart failure (HF), and were accompanied by adverse outcomes and worse symptoms in this population. [18]

Especially in elderly groups of people, serum calcium levels as hypocalcemia was considered to be a reversible cause of heart failure. [19] Observational studies suggest that hypocalcemia could be considered as a reversible cause of congestive heart failure and cardiomyopathy both. [20,21]

Hypo calcemic dilated cardiomyopathy was a prime reason of heart failure among adults. [22,23,24] Hypo calcemic cardiomyopathy among infants was presented by heart failure in a previously healthy infant with hypo calcemic status without organic lesions of cardiovascular system. [25]

Conclusion

In this aforementioned study among patients of the both acute and chronic phase are prone to develop the diseases. Reduced concentration of iron may project to abnormal synthesis of triglycerides and cholesterol. While on the other aspect prolonged deficiency of calcium and iron may project to abnormal synthesis of triglycerides and cholesterol. Iron, calcium, triglycerides and cholesterol are the principle marker for the occurrence of the cardiac disease along with its severity and complications. Calcium and iron both are the important predictors for observing the severity of cardiac diseases along with its complications.

A renowned fact is that the increasing prevalence of disease as age progresses is associated with the implications of calcium and iron deficiency in the pathogenesis of various disorders. For the confirmation of these results, a long term follow up involving a large number of patients would be required.

References

1. Ebner N et al. Iron deficiency in heart failure: a practical guide. Nutrients. 2013 Sep 23; 5(9): 3730-9.
2. John S et al. New insights in the activation of human cholesterol esterase to design potent anti-cholesterol drugs. Mol Divers. 2014 Feb; 18(1): 119-31.
3. Reda S et al. Heart failure and anemia. Herz. 2013 Sep; 38(6): 597-603.
4. Arora NP et al. Iron deficiency anemia in heart failure. Heart Fail Rev. 2013 Jul; 18(4):485-501.
5. Qaseem A et al. Treatment of anemia in patients with heart disease: a clinical practice guideline from the American College of Physicians. Ann Intern Med. 2013 Dec 3; 159(11): 770-9.
6. Gunawardena S et al. Anemia and iron deficiency in heart failure. Curr Heart Fail Rep. 2012 Dec; 9(4): 319-27.
7. Martinez-Quintana E et al. Iron deficiency anemia detection from hematology parameters in adult congenital heart disease patients. Congenit Heart Dis. 2013 Mar-Apr; 8(2): 117-23.
8. Jankowska EA et al. Iron deficiency predicts impaired exercise capacity in patients with systolic chronic heart failure. J Card Fail. 2011 Nov; 17(11):
9. 899-906.
10. Santilli G et al. Diagnosis and treatment of anemia in heart failure patients. G Ital Cardiol (Rome). 2011 May; 12(5): 319-26.
11. Klip IT et al. Iron deficiency in chronic heart failure: an international pooled analysis. Am Heart J. 2013 April; 165(4): 575-582.e3.
12. Zhang W et al. Association of dietary iron intake with mortality from cardiovascular disease; the JACC study. J Epidemiol. 2012; 22(6): 484-93.
13. Zhang T et al. Cardiomyocyte calcium and calcium/calmodulin-dependent protein kinase II: friends or foes? Recent Prog Horm Res. 2004; 59: 141-68.
14. Norlin M et al. Enzymes in the conversion of cholesterol into bile acids. Curr Mol Med. 2007 Mar; 7(2): 199-218.
15. Varbo A et al. Elevated remnant cholesterol causes both low-grade inflammation and ischemic heart disease, whereas elevated low-density lipoprotein cholesterol causes ischemic

heart disease without inflammation. Circulation. 2013 Sep 17; 128(12): 1298-309.
16. Jankowska EA et al. Iron deficiency and heart failure: diagnostic dilemmas and therapeutic perspectives. Eur Heart J. 2013 Mar; 34(11): 816-29.
17. Kang P et al. Association of total iron binding capacity with coronary artery disease. Clin Chim Acta. 2012 Oct 9; 413(19-20): 1424-9.
18. Von Hachling S et al. Anemia in chronic heart failure: can we treat? Heart Fil Rev. 2012 Mar; 17(2): 203-10.
19. Van Veldhuisen DJ et al. Anemia and iron deficiency in heart failure: mechanisms and therapeutic approaches. Nat Rev Cardiol. 2011 May 31; 8(9):485-93.
20. Rangel I et al. Hypocalcemia is a reversible cause of heart failure. Rev Port Cardiol. 2012 Jan; 31(1): 39-41.
21. Chraibi S et al. Hypo calcemic dilated cardiomyopathy: rare cause of heart failure. Ann Med Interne (Paris). 2001 Nov; 152(7): 483-5.
22. Avsar A ET AL. A rare cause of reversible dilated cardiomyopathy: hypocalcemia. Echocardiography. 004 Oct; 21(7): 609-12.
23. Suzuki T et al. Hypocalcemic heart failure: a reversible form of heart muscle disease. Clin Cardiol. 1998 Mar; 21(3): 227-8.
24. Ari H et al. A rare cause of reversible dilated cardiomyopathy: hypocalcemia. Turk Kardiyol Dern Ars. 2009 Jun; 37(4): 266-8.
25. Verma S et al. Hypocalcemia nutritional rickets: a curable cause of dilated cardiomyopathy. J Trop Pediatr. 2011 Apr; 57(2): 126-8.
26. Brown J et al. Hypocalcemic rickets and dilated cardiomyopathy: case reports and review of literature. K Pediatr Cardiol. 2009 Aug; 30(6): 818-23.