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Alteration of Serum Vitamin D in Patients of Myocardial Infarction and Ischemic Heart Diseases

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Abstract

Background: Cardiovascular disease (CVD) is the one of the major cause of morbidity and mortality. Experimental studies have demonstrated physiological functions of vitamin D metabolites on cardiomyocytes and endothelial and vascular smooth muscle cells. In view of a complex scenario to understand cardiac disorders linking with vitamin D the currentstudywasundertaken oncardiac patients of MI and IHD.

Methodology: The cross sectional study was conducted on patients who were suffering fromcardiovascular disease (CVD). Study included 150 CVD patients (age 18 to 79 years)who wereadmitted in ICCU of a tertiary care hospital.). Patients were divided in to two groups namely myocardial infarction(MI) group 1(n=75) and ischemic heart disease (IHD) group 2 (n=75).Anthropometric, physiological and biochemical parameters were measured using standard techniques. Data was expressed as mean ± Standard Deviation (mean ± SD). The level of statistical significance was observed at $P<0.05$, $P<0.01$ using SPSS software 16.0.

Results: There is increase in the blood pressure mainly mean arterial pressure in both MI and IHD patients. Biochemical parameters which shows normal levels of serum sodium, potassium and creatinine, higher levels of CPK-MB and reduction in serum calcium and vitamin D of both MI and IHD patients compared to normal recommendedvalues although these values are not statistically significant between MI and IHD patients.

Conclusion: The significant role of vitamin D for calcium homeostasis may be considered as important marker for assessment of severity and morbidity of MI and IHD.

Keywords: *Cardiovascular disease, serum calcium, vitamin D.*

Introduction

Cardiovascular disease (CVD) is the one of the major cause of morbidity and mortality. It is also the number-one cause of death globally. People with CVD, or those who are at high CVD risk, need early detection and management of their condition, through either counseling or medication.[1] In recent years, deficiency of vitamin D has been associated with clinical atherosclerosis in coronary calcification as well as with cardiovascular events such as myocardial infarction, stroke, and congestive heart failure.[2] Experimental studies have demonstrated physiological functions of vitamin D metabolites on cardiomyocytes and endothelial and vascular smooth muscle cells. Low vitamin D levels are associated with left ventricular hypertrophy, vascular dysfunction, and renin-angiotensin system (RAS) activation.vitamin D deficiency is prevalent in 30% to 50% of adults in developed countries.[3] Molecular, animal and human studies have established

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that both calcium and vitamin D are associated with cardiovascular diseases (CVD).[4]

In view of a complex scenario to understand cardiac disorders linking with vitamin D dependent alteration of calcium homeostasis, the current study has been undertaken oncardiac patients of myocardial infarction(MI) and ischemic heart disease(IHD)in a tertiary hospital of Vijayapura, Karnataka,India

Materials and Method

The cross sectional study was conducted on patients who were suffering fromcardiovascular disease (CVD). Study included 150 CVD patients (age 18 to 79 years) who wereadmitted in ICCU of a tertiary care hospital of Vijayapur (Karnataka). Patients were divided in to two groups namely myocardial infarction(MI) group 1(n=75) and ischemic heart disease (IHD) group 2 (n=75).Patients suffering from hyperthyroidism, chronic kidney disease, metabolic andmalignant bonediseases whichaffect calcium homeostasis, and patients who is with supplementation of calcium, vitamin D, calcium containing antacids were excluded from the study. Written informed consent was obtained from all patients and were subjected to detailed history.Anthropometric parameters like height in centimetres (cms), weight in kilograms (kg), body mass index (BMI) in kilograms per square meter (kg/m^2) and body surface area (BSA) in square meter (m2) and physiological parameters like heart rate (HR) in (beats/minute), systolic blood pressure (SBP) in millimetre of mercury (mmHg), diastolic blood pressure (DBP)(mmHg), pulse pressure (PP) (mmHg) and mean arterial pressure (MAP) (mmHg) were recorded by using standard procedures. All the recordings were done in the morning between 9-10 am at room temperature. Blood sample was collected from antecubital vein by means of dry disposable syringeto estimate biochemical parameters like serum electrolyte such as $Na^+$and K^+[by Ion Selective Electrode (ISE)method],serumcreatinine,CPKMB,serum calcium(byCresolthelinemethod), vitamin D kitmethod)in all patients. The study protocol was approved by the Institutional Ethics Committee(IEC Ref No-251/2017-18 dated March 20, 2018) as per the ICMR guidelines 2006.

Statistical analysis: Data was expressed as mean±Standard Deviation (mean±SD). The data have been expressed in the form of tables and diagrams. Differences between mean values of parameters between MI and IHD were evaluated by one-way ANOVA followed by Post-Hoc test (Least significant difference). The level of statistical significance was observed at $P<0.05$, $P<0.01$ using SPSS software 16.0.

Results

Table 1 showsweight, height, BMI, BSA, HR and BPof both MI and OHD patients.There is no significant difference in between the observed groups but there is increase in the blood pressure mainly mean arterial pressure in both MI and IHD patientsfrom normal recommended range.

Table 1: Physical anthropometryand physiological parameters in MI and IHD patients

Parameters	Myocardial infarction (n=75)	Ischemic heart disease (n=75)	p-value
Age (yrs)	54.92±9.96	58.9± 14.5	0.214
Height (cms)	159.36± 6.62	160.54 ± 4.2	0.494
Weight (kg)	64.24± 10.65	66.8 ± 11.63	0.394
BSA (m^2)	1.67±0.15	1.7 ± 0.14	0.484
BMI (kg/m^2)	25.20± 3.09	25.86 ± 3.84	0.508
HR (bpm) (65-75bpm)	83.62 ± 15.06	86.24 ± 13.58	0.898
SBP (mmHg) (120-130mmHg)	130.73 ± 18.6	128.93 ±29.7	0.3647
DBP (mmHg) (80-90mmHg)	81.63 ± 11.1	78.32 ±11.37	0.150
PP (mmHg) (40-50mmHg)	52.24 ± 12.3	51.5 ± 20.7	0.802
MAP (mmHg) (90-93mmHg)	**100.12 ± 13.6**	**95.33 ± 15.6**	**0.207**

Table 2 shows biochemical parameters which alsoshows normal levels of serum sodium, potassium, creatinine withhigher levels of CPK-MB andreduction in serum calcium and vitamin D of both MI and IHD patients as compared to normal recommended values although no statistical significance were observed in between MI and IHD patients

Table 2: Showing biochemical parameters in MI and IHD patients

Parameters	Myocardial Infarction (n=75)	Ischemic heart disease (n=75)	p-value
Sodium (133-146mEq/L)	138.76±4.19	136.76±5.2	0.269
Potassium (2.8-5.2mEq/L)	4.21±0.67	4.23±0.68	0.712
Serum creatinin (0.9-1.4 mg/dl)	0.95±0.72	1.41±1.39	0.061
CPK-MB (**0-26 U/L)**	**33.70±17.89**	**30.72±15.13**	0.156
Serum calcium (**8.5-10.2mg/dl)**	**8.48±0.59**	**8.32±1.32**	0.617
Vitamin D **(20-50 ng/ml)**	**12.8±2.30**	**12.83±1.93**	0.760

Discussion

Results of our study shows lower calcium and vitamin D in MI and IHD patients which is indicative of altered calcium homeostasis in both MI and IHD patients. Possibly vitamin D might have played a significant role to control calcium homeostasis in case of cardiovascular disorders including MI and IHD.Emerging studies show that vitamin D deficiency is a highly prevalent condition and is independently associated with most CVD risk factors and to CVD morbidity and mortality.[5]Vitamin D and calcium deficiency is associated with ischemic heart disease and myocardial infarction[6]. Vitamin D and calcium status is prognostic for major post infarctionadverse events, such as heart failure, recurrent acute myocardial infarction, death [7-8]. Some case reports of patients suffering from heart failure support our hypothesis that low serum levels of vitamin D metabolites might be an important cause of the reduced serum Ca^{2+} level and of cardiac dysfunction.[9-11]Many recent studies have demonstrated a strong association between low levels of vitamin D and hypertension [12-14]Results also indicate that lower vitamin D levels irrespective of MI or IHD are suggestive of a relationship between vitamin D and cardiovascular health.

New findings reinforce that vitamin D deficiency is an important public health problem. Future studies are still required to establish clinical guidelines for vitamin D supplementation required to achieve adequate vitamin D levels in people who are at risk for CVD.

Conclusion

The significant role of vitamin D for calcium homeostasis may be considered as important marker for assessment of severity and morbidity of MI and IHD.

Conflict of Interest: The authors have none to declare.

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Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

References

1. Holick MF. Vitamin D deficiency. N Engl J Med 2007;357:266-281.
2. Reid IR, Bolland MJ. Role of vitamin D deficiency in cardiovascular disease. Heart 2012;98(8):609-614.
3. Lindqvist PG. On the possible link between vitamin D deficiency and cardiovascular disease. Circulation 2014;129:e413-e414.
4. Idris Guessous A, B Murielle Bochud B Olivier Bonny C Michel Burnier C. Calcium, Vitamin D and Cardiovascular Disease, Kidney Blood Press Res 2011;34:404–417
5. S. M. Hlaing, L. A. Garcia, J. R. Contreras et al., 1,25-vitamin D3 promotes cardiac differentiation through modulation of the WNT signaling pathway.J Molecul Endocrin,2014; 53(3):303–317.
6. L. L.Ng, J. K. Sandhu, I. B. Squire, J. E.Davies, andD. J. L. Jones,Vitamin D and prognosis in acute myocardial infarction,InterlJ Cardiol,2013;168(3): 2341–2346,

7. L. C. Correia, F. Sodre, G. Garcia et al., Relation of severe deficiency of vitamin D to cardiovascular mortality during acute coronary syndromes,Am J Cardiol,2013;111(3): 324–327.
8. Brunvand L, Haga P, Tangsrud SE, Haug E. Congestive heart failure caused by vitamin D deficiency? Acta Paediatr 1995;84:106-8
9. Gillor A, Grenoeck P, Kaiser J, Schmitz-Stolbrink A. Congestive heart failure in rickets caused by vitamin D deficiency. Monatsschr Kinder-heilk 1989;108-10
10. Avery PG, Arnold IR, Hubner PJ, Iqbal SJ. Cardiac failure secondary to hypocalcemia of nutritional osteomalacia. Eur Heart J 1992;13:426-7
11. Forman JP, Curhan GC, Taylor EN. Plasma 25-hydroxyvitamin D levels and risk of incident hypertension among young women. Hypertension. 2008;52(5):828-32
12. Bhandari SK, Pashayan S, Liu IL, et al.25-Hydroxyvitamin D level and hypertension rates.J Clin Hypertens.2011;13(3):170-7
13. Burgaz A, Orsini N, Larsson SC, et al. Blood 25-hydroxyvitamin D concentration and hypertension: a metaanalysis. J Hypertens. 2011; 29(4):636-45
14. Kunutsor SK, Apekey TA, Steur M. Vitamin D and risk of future hypertension: meta-analysis of 283,537 participants. Eur J Epidemiol 2013;28:205-221=