ORIGINAL RESEARCH

Assessment of serum parathyroid hormone levels and its relation with severity and duration of heart failure

[1]Dr. Rahul Shekhar, [2]Dr. Ashwini Kumar

[1,2]Senior Resident, Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India

Corresponding Author
Dr. Rahul Shekhar
Senior Resident, Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India

Revised date: 25 November, 2023 Acceptance date: 28 December, 2023

ABSTRACT

Background: Heart failure (HF) is a clinical syndrome that affects individuals who have an inherited or acquired abnormality of their heart's structure and/or function. The present study was conducted to evaluate serum parathyroid hormone levels and its relation with severity and duration of heart failure. **Materials & Methods:** The study was conducted at Department of Medicine, Patna Medical College and Hospital, Patna during June 2022 - Dec 2022. 45 patients with CCF of both genders underwent 2- D echocardiography. Parameters such as ejection fraction, and NYHA grading. Serum parathyroid hormone levels were measured by chemiluminescence immunoassay technique. **Results:** Out of 45 patients, males were 25 and females were 20. Out of 24 patients with EJ <35%, 13 had serum PTH >72pg/ml and 9 had <72pg/ml. 11 patients with EF 35-40, all had serum PTH >72pg/ml. 10 with EJ >40, all had serum PTH >72pg/ml. Out of 23 grade II patients, all had serum PTH >72pg/ml. Out of 22 grade II patients, all had serum PTH >72pg/ml. Out of 25 patients with duration 1-2 years, 24 had serum PTH >72pg/ml and out of 20 patients with duration >2 years, 12 had serum PTH <72pg/ml. The difference was significant (P< 0.05). **Conclusion:** Serum PTH and other serum-derived biomarkers of cardiomyocyte necrosis are linked to higher rates of cardiac morbidity and mortality both inside hospitals and outside.

Keywords: Heart failure, chemiluminescence, parathyroid hormone

INTRODUCTION

Heart failure (HF) is a clinical syndrome that affects individuals who have an inherited or acquired abnormality of their heart's structure and/or function.[1] Patients with HF experience a constellation of clinical symptoms, such as fatigue and dyspnea, as well as signs, such as edema and rales, that result in a reduced quality of life, frequent hospitalizations, and a shortened life expectancy. Ischaemic heart disease accounted for 38% of heart failure cases worldwide, with hypertensive heart disease, rheumatic heart disease, and cardiopulmonary illness accounting for the remaining 34% of instances. A more comprehensive view of CHF acknowledges its systemic origins, which have been characterized as a disturbance of the neuroendocrine-immune system.[2,3]

Unusual rise of serum PTH causes cardiomyocytes to accumulate excessive amounts of calcium intracellularly, which in turn causes myocyte destruction and replacement fibrosis.[4] Oxidative stress and Ca2+ overloading causes the mPTP in mitochondria to open nonphysiologically. This causes osmotic-based structural and functional degeneration of these organelles, which in turn sets off the downhill final common cell death pathway that results in cardiomyocyte necrosis and replacement fibrosis.[5]This formerly effective muscular pump gradually fails during the systolic and/or diastolic phases of the cardiac cycle due to the cumulative loss of contractile elements, the deposition of fibrous tissue, stiff in-series and in-parallel elastic elements made primarily of type I fibrillar collagen with the tensile strength of steel.[6]The present study was conducted to evaluate serum parathyroid hormone levels and its relation with severity and duration of heart failure.

MATERIALS & METHODS

The study was conducted at Department of Medicine, Patna Medical College and Hospital, Patna during June 2022 - Dec 2022. The present study was conducted on45 patients with CCF of both genders.All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. All patients underwent 2- D echocardiography.

Parameters such as ejection fraction, and NYHA grading, CBC, urine microscopy, RFT, LFT, RBS, serum electrolytes, lipid profile were done for all patients and thyroid function tests wherever applicable. Serum parathyroid hormone levels were measured by chemiluminescence immunoassay technique. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 45		
Gender	**Male**	**Female**
Number	25	20

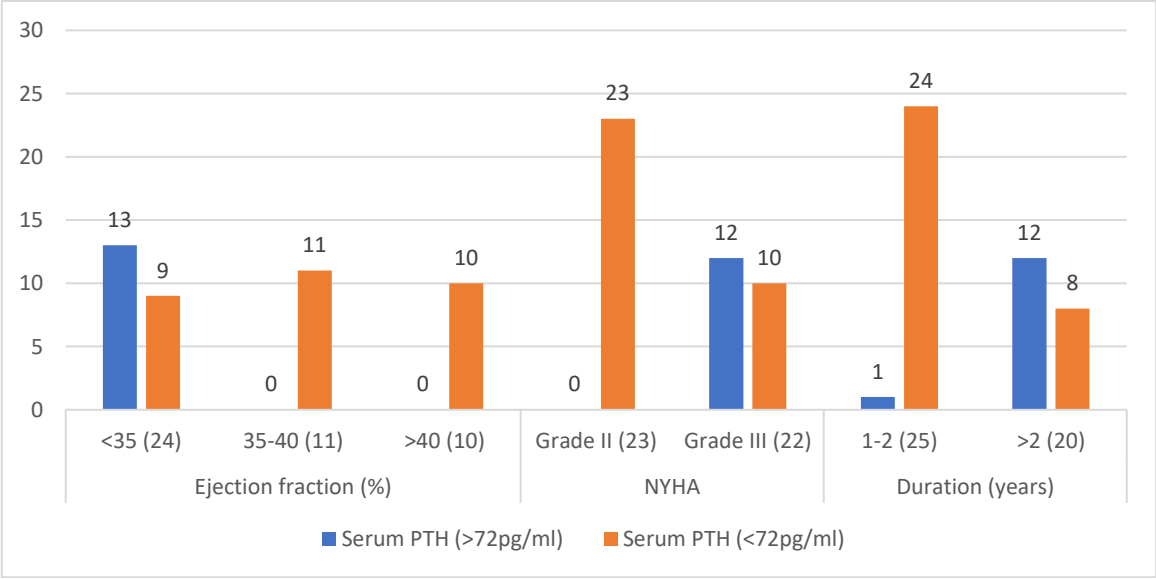
Table I shows that out of 45 patients, males were 25 and females were 20.

Table II Assessment of parameters

Parameters	Variables	Serum PTH (>72pg/ml)	Serum PTH (<72pg/ml)	P value
Ejection fraction (%)	<35 (24)	13	9	0.05
	35-40 (11)	0	11	
	>40 (10)	0	10	
NYHA	Grade II (23)	0	23	0.04
	Grade III (22)	12	10	
Duration (years)	1-2 (25)	1	24	0.02
	>2 (20)	12	8	

Table II shows that out of 24 patients with EJ <35%, 13 had serum PTH >72pg/ml and 9 had <72pg/ml. 11 patients with EF 35-40, all had serum PTH >72pg/ml. 10 with EJ >40, all had serum PTH >72pg/ml. Out of 23 grade II patients, all had serum PTH >72pg/ml. Out of 22 grade II patients, all had serum PTH >72pg/ml. Out of 25 patients with duration 1-2 years, 24 had serum PTH >72pg/ml and out of 20 patients with duration >2 years, 12 had serum PTH <72pg/ml. The difference was significant (P< 0.05).

Graph I Assessment of parameters



DISCUSSION

The presence of oxidative stress with reactive oxygen and nitrogen intermediates that overwhelm endogenous antioxidant defences in such diverse tissues as skin,skeletal muscle, heart, peripheral blood mononuclear cells (lymphocytes andmonocytes) and blood.[7,8]A proinflammatory phenotype with activated peripheral blood mononuclear cells and elevations in circulating chemokines and cytokines, such as interleukin-6 and tumor necrosis factor(TNF)-α 3.[9] A catabolic state with loss of soft tissues and bone due, in part, to negative caloric and nitrogen balance that eventuates in a wasting syndrome termed cardiac cachexia.[10]The present study was conducted to evaluate serum parathyroid hormone levels and its relation with severity and duration of heart failure.

We found that out of 45 patients, males were 25 and females were 20. Madhura et al[11]conducted a study on 50 patients diagnosed to have CCF on the basis of symptoms, clinicalexamination, NYHA grading and 2-D Echocardiography. SerumPTH was measured by chemiluminescence and its correlation with severity

and duration of heart failure was analysed statistically. Among the patients studied, 56% of the patients with EF ≤ 35% hadelevated serum PTH levels(Mean: 70.1±14.6 pg/ml, p2 years had elevated serum PTH levels>72pg/ml (p< 0.001)

We found that out of 24 patients with EJ <35%, 13 had serum PTH >72pg/ml and 9 had <72pg/ml. 11 patients with EF 35-40, all had serum PTH >72pg/ml. 10 with EJ >40, all had serum PTH >72pg/ml. Out of 23 grade II patients, all had serum PTH >72pg/ml. Out of 22 grade II patients, all had serum PTH >72pg/ml. Out of 25 patients with duration 1-2 years, 24 had serum PTH >72pg/ml and out of 20 patients with duration >2 years, 12 had serum PTH <72pg/ml. Meng et al[12]aimed to systematically evaluate the association between circulating level of PTH and risk of heart failure in the general population. Higher circulating level of PTH was associated with an increased risk of heart failure (HR: 1.38; 95% CI 1.09–1.74) in a random effect model. Subgroup analyses revealed that the risk of heart failure was more pronounced among men (HR: 1.75; 95% CI 1.38–2.22) than in both genders. However, the risk increment was not statistically significant (HR: 1.12; 95% CI 0.76–1.66) in the middle-aged population. Higher PTH level is independently associated with an exacerbated risk of heart failure in the general population.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that serum PTH and other serum-derived biomarkers of cardiomyocyte necrosis are linked to higher rates of cardiac morbidity and mortality both inside hospitals and outside.

REFERENCES

1. Ahokas RA, Sun Y et al.Cellular and molecular pathways to myocardial necrosis andreplacement fibrosis. Heart Fail Rev. 2011;16(1):23-34.
2. Weber KT. Cardiac interstitium in health and disease: the fibrillar collagen network. Am Coll Cardiol 1989; 13:1637– 1652.
3. Bozic B, Loncar G, Prodanovic N, Lepic T, Radojicic Z, Cvorovic V et al. Parathyroid hormone response to vitamin D insufficiency in elderly maleswith chronic heart failure. Physiol Res 2011;60 Suppl1:S155-63.
4. Khouzam RN, Dishmon DA, Farah V, Flax SD, Carbone LD, Weber KT.Secondary hyperparathyroidism in patients with untreated and treated congestive heart failure.Am J Med Sci. 2006 ;331(1):30.
5. Loncar G, Bozic B, Dimkovic S, Prodanovic N, Radojicic Z, Cvorovic V et al. Association of increased parathyroid hormone with neuroendocrine activation and endothelial dysfunction in elderly men with heart failure. J Endocrinol Invest. 2011;34(3):78-80.
6. Anderson JL, Vanwoerkom RC, Horne BD, Bair TL, May HT, Lappé DL et al. Parathyroid hormone, vitamin D, renal dysfunction, and cardiovascular disease:dependent or independent risk factors? Am Heart J. 2011;162(2):331-339.e2.
7. Altay H, Zorlu A, Binici S, Bilgi M, Yilmaz MB, Colkesen Y et al. Relation of serum parathyroid hormone level to severity of heart failure. Am JCardiol 2012 ;109(2):252-6.
8. Sugimoto T, Tanigawa T, Onishi K, Fujimoto N, Matsuda A, Nakamori S et al. Serum intact parathyroid hormone levels predicthospitalisation for heart failure. Heart. 2009;95(5):395. 13. Jawwad Yusuf, M.Usman Khan,Yaser Cheema,Syamal KBhattacharya,and Karl T. Weber. Disturbances in calcium metabolism andcardiomyocyte necrosis: the role of calcitropic hormones. Prog Cardiovasc Dis. 2012;55(1):77–86.
9. Robb D. Kociol. Heart Failure Editors' Picks: Most Important Papers inPathophysiology and genetics. Circ Heart Fail. 2012;5:e32-e49.
10. Nakayama H, Chen X, Baines CP, Klevitsky R, Zhang X, Zhang H et al. Ca2+ and mitochondrialdependent cardiomyocyte necrosis as a primary mediator of heart failure. J Clin Invest 2007;117:2431–2444.
11. Madhura A R, Veeranna Gowda KM, Jayachandra, Raghavendra BM. A cross-sectional observational study of serum parathyroid hormone levels and its relation with severity and duration of heart failure. International Journal of Health and Clinical Research, 2021;4(3):123-126.
12. Fanbo Meng, MD,Wei Wang, MM, Jianghong Ma, MM, and Baisong Lin. Parathyroid hormone and risk of heart failure in the general population. A meta-analysis of prospective studies