

Lower Serum Calcium Levels In Covid-19 Patients: A Case-Control Study In A Tertiary Care Centre

R Hemalathaa¹, D Merriwin^{2*}, N Ananthi³, E Keerthika⁴, V Rakshana⁵, C S Brethis⁶

¹Assistant Professor, Department of Biochemistry, Saveetha Medical College, Thandalam, Kanchipuram District - 602105 Tamil Nadu

²MBBS, MD Biochemistry Assistant Professor, Department of Biochemistry Saveetha Medical College, Thandalam, Kanchipuram District - 602105 Tamil Nadu, email - drdmerriwin@gmail.com Phone - 9445116762

³Professor & HOD, Department of Biochemistry, Saveetha Medical College, Thandalam, Kanchipuram District - 602105 Tamil Nadu

⁴Tutor, Department of Biochemistry, Saveetha Medical College, Thandalam, Kanchipuram District - 602105 Tamil Nadu

⁵Intern, Saveetha Medical College, Thandalam, Kanchipuram District - 602105 Tamil Nadu

⁶Associate Professor, Department of Pharmacology, ACS Medical College, Thandalam, Kanchipuram District - 602105 Tamil Nadu

*Corresponding Author:-Dr.D.Merriwin

*MBBS, MD Biochemistry Assistant Professor, Department of Biochemistry Saveetha Medical College, Thandalam, Kanchipuram District - 602105 Tamil Nadu, email - drdmerriwin@gmail.com Phone - 9445116762

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Abstract

Background: The novel coronavirus disease (COVID-19) has affected over 50 million people and has inflicted more than 1.2 million casualties ever since its inception in December 2019. Besides, multiple hematological and biochemical parameters have emerged as potential biomarkers to predict severe disease and mortality in COVID-19. One such biochemical biomarker is hypocalcemia. Hypocalcemia is associated with severe disease, organ failure, increased likelihood of hospitalization, admission to the intensive care unit, need for mechanical ventilation, and death from COVID-19. Hence, the present study was undertaken to compare the serum total calcium in patients infected with COVID-19 and a normal healthy population.

Aim: To compare serum total calcium in patients infected with COVID-19 and normal healthy populations.

Materials and methods: This is a case-control study with 50 COVID-19 patients and 50 normal healthy individuals as controls. Serum calcium was determined by Arsenazo III method using Vitros 5600 autoanalyser.

Results: Chi-square analysis was done and the p-value between cases and control was < 0.05 which is significant. 20% of the COVID-19 patients had very severe hypocalcemia ranging between 4.5 – 6 mg/dl, 47% of the COVID-19 patients had moderate to severe hypocalcemia with values between 6.6 – 8.5 mg/dl, and 33% of the COVID-19 patients had normal calcium levels ranging from 8.6 – 10 mg/dl.

Conclusion: Hypocalcemia is highly prevalent in COVID-19 patients implying that hypocalcemia is intrinsic to the disease. Prospective studies with a larger number of patients are required to prove this hypothesis and unravel the underlying pathophysiological mechanisms.

Keywords : COVID-19, Calcium, Hypocalcemia

1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has spread globally [1,2]. As of 16 October 2020, a total of 39023292 confirmed cases and 1099586 deaths have been reported in more than 200 countries worldwide [3]. A report showed that 70% of acutely ill patients had decreased levels of serum calcium which is associated with a poor prognosis [4]. Hypocalcemia is associated with severe disease, organ failure, increased likelihood of hospitalization, admission to the intensive care unit, need for mechanical ventilation, and death from COVID-19 [5–9]. The prognosis tends to be poor, specifically in patients with advancing age and in those with co-morbid conditions [10]. Besides, multiple hematological and biochemical parameters have emerged as potential biomarkers to predict severe disease and mortality in COVID-19 [11]. However, to date, the prevalence of hypocalcemia in non-severe COVID-19 patients has not been explored. In our clinical practice, we had encountered cases of biochemically confirmed hypocalcemia in patients with non-severe COVID-19. So, this study was undertaken as there is a dearth of knowledge about this correlation between serum calcium level in COVID-19.

2. MATERIALS AND METHODS

Study Design :

This single-center, retrospective, observational study was approved by the Institutional Review Board (IRB) at the Department of Biochemistry, Saveetha medical college & hospital, Thandalam, Tamil Nadu. From 29 January to 10

February 2021, 50 patients with confirmed COVID-19 admitted to Saveetha medical college & Hospital were enrolled in this retrospective study.

Data Collection :

The baseline clinical characteristics including age, underlying disease, days from onset to admission, and clinical classifications were collected from electronic medical records including all the laboratory tests. The levels of serum calcium were recorded. The estimation of serum calcium was assayed by Arsenazo III method using Vitros 5600 auto-analyzer.

Statistical analysis :

Student independent t-test and chi-square analysis were performed using SPSS version 26.0

3. RESULTS :

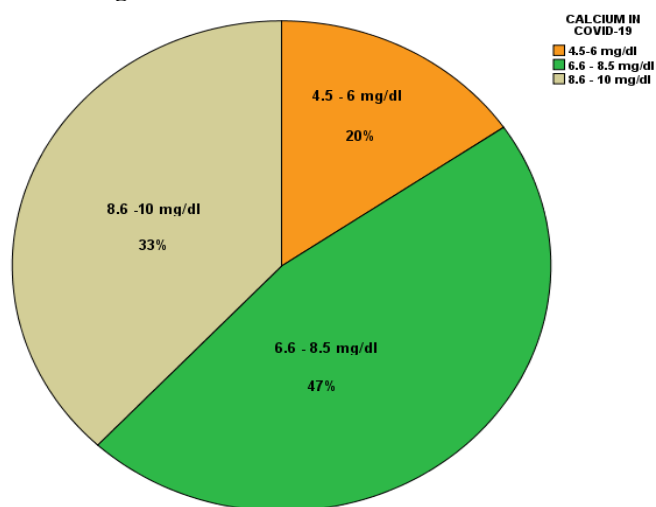
TABLE 1. Descriptive Statistics

S.NO	CATEGORY	CASES	CONTROL	p-value
1.	Age(years)	35 + 2.1	35 +1.1	0.09
2.	Height (cm)	160 + 3.8	161+1.8	0.07
3.	Weight (kgs)	72 +1.9	73+ 0.9	0.06
4.	Mean Serum calcium (mg/dl)	7.4	9.3	0.03*

TABLE 2. Distribution Of Calcium Values In Covid-19 Patients By Chi-Square Analysis

CATEGORY	DISTRIBUTION IN %
Very severe 4.5 -6 mg/dl	20
Moderate to severe 6.1 – 8.5 mg/dl	47
Normal 8.6 -10 mg/dl	33

Fig 1. Distribution Of Calcium Values In COVID-19



Chi-square analysis is done and the p-value between cases and control is < 0.05 which is significant. 20% of the COVID-19 patients had very severe hypocalcemia ranging between 4.5 – 6 mg/dl, 47% of the COVID-19 patients had moderate to severe hypocalcemia with values between 6.6 – 8.5 mg/dl, and 33% of the COVID-19 patients had normal calcium levels ranging from 8.6 – 10 mg/dl.

4. DISCUSSION :

In this study, we analyzed the different levels of serum calcium levels in covid patients. Very low serum calcium is seen in the patients affected with covid-19. Calcium plays a key role in many biological functions. The total serum calcium was decreased even more with increased age and was also seen more in females than in males. This was because when people grow old their kidneys, liver, and intestines start to fail, and vitamin- (cholecalciferol) is depleted which is an important hormone in maintaining calcium homeostasis along with parathormone and calcitriol (12). According to the previous experiments conducted in vitro and in animal models infected with covid SARS-CoV E gene encodes for a transmembrane protein with ion channel activity that is highly synthesized during infection and is mainly seen in the Golgi apparatus and endoplasmic reticulum. These ion channels are permeable to calcium and it was demonstrated that slight alterations in the calcium homeostasis could cause activation of inflammatory pathways leading to increased levels of IL-1b, TNF, and IL-6, linked to lung cell damage and oedema accumulation (2). So, serum calcium levels can be used as an important indicator in order to diagnose patients affected with coronavirus. It can also help in the diagnosis of the

severity of coronavirus whether it is mild, moderate, or severe (3). It can also help to come up with a treatment plan according to the severity and progression of the disease.

5. CONCLUSION

In this study, we collected calcium levels of covid patients. The patients with covid showed lesser values of serum calcium levels. The patients affected with SARS-CoV-2 were highly prevalent to hypocalcemia i.e., lower serum calcium than normal serum calcium < 8.6–10mg/dl. Most of the patients showed mild to moderate hypocalcemia levels i.e., 6.1–8.5 mg/dl, while some patients showed serum calcium decrease of up to 4mg/dl. This study shows that patients with COVID-19 are highly pervasive to decreased serum calcium and hypocalcemia which affects calcium homeostasis and causes various side effects.

6. CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript.

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