

Short Communication

Prevalence of hypocalcaemia in patients attending the Olabisi Onabanjo University Teaching Hospital, Sagamu, South Western Nigeria

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Nine hundred and two (902) patients were randomly selected for the study from the patients that reported in the Clinical Biochemistry Laboratory of Olabisi Onabanjo University Teaching Hospital, Nigeria. The period of study was two years. The prevalence of hypocalcaemia was 11.53% (serum calcium level = 8.36 ± 0.40 mg/100 ml), and reference range for serum calcium of our laboratory = 9 - 11 mg/100 ml (2.25 - 2.75 mmol/L). The causes of hypocalcaemia found in the study environment are renal failure (27.88%), postoperative cases – thyroidectomy (10.58%), gastroenteritis (8.65%), cardiovascular diseases (8.56%), malnutrition (8.65%), acute respiratory infection (6.73%), encephalitis (6.73%), hypoparathyroidism (4.81%), hepatic coma (3.85%) and other ailments (13.47%). The major cause of hypocalcaemia in the study environment is renal failure (Serum calcium level = 7.77 ± 1.30 mg/100 ml).

Key words: Biochemical screening, *hypocalcaemic* patients, prevalence.

INTRODUCTION

Normal calcium homeostasis is important for the various physiological functions of the body. Ringer (1883) showed that calcium was essential for myocardial contraction. McLean and Hastings (1934) showed that this myocardial contraction was the responsibility of the ionized calcium. Whereas protein bound and citrate bound calcium had no effect. Ionized calcium is necessary for blood coagulation and nerve function (Ganong, 2003). It is important to maintain ionized calcium at a near normal concentration, especially during surgery and in critically ill patients (Drop, 1985). Calcium is a key component in the cell for maintenance of proper structure of membranes and organelles. It is also a pivoted regulator of a wide variety of cellular functions as

a major second messenger from plasma membrane receptors (Kenneth et al., 1991).

The body maintains calcium homeostasis by balancing the amount of calcium needed to rebuild new bone, the amount absorbed from the gastro-intestinal tract, and the amount filtered out by the kidneys as waste. Calcium balance is essentially being regulated by the actions of parathyroid hormone, calcitonin and vitamin D. Also, a few other hormones namely, the thyroid hormones, growth hormone, glucocorticoids and oestrogen have influences on calcium balance (Ganong, 2003). Hypocalcaemia means reduced blood level of calcium below the normal level. The reference range varies for different laboratories. In our laboratory, it is 9.0-11 mg/100 ml. Mild degrees of hypocalcaemia may be a symptomatic. Higher degrees of hypocalcaemia are symptomatic and the usual symptoms and signs of hypocalcaemia include tetany, convulsions, cataracts, fatigue,

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Table 1. Total calcium concentration in 902 patients (sera) before and after adjusting on albumin.

	Mean (mg/100 ml)	SD (mg/100 ml)	95% limits (mg/100 ml)
Measured calcium values before adjusting on albumin	9.41	0.80	7.81-11.01
Values of calcium after adjusting on albumin	9.87	0.43	9.01-10.73

Table 2. Distribution of total calcium values in 902 patients (sera) after adjusting on albumin concentration.

	Raised value(> 11 mg/100 ml)	Normal value (9-11 mg/100 ml)	(9-11 mg/100 ml) (<9 mg/100 ml)
Numbers of Patients	34 patients	764 patients	104 patients
Prevalence	-	-	11.53%

lethargy and weight loss (Haussler and McCain, 1977).

Since ionized calcium is the physiologically active calcium, there is a need to adjust the laboratory value of the total serum calcium on albumin (Payne et al., 1979; Wills and Lewin, 1971; Walker and Payne, 1979). The known causes of hypocalcaemia include hypoparathyroidism malnutrition, malabsorption and renal failure (Diquelou et al., 2005; Marya and Bhargava, 1984). A suspicion of hypocalcaemia through history and clinical examination is usually further confirmed by electrocardiography, radiography and biochemical investigations (Angela, 1980; Bess-Dawson, 1991). However, this paper examines the biochemical investigations. There is information in literature on the prevalence of hypocalcaemia in an apparently healthy population (Marya and Bahrgava, 1984; Philipson et al., 1978), however, published information is not available in literature on the prevalence of hypocalcaemia in this study environment (Olabisi Onabanjo University Teaching Hospital, Sagamu). This study is therefore designed to determine the prevalence of hypocalcaemia in the Teaching Hospital, evaluate the causes of hypocalcaemia in the study environment and thereby, create awareness on hypocalcaemia for public health education.

MATERIALS AND METHODS

A total of nine hundred and two (902) patients were randomly selected from the patients that reported in the Clinical Biochemistry Laboratory of Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria. The study spreads over two years. 10.0 ml of blood sample was taken from each patient and the serum obtained for estimation of the various analytes. Venous stasis was avoided when obtaining blood samples from the patients (Ogunkolo et al., 2006). Total calcium, phosphate, total protein and albumin of each patient were determined. Cresolphthalein complexone was used for total calcium (Gitelman, 1967), biuret method for total protein (Henry et al., 1957), and bromocresol green for albumin (Webster et al., 1974). The total serum calcium value of each patient was adjusted based on the value of albumin of the same patient and the adjusted calcium value obtained (Payne et al., 1979; Wills and Lewin, 1971; Walker and Payne, 1979; Ogunkolo et al., 2005).

RESULTS AND DISCUSSION

The reference range for the total serum calcium values in this laboratory is 9.00 – 11.00 mg/100 ml (2.25 – 2.75 mmol/L). The reference range of albumin is 2.40–4.50 g/dl (24.0–45.0 g/L). The results of the study are presented in Tables 1-3. Out of the 902 patients, 104 patients were found to be hypocalcaemia (Tables 2 and 3). The clinical diagnosis of these hypocalcaemic patients agreed with our biochemical findings on the state of their serum calcium (Table 3).

The prevalence of hypocalcaemia in this hospital population (patients attending the Olabisi Onabanjo University Teaching Hospital) is 11.53%. The prevalence of 11.53% in our study shows that there is a higher prevalence of hypocalcaemia in hospital population, than in apparently healthy population. Philipson et al. (1978) screened an apparently healthy population and obtained a prevalence of 0.6%. Other studies using hospital populations support our findings. In 1984, Schmitt et al. studied the prevalence of hypocalcaemia in patients receiving chronic anticonvulsant therapy and obtained 29%. Karamifar et al. (2002) investigated prevalence of hypocalcaemia in jaundiced neonates on phototherapy in Iran and they obtained 14%. Also, in 2005 some workers in Saudi examined serum calcium in children and found a prevalence rate of 58% for hypocalcaemia (Bin Mohanna et al., 2005). All these suggest that the prevalence of hypocalcaemia varies from place to place. They all gave high values for hospital populations.

Various ailments are diagnosed for these hypocalcaemic patients, and they are the causes of hypocalcaemia in these 104 patients. They include acute respiratory infection, 7 (6.73%); gastroenteritis, 9 (8.65%); malnutrition, 9 (8.65%); encephalitis 7 (6.73%); hypoparathyroidism, 5 (4.81%); diabetes mellitus, 5 (4.81%); hepatic coma, 4 (3.85%); thyroidectomy, 11 (10.58%), reproductive diseases 3 (2.88%); cardiovascular diseases 9 (8.65%); renal failure; 29 (27.88%) and histoplasmosis 2 (1.92%). The association of these diseases with hypocalcaemia is well documented in literature; acute respiratory

Table 3. Statistical analysis of 104 diagnosed hypocalcaemia patients.

Clinical Diagnosis	No. of patients	Percentage	Mean serum Calcium Level (mg/100 ml)	SD
Renal failure	29	27.88%	7.77	1.30
Post-operation (thyroidectomy)	11	10.58%	8.77	0.17
Gastroenteritis	9	8.65%	8.36	0.45
Cardiovascular diseases	9	8.65%	8.74	0.19
Malnutrition	9	8.65%	8.54	0.30
Acute respiratory Infection (ARI)	7	6.73%	8.37	0.20
Encephalitis	7	6.73%	8.66	0.01
Hypoparathyroidism	5	4.81%	8.38	0.18
Diabetes mellitus	5	4.81%	8.54	0.30
Hepatic coma	4	3.85%	8.87	0.01
Reproductive diseases	3	2.88%	8.73	0.01
Fistula in ano	2	1.92%	8.84	-
Histoplasmosis	2	1.92%	8.03	-
Interloop abscess	2	1.92%	8.80	-

infection, gastroenteritis, malnutrition and CNS disease (Asmat et al., 2004), hypoparathyroidism (Philipson et al., 1978), diabetes mellitus (Arthur et al., 2000), hepatic coma (Philip, 1993), cardiovascular disease, (Evans, 1964), renal failure (Hassler and McCain, 1977) and histoplasmosis (Baker and Worthley, 2002).

The study shows that among the various causes, renal failure is the commonest cause of hypocalcaemia in the study population. Our findings provide empirical evidence to support the fact that hypocalcaemia is more prevalent in hospital population than normal population. It is therefore necessary to educate the public on the risk of hypocalcaemia hence the need for routine screening for hypocalcaemia in health and in patients.

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