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Full Length Research Paper

Hypoalbuminaemia associated hypocalcaemia with overt clinical features: A case report

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Hypocalcaemia is defined as serum calcium level less than 9.0 mg/100 ml (2.25 Mmol/l). It is often only being considered as a differential diagnosis in the paediatric unit, where it is usually included as part of routine investigations, especially in children with clinical problems such as convulsions, seizure, apathy, muscles weakness, tetany, suspected vitamin D deficiency or maternal hypercalcaemia. In adult patients however, hypocalcaemia is often neglected (especially in private health facilities) except in specialties such as rheumatology, neurology, nephrology and intensive care unit. In this report, neurological manifestations (paraesthesia, delirium, seizure and coma) were presented by the patient. Both anthropometric and biochemical parameters were evaluated in this patient and the results were used to evaluate the patients clinical presentation. The findings revealed that there was malnutrition, which manifested biochemically as hypoalbuminaemia and hypocalcaemia. Calcium replacement therapy satisfactorily returned this patient to stable clinical state, the therapy was done parenterally but gradually. Surprisingly, this patient showed overt clinical features of hypocalcaemia against the popular belief that hypoalbumineamic hypocalcaemia does not have a physiological significance. This report emphasizes the need to include serum calcium estimations in our routine investigations in clinical practice on one hand, and on the other hand, it appears to disagree with the overemphasized rarity of physiologically significant hypocalcaemia due to hypoalbuminaemia.

Key words: Hypocalcaemia, hypoalbuminaemia, overt clinical features.

CASE REPORT

A 56-year-old woman presented twice in a private hospital (Skylark Hospital) in Sagamu, Ogun State, Nigeria. Her complaints at the first presentation included body weakness, tingling sensation, low grade fever and loss of appetite of about 4 - 5 days duration. She then developed delirium and was rushed to the hospital. At this time, she was only given empirical treatments and she recovered fully within 3 days and was discharged. No intensive evaluation (such as anthropometric and biochemical parameters) was done at this presentation. At the second presentation, which occurred within 3 weeks after the first, she was rushed down to the hospital with history of having convulsed for some minutes and then became comatose. Prior to the convulsion she was said to be apparently well except for body weakness. At this presentation, the patient was properly evaluated. Clinical evaluation revealed an asthenic woman, mildly pale, not jaundiced, poor hydration, coarse hair, marked alopecia, afebrile and comatose. Her cardio respiratory status was clinically satisfactory. Biochemical and

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Table 1. Results of biochemical and heamatological parameters requested in the 56-yr-old patient.

Biochemical parameters		Haematological parameters	
Urea	18 g/100 ml (10 - 40)		
Potassium	3.9 mEq/l (3.6 - 5.3)	PCV	30% (35 - 45)
Sodium	14l mEq/l (135 - 150)	Red cell -	Megaloblastic,
Hco3	26 mEq/l (22 - 32)	morphology	Hypochromic
Chloride	100 mEq/l (95 - 105)	WBC	6,200 (4 - 11,000)
Glucose	172 mg/100 ml (random/b/s)		Neutr. 66%
Total Bilirubin	0.2 mg/100 ml (0.2 - 0.5)		Lymph. 27%
SGOT	24 µl (0 - 27)		Eosinop. 5%
SGPT	25 µl (0 - 28)		Basophil. 2%
Albumin (mean)	1.8 g/100 ml (3.8 - 5.2)	ESR	28 mm (0 - 15)
Calcium (mean)	6 mg/100 ml (9 - 11)		

Table 2. Data on the demographic and anthropometric indices studied in the 56-yr-old patient.

Demographic characteristics		Anthropometric indices	
Age	56 years	Height	1.54 m
Socio-economic	Low class	weight	44.50 kg
Parity	Nulliparous	Body mass (BMI)	18.78 18.8

BMI: Body mass index; Below 20, Underweight; 20 – 25, Normal; 25 – 30, Overweight; Above 30, Obese.

haematological investigations were requested.

BLOOD COLLECTION AND ANALYTICAL METHODS USED

Ten millilitre of venous blood was collected from the patient, 4.0 ml of blood was dispensed into ethylene-diamine-tetra-acetic (EDTA) bottle and was used for erythrocyte sedimentation rate (ESR), white blood cell count (WBC), parked cell volume (PCV) and red cell morphology. 4.0 ml of blood was dispensed into lithium heparin bottle and plasma was separated by centrifugation. The plasma was used for the estimation of sodium, potassium, chloride, bicarbonate, urea, alanine amino transferase (ALT), aspertate amino transferase (ALT), total bilirubin, albumin and total calcium. 2.0 ml of blood was dispensed into fluoride oxalate bottle and plasma was separated by centrifugation. The plasma was used for glucose estimation.

Albumin was determined using the bromocresol green method as described by Doumas et al. (1971), aspartate and alanine transferases as described by Retimen (1957), sodium and potassium by flame photometery emission method as described by Cheesbrough (1987), total calcium was estimated by method as described by Stern and Lewis (1957), chloride by Schales and Schales method (1941), Bicarbonate by method as described by Segal (1955), and urea by method described by March et al. (1965). The erythrocyte sedimentation rate was determined by the method of Westergreen (1921) and WBC, PCV and red cell morphology was determined by the method as described by Dacie and Lewis (1991). Glucose was estimated by enzymatic method as described by Kaplan and Szabo (1983). While being investigated, the patient was commenced on emperical treatment.

RESULTS

The results obtained are shown in Table 1. The results of the biochemical and heamatological profiles revealed gross deficiency indicating both hypoalbuminaemia and hypocalcaemia. Parenteral administration of calcium was commenced immediately and the patient's sensorium improved gradually until she finally became fully conscious and made drastic improvements within 48 h.

After another 2 - 3 days, other symptoms disappeared. Further evaluation of the patient was then done by assessing parameters such as her demographic characteristics and her anthropometric indices. The information obtained is as shown in Table 2.

There was no history suggestive of malabsorption or pancreatitis in this patient, neither was there history of chronic diarrhea or anticonvulsant therapy. From the results, hypocalcaemia, hypoalbuminaemia and anaemia are obvious and other biochemical/heamatological parameters were within normal limits. The anaemia is nutritional, as revealed by a body mass index of 18.8. This patient was discharged hale and hearty after a proper nutritional rehabilitation. Serial estimations of serum calcium and albumin were done till plasma values became normalized. Efforts to conduct parathyroid hormone assay in this patient failed due to lack of facilities for the assay.

DISCUSSION

Calcium is a pivoted regulator of a wide variety of cellular functions as a major second messenger from plasma membrane receptors. Ionized calcium is the physiologically important calcium, for instance in myocardial contraction (Mclean and Hastings, 1934) and in blood coagulation and nerve function (Ganong, 2003). Calcium balance is ensured by a combination of systems, these include; adequate intake, absorption from gastrointestinal tract via vitamin D, availability of albumin for binding, intestinal or renal losses and mobilization from bone through the action of parathyroid hormone.

This 56- year-old woman being reported is of low socio-economic status by her demographic indices, using the classification system adopted by Alakija (2000) and is malnourished as reflected by her body mass index of 18.8 (interp. BMI). Her serum calcium and albumin (average of 2 different estimations) gave 6 mg/100 ml and 1.8 g/100 ml, respectively, these indicated hypocalcaemia and hypoalbuminaemia, respectively. There was no biochemical evidence of either Liver or renal dysfunction in this patient. It is likely therefore that the hypocalcaemia in this patient might be a result of hypoalbuminaemia or simply because of malnutrition, which may be connected with her low socio-economic status. The relationship between hypocalcaemia and malnutrition as observed in this patient is documented in literature (Asmat et al., 2004). The peculiarity of this report is the occurrence of hypoalbuminaemia associated hypocalcaemia with classical clinical manifestations. Mostly documented in literature is that in conditions of hypoalbuminaemia (chronic liver disease, nephrotic syndrome and malnutrition), only total calcium is affected and not ionized calcium, and hence clinical manifestations are rare. However, in severe hypocalcaemia, in which the total calcium levels are below 7.5 mg/dl or 1.88 mmol/l, it had been reported that clinical features occurred (Bushinsky and Monk, 1998). It is also in literature that severe hypoalbuminaemia caused low serum ionized calcium (Butler et al., 1984).

Laryngospasm due to falsely low levels of calcium due to hypoalbumineamia had been reported (Aguilera and Vaughan, 2000). Significant hypoalbumineamic hypocalcaemia occurred in acute pancreatitis complicating 50% full-thickness burns in a 5-yr old child (Wilson, 2003).

Another study supporting this report was reported years ago, it reported the occurrence of low serum ionized calcium in acute pancreatitis as a result of hypoalbuminaemia (Allam and Imrie, 2005) with the rare occurrence of overt and subclinical manifestations of hypocalcaemia.

Despite the inadequate attention being given to hypocalcaemia in clinical practice, hypocalcaemia remains a common metabolic problem encountered in different age groups and different clinical situations. Hypocalcaemia occurred in neonates receiving phototherapy for neonatal jaundice (Karamifar et al., 2002), hypocalcaemia was reported in children investi-gated for serum calcium level in a study in Sana' a Yemen (Mohanna et al., 2005) and hypocalcaemia occurred in adult patients receiving chronic anti convulsant therapy (Schmitt et al., 1984).

Furthermore, a study on prevalence of hypocalcaemia in a hospital population in a sub-urban community in South Western Nigeria reported that 11.53% of the population studied had hypocalcaemia (Ogunkolo et al., 2006). Hypocalcaemia was also studied in critically ill children in a paediatric intensive care unit in India, it revealed that 35% of the patients had hypocalcaemia at admission and another 13% during hospital stay (Singhi et al., 2003). This study also showed that mortality was significantly higher in hypocalcaemia compared with normocalcaemia patients (Singhi et al., 2003).

In conclusion, malnutrition (a result of poverty and ignorance) has translated into a serious clinical problem, hypoalbuminaemia associated hypocalcaemia with overt clinical features. Also, the various reports cited in this case report show that the observation of hypocalcaemia and its clinical manifestations in the present study is not an uncommon event but the observation of hypoalbuminaemic hypocalcaemia with clinical manifestation is a rare event. More studies are therefore necessary to further elucidate facts on this rare observation.

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