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Case Report

Biochemistry Section

# Bisalbuminemia: An Uncommon Finding on Serum Electrophoresis

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## ABSTRACT

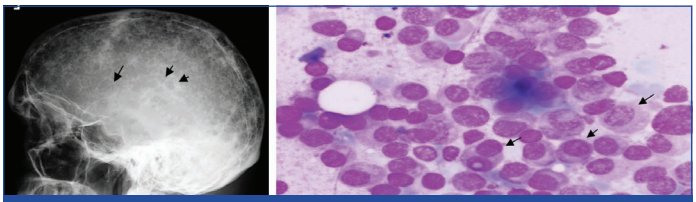
Bisalbuminemia is a rare finding, characterised by the presence of two albumin fraction on serum protein electrophoresis. The disorder can either be inherited in autosomal dominant pattern or acquired. Acquired bisalbuminemia have discovered in various pathological conditions like diabetes mellitus, multiple myeloma, Alzheimer's disorder, sarcoidosis, nephrotic syndrome, chronic kidney disease, pancreatic pseudocyst and in patient receiving high doses of penicillin. Hereby, authors report an uncommon case of a 55-year-old male, who presented with symptoms of lower back pain since four months. X-ray skull showed multiple lytic lesions. Bone marrow aspirate was hypercellular and showed 60% plasma cells. Patient was diagnosed with multiple myeloma and was sent for further biochemical investigations. Serum protein electrophoresis showed two distinct bands in the albumin region and a prominent M peak in gamma globulin region. The band may be mistaken as an abnormal globulin peak, specifically while screening suspected or confirmed cases of monoclonal gammopathies.

**Keywords:** Albumin fraction, M band, Multiple myeloma, Serum albumin

## CASE REPORT

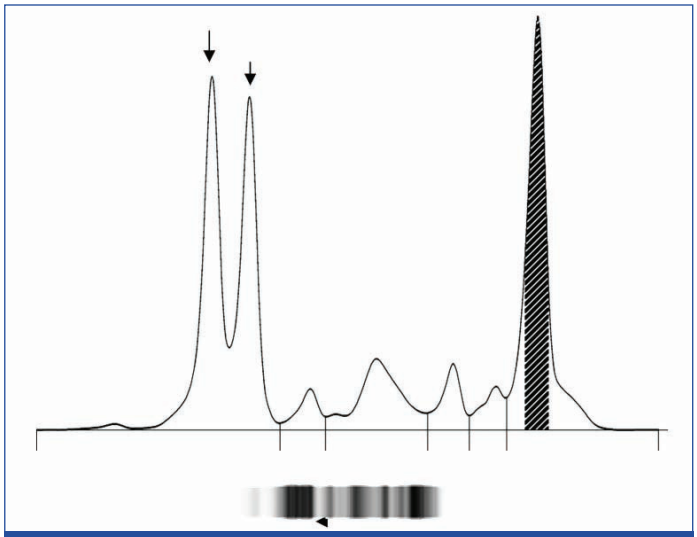
A 55-year-old male presented to the Oncology Department with symptoms of lower back pain, since four months. He had dull backache that had been increasing with time. Patient had no significant personal or past medical history. There was no significant family history.

On physical examination, patient showed severe pallor. X-ray skull showed multiple lytic lesions [Table/Fig-1]. Bone marrow aspirate was hypercellular and showed 60% plasma cells [Table/Fig-2]. Patient was diagnosed with multiple myeloma. Patient was referred to Department of Biochemistry for further investigations. Biochemical investigation revealed, haemoglobin was 6.9 gm%, haematocrit was 20.6%, red blood cells count was 2.39 million/cumm, white blood cells count was 4100/cumm, platelet was 200,000/cumm. Serum urea and creatinine were 78 mg/dL and 1.8 mg/dL, respectively. Serum lactate dehydrogenase was 489 U/L, serum protein was 10.8 gm/dL and albumin 4.2 gm/dL.



**[Table/Fig-1]:** Lateral radiograph of skull showing several lytics lesions.
**[Table/Fig-2]:** Photomicrograph of the bone marrow aspiration showing hypercellularity with increased plasma cells having eccentric nucleus and perinuclear hallow. Few of the plasma cells showing binucleation. (Leishman stain, 100X, oil immersion). (Images from left to right)

Serum protein electrophoresis was done on fully automated capillary electrophoresis system Sebia Minicap Flex Piercing system. Serum protein electrophoresis showed two distinct bands in the albumin region and a prominent M peak in gamma globulin region [Table/Fig-3]. Serum protein electrophoresis showed: albumin-45.9%, alpha 1-3.1%, alpha 2-10.9%, beta 1-4.6%, beta 2-3.5% and gamma-32% [Table/Fig-4]. The patient had eight 28-day cycles of bortezomib (1.3 mg/m$^2$ on days 1, 8, 15, 22 of each cycle), cyclophosphamide (300 mg/m$^2$ on days 1, 8, 15, 22) and dexamethasone (40 mg on days 1, 8, 15, 22) followed by two weekly bortezomib (2 mg) was given.



**[Table/Fig-3]:** Serum protein electrophoresis showing 2 bands in albumin region with an M peak in gamma region.

| Serum protein electrophoresis | | | | | |
|---|---|---|---|---|---|
| Serum proteins fraction | Result (%) | Reference percentage | Reference concentration | Peaks | % |
| Albumin | 45.9% | <55.8-66.1 | 40.2-47.6 | M peak | 23.1 |
| Alpha 1 | 3.1% | 2.9-4.9 | 2.1-3.5 | | |
| Alpha 2 | 10.9% | 7.1-11.8 | 5.1-8.5 | | |
| Beta 1 | 4.6% | <4.7-7.2 | 3.4-5.2 | | |
| Beta 2 | 3.5% | 3.2-6.5 | 2.3-4.7 | | |
| Gamma | 32.0% | >11.1-18.8 | 8.0-13.5 | | |

**[Table/Fig-4]:** Serum protein electrophoresis: Serum proteins are separated into fractions- Albumin, alpha1, alpha 2, beta 1.
A/G Ratio: 0.85, Total protein: 10.8 gm/dL

## DISCUSSION

Bisalbuminemia is a rare disorder characterised by the presence of two distinct fractions of albumin on serum protein electrophoresis. Bisalbuminemia may be hereditary or acquired and is very uncommon in Indian population [1]. Hereditary bisalbuminemia transmitted as an autosomal dominant pattern, is a relatively very

rare genetic disorder [2]. The incidence of inherited bisalbuminemia is stated to be 1:10,000 to 1:1000 [3]. Acquired bisalbuminemia have discovered in various pathological conditions like diabetes mellitus [4], multiple myeloma [5,6], Alzheimer's disorder [7], sarcoidosis [3], nephrotic syndrome [8], chronic kidney disease [9], pancreatic pseudocyst [10] and in patient receiving high doses of penicillin [11,12].

Serum protein electrophoresis is an investigative procedure which is performed routinely for diagnostic purpose, specifically as an screening test for monoclonal gammopathies. Here, reported case is of bisalbuminemia in patient of multiple myeloma. In the present case, serum protein electrophoresis showed two distinct bands in the albumin region and a prominent M peak in gamma globulin region. The patient had no any other co-morbidity. Few cases of bisalbuminemia have been reported in patients with multiple myeloma [5,6]. There was no clinical importance of this entity, except stated above. In a study by Chan PC, the author found that bisalbuminemia is not associated with monoclonal gummopathies, but, is an incidental finding [13]. Bisalbuminemia can interfere with the serum protein electrophoresis diagnosis, but, is of little diagnostic or therapeutic significance [6,14]. This can cause difficulty in the reporting of serum protein electrophoresis diagnosis in multiple myeloma. Therefore, it is important to recognise such variant, while interpreting serum protein electrophoresis.

## CONCLUSION(S)

Though bisalbuminemia does not influence disease process, it should not be mistaken as an abnormal globulin peak specifically, while screening suspected or confirmed cases of monoclonal gammopathies. One must keep this entity in the radar and interpret it with caution.

## REFERENCES


[1] Chhabras S, Bansal F, Saikia B, Minz RW. Bisalbuminemia: A rarely encountered protein anomaly. J Lab Physicians. 2013;5(2):145-46.
[2] Angouridaki C, Papageorgiou V, Tsavdaridou V, Giannousis M, Alexiou-Daniel S. Detection of hereditary bisalbuminemia in a Greek family by capillary zone electrophoresis. Hippokratia. 2008;12(2):119-21.
[3] Šimundić A, Miler M, Nikolac N, Topić E, Čaržavec D, Milanović B, et al. Bisalbuminemia in a male Croatian patient with sarcoidosis. Biochemia Medica. 2009;19:95-100.
[4] Shetty JK, Maradi R, Prabhu K, Bhat G. Bisalbuminemia in a hypothyroid patient with Diabetes. J Clin Diagn Res. 2015;9(9):BD01-02.
[5] Kalambokis G, Kitsanou M, Kalogera C, Kolios G, Seferiadis K, Tsianos E. Inherited bisalbuminemia with benign monoclonal gammopathy detected by capillary but not agarose gel electrophoresis. Clin Chem. 2002;48(11):2076-77.
[6] Agarwal P, Parkash A, Tejwani N, Mehta A. Bisalbuminemia: A rare finding on serum electrophoresis. Indian J Hematol Blood Transfus. 2018;34(3):558-59.
[7] Shetty JK, Prakash M, Gopalakarishna K. Bisalbuminemia in adult male with Alzheimer's disease. Indian J Med Sci. 2007;61(6):356-57.
[8] Hoang MP, Baskin LB, Wians FH Jr. Bisalbuminuria in an adult with bisalbuminemia and nephrotic syndrome. Clin Chim Acta. 1999;284(1):101-07.
[9] Ejaz AA, Krishna M, Wasiluk A, Knight JD. Bisalbuminemia in chronic kidney disease. Clin Exp Nephrol. 2004;8(3):270-73.
[10] Kobayashi S, Okamura N, Kamoi K, Sugita O. Bisalbumin (fast and slow type) induced by human pancreatic juice. Ann Clin Biochem. 1995;32(Pt 1):63-67.
[11] Arvan DA, Blumberg BS, Melartin L. Transient "bisalbuminemia" induced by drugs. Clin Chim Acta. 1968;22(02):211-18.
[12] Lapresle C, Wal JM. The binding of penicillin to albumin molecules in bisalbuminemia induced by penicillin therapy. Biochim Biophys Acta. 1979;586(1):106-11.
[13] Chan PC. Bisalbuminemia: Lack of association with monoclonal gammopathy and value-justification for reporting in serum protein electrophoresis. J Clin Chem Lab Med. 2017;1(1):108.
[14] Pavithra HN, Tahkn A, Agrawal N, Singh R. Bisalbuminemia: Complicating the diagnosis of multiple myeloma. IARJ Med Sci. 2020;1(6);310-11.



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