

**Kan MK**  
**Bassey EU**  
**Ekpenyong EE**  
**Kouya F**  
**Ikpeme EE**

## **Bilateral Nephromegaly Due to Acute Lymphoblastic Leukaemia in an African Male Child: A Case Report**

---

**Corresponding Author** (✉)

**Kan Kate Mafor**

Department of Clinical Sciences,  
Faculty of Health Sciences,  
University of Bamenda,  
Cameroon

Email: katiekan20@gmail.com  
+237671896981

---

**Kan MK<sup>1</sup>**

**Bassey, EU<sup>2</sup>**

**Ekpenyong EE<sup>2</sup>**

**Kouya F<sup>3</sup>**

**Ikpeme EE<sup>2</sup>**

<sup>1</sup>Department of Clinical Sciences, University of Bamenda, Cameroon.

<sup>2</sup>Department of Paediatrics, University of Uyo Teaching Hospital, Nigeria. <sup>3</sup>Mbingo Baptist Hospital, Cameroon.

**Abstract**

**Background:** Nephromegaly is the enlargement of the kidney(s). In children, common causes include polycystic kidney disease, hydronephrosis, nephroblastoma, lymphomas, glycogen storage disorders and rarely infiltration by leukaemic blast cells. Involvement of the kidneys may be indicative of advanced disease and could be associated with poor outcome.

**Case-report:** We report the case of a 34-month-old male from Cameroon in Central Africa who presented with abdominal distension, pain, and bilateral proptosis. Ultrasound imaging studies was in keeping with bilateral kidney enlargement. Fine needle aspiration (FNA) of the kidneys revealed blast cells infiltration, and bone marrow examination was confirmatory of

Acute Lymphoblastic Leukaemia (ALL).

**Conclusion:** There was an initial response to chemotherapy with regression of proptosis and reduction of both kidney sizes sonographically, however, a relapse occurred during the maintenance phase of treatment with re-emergence of earlier presenting symptoms which led to death.

This case seeks to demonstrate a rare presentation of leukaemia and highlights the possibility of bilateral kidney involvement as an initial manifestation of ALL, which may also indicate a bad prognostic factor associated with poor outcome.

**Keywords:** Nephromegaly, child, Central Africa, leukaemia, poor outcome.

---

**Introduction**

Nephromegaly is increase in the size of the kidney(s) and may occur due to any of the pathological mechanisms such as hypertrophy, hyperplasia, or neoplastic infiltration of the renal parenchyma.<sup>1,2</sup> It can be unilateral or bilateral.<sup>3-5</sup> The causes of nephromegaly in children may be congenital resulting from hydronephrosis due to obstructive uropathy, polycystic kidney disease, Beckwith-Weideman syndrome, glycogen storage disease or acquired as tumours such as nephroblastoma, lymphoma, acute glomerulonephritis, human immunodeficiency virus associated nephropathy and diabetic nephropathy.<sup>2,6</sup>

Acute leukaemias are the commonest

haematological malignancy in children worldwide, and the commonest clinical presentation of the disease includes fever, anaemia, bleeding, bone pain, lymphadenopathy and hepatosplenomegaly. Acute lymphoblastic leukaemia (ALL) is more common in children than in adults.<sup>6</sup>

Involvement of the kidneys in ALL is rare but could occur and may be an early manifestation of the disease<sup>7</sup>. Leukaemia may present with abdominal distension due to enlargement of the kidneys due to infiltration by leukaemic cells being the only manifestation of this childhood cancer.<sup>2,8-11</sup> Certain prognostic factors have been associated with outcome of the disease. It is however uncertain whether kidney involvement alters the outcome of

ALL.<sup>8-11</sup>

We report the rare case of an initial presentation of ALL involving the kidneys in a pre-school Cameroonian male, seen at the Mbingo Baptist Hospital, North-West Cameroon.

### **Case Report**

A 34-month male presented with abdominal pains and abdominal distension of nine days duration. This was associated with anorexia, generalized body weakness and urinary frequency. There was no vomiting, no change in consistency of stools, and no haematuria. About the same time, the child was noticed to have swelling of the cheeks and eyes but no reduction in urine output, no history of fever, night sweats or weight loss. His perinatal history was uneventful. His developmental milestones were appropriate for each stage, and immunization was up to date. He was the last of six children and no similar symptoms among siblings. Both parents are farmers residing in the village.

General physical examination showed anthropometric values of weight -13kg, length - 85.5cm, and mid upper arm circumference - 12.5cm. Vital signs showed a temperature of 36.4°C, pulse rate of 110 beats per minute, respiratory rate - 36 cycles per minute, blood pressure-120/70mmHg, body surface area of 0.54m<sup>2</sup> and SPaO<sub>2</sub> - 95% in room air. He had bilateral proptosis with distended veins on the eyelids, moderate pallor, not icteric, with bilateral submandibular lymphadenopathy ranging in size from 1-3cm but had no axillary or inguinal lymphadenopathy. He had non-pitting pedal oedema more to the right than the left.

Cardiovascular examination revealed prominent neck veins, but jugular venous pressure was not raised. The heart was normally placed with normal heart sounds and no murmurs. Respiratory examination revealed no abnormalities and the chest was clear bilaterally with no added sounds.

He had a uniformly distended abdomen which was tender, and a left lower quadrant mass measuring about 10 by 8cm, firm and smooth, as well as a right lower quadrant mass measuring 6 by 5 cm, firm in

consistency with a smooth surface and was non-tender and both kidneys were ballotable. There was no evidence of ascites and no testicular swelling. The bowel sounds and rectal examinations were normal respectively.

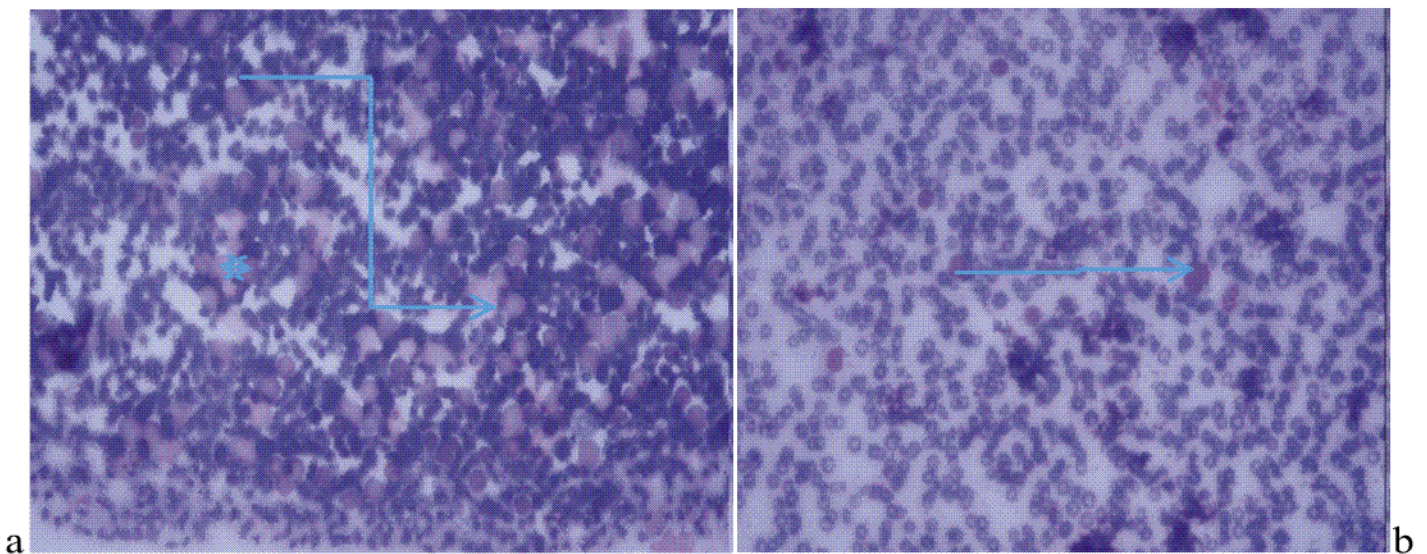
A provisional diagnosis of an intra-abdominal malignancy was entertained, with differentials being nephroblastoma, neuroblastoma and non-Hodgkin's lymphoma.

Initial investigations done; were a complete blood count which revealed leukocytosis with a white blood cell count of 16,400/mm<sup>3</sup> and absolute neutrophil count - 8460, neutrophils -35% and lymphocytes -48%. Hemoglobin was 8g/dl, with mean corpuscular volume of 51.6fL, platelet count was 180 × 10<sup>9</sup>/L with findings suggesting a bicytopenia. An initial peripheral blood smear showed erythroblastaemia, microcytic anaemia, and blast cells - 3% with relative lymphocytosis.

Initial abdominal ultrasound scan revealed bilateral kidney enlargement with an abnormal echo-pattern, with severely enlarged and more hypoechoic outline resulting in a lobulated pattern of the kidneys. Right kidney dimensions were 13.1 x 8.2 x 8.6 cm = 443cm<sup>3</sup> and the left kidney 13.0 x 8.0 x 8.1 cm = 403cm<sup>3</sup> respectively.

Ultrasound guided fine needle aspiration of the right submandibular node and left lower abdominal quadrant mass were obtained for cytology and the smears from both sites showed the same cell population, which were primitive round cells with almost indiscernible cytoplasm, homogenous chromatin without nucleoli and sparse small, round cytoplasmic vacuoles in some cells (see figure 1 a and b). These findings were suggestive of a malignant small round cell neoplasm in favour of lymphoblastic lymphoma or leukaemia.





**Figure 1 a:** abdominal mass (left kidney) showing blast cells **b:** peripheral blood cells illustrating blast cells (as depicted by arrow).

A repeat peripheral blood smear done two weeks later revealed increased blast cells from an initial 3% to 26% consistent with precursors of lymphoid neoplasm, favoring lymphoblastic leukaemia. Cerebrospinal fluid for cytology was negative for malignancy. Haemoglobin electrophoresis indicated AA genotype. Blood group A+. Urinalysis was not remarkable for proteinuria or haematuria with white cell count of 2-3 per high power field. Thyroid stimulating hormone-2.36IU (0.27-4.2) and T3-0.19IU (0.2-0.44) which were within normal ranges. Electrolytes/Urea/ Creatinine showed: Serum creatinine - 0.22mg/dl (0.5 -1.2), Urea 19.56 mg/dL (16.6-45.5), serum calcium -10.24mg/dL (8.6-10.0), Albumin -3.67 mg/dL, uric acid -9.07mg/dL (3.4-7.0), Sodium -132 mmol/L (135-145), Potassium-4.4mmol/L (3.5-5.1mmol/L), chloride - 105mmol/L(98-107).

Liver function tests were essentially normal. Covid 19 antigen test was negative. Liver was also enlarged measuring 13.1cm, homogenous with a normal echotexture and vasculature and a smooth outline. The spleen was 9.7cm, homogenous with a smooth outline.

Nervous system examination was not remarkable. A definitive diagnosis of Acute Lymphoblastic

Leukaemia with bilateral nephromegaly from leukaemic infiltrates and probable bilateral orbital infiltration was made.

He was transfused with fresh whole blood 20ml/Kg =260ml, and commenced on allopurinol 100mg daily, and cotrimoxazole 40/240 mg daily prophylaxis till demise. He was also commenced on the protocol for the treatment of standard risk for acute lymphoblastic leukaemia. He had completed the induction phase (prednisolone 60mg/m<sup>2</sup> given day 1-7, vincristine 1.5mg/m<sup>2</sup> day 8, 15, 22, 29) then dexamethasone at 6mg/m<sup>2</sup>/day from day 8-22, then reduced and stopped over 7 days), asparaginase 10000UI/m<sup>2</sup> day 22, 24, 26, 29, 30 and 33, also received intrathecal methotrexate 8mg on day 8 and 22 and was maintained on the consolidation phase ( vincristine 1.5mg/m<sup>2</sup> 36, 57, 64, oral methotrexate 25mg/m<sup>2</sup>/day in the morning, prednisolone and 6 mercaptopurine 50mg/m<sup>2</sup>) in the evening which he received for a total duration of three and half months.

A bone marrow aspiration taken six weeks after induction revealed good maturation of the myeloid series with adequate megakaryocytes and differentials as follows: Blasts - 1%, promyelocytes - 2%, metamyelocytes -1%, band cells-20%, mature neutrophils - 45%, lymphocytes -8%, plasma cells, erythroid precursors 20%.

Three months into treatment, periorbital swelling, lymphadenopathy and abdominal masses and pedal



oedema had resolved and a repeat abdominal ultrasound scan showed improvement from previous scan with remarkable indices, as the kidneys had reduced in size, now measuring 10.2 x4.8 x5.8cm =148cm<sup>3</sup> and left kidney measures 10.0 x 4.8 x 6.0cm= 151 cm<sup>3</sup>.

Both kidneys showed normal papillae with patch bright areas in the cortex and normal perfusion. The liver measured 10.7cm, with a homogenous and regular outline and the spleen was 10cm, homogenous and regular. The patient however relapsed evidence by reappearance of blast cells in the peripheral blood smear accompanied by periorbital swelling, marked abdominal distension with pains as well as bone pains which was noted fourteen weeks into the consolidation phase. He deteriorated and few days later after declining further medical intervention and died. Possible cause of death could not be ascertained as an autopsy was not done.

### Discussion

Leukaemia could be a cause of kidney enlargement in children and may be unilateral or bilateral.<sup>12</sup> It may also be an early unusual presentation of the disease, manifesting as abdominal distension and pain as was the case in this patient<sup>7,12,13</sup>. These presenting symptoms vary from the usual; being fever, pallor, bone pain, bleeding, hepatosplenomegaly and lymphadenopathy but other organs like the kidney may be involved.

Nephromegaly has been documented in 2-24% of patients with ALL<sup>12,13</sup> with possible explanations of infiltration of the renal parenchyma with leukaemic deposits which has been thought to be associated with advanced disease.<sup>1,5,6</sup> Leukaemic cell infiltration of the kidneys may result in renal impairment<sup>16</sup> but this is extremely rare<sup>17</sup>, however this patient's renal functions was preserved throughout the course of the disease and treatment as has been documented with some cases in literature where renal function was preserved.<sup>14,15,17</sup>

Infiltration of organs by leukaemic cells in ALL is commonly observed in bone marrow, liver, spleen and lymph nodes. This patient had organ infiltration

by leukaemic cells as was evidenced by lymph node, kidney FNA and bone marrow biopsy, but we did not prove liver and spleen infiltration histologically. Metastases to sanctuary sites like the testis and the central nervous system may also be noted, however; these were absent in our patient.<sup>15,16</sup>

This patient demonstrated sonographic features of enlarged hypoechoic nodular kidneys. Features of leukaemic infiltration to the kidneys may be indicated by an ultrasound scan when kidneys are seen to be enlarged with hyperechoic pattern or hypoechoic nodular lesions in the renal cortex. There could also be loss of corticomedullary differentiation as well as cystic lesions or pyelocaliceal dilatation.<sup>15-19</sup> With initiation of treatment, some studies have noted a reduction in the size of the kidneys as occurred with this patient where there was an initial response upon initiation of chemotherapy with the standard risk protocol.<sup>15-17</sup> Nevertheless, the patient relapsed towards the end of the consolidation phase of the treatment. The outcome of this patient may reflect the possibility that kidney involvement may be an indication of advanced disease in ALL as have been speculated by some authors<sup>12,17, 21</sup>. This could portend kidney infiltration as a poor prognostic factor<sup>5,6,21</sup>, in view of the patient's later deterioration which was not further investigated probably due to sepsis or acute kidney injury<sup>12</sup>.

Some authors have reported that kidney enlargement in leukaemic patients is a poor predictive outcome while others thought it did not affect outcome.<sup>15-17</sup> We could therefore infer that nephromegaly in leukaemia may be regarded as high-risk disease in view of probable renal impairment and should be treated with the protocol for high risk disease instead of the standard protocol which was used in this patient.<sup>20-22</sup>

Cytogenetic studies and special immunohistochemical staining techniques which are important test in differentiating specific cell type involvement, as well as prognostication of the leukaemic disease was not done, due to the unavailability of these diagnostic facility in our centre; in a resource-poor country.

### Conclusion

Bilateral kidney enlargement in children may be an early manifestation of acute lymphoblastic leukaemia and may indicate advanced high risk disease suggestive of poor prognosis and a poor outcome. It would be necessary to use more aggressive treatment protocols, to reduce mortality, improve outcome and increase survival.

### Conflicts Of Interest: None

**Ethical Consideration:** Informed consent was obtained from mother of the child to publish the case.

### Authors' Contributions

KKM managed the patient, conceived the idea to report the case and worked with co-authors to develop the manuscript. BEU read and provided constructive feedback for the case. EEE was responsible for the writing and developing the manuscript. KF managed the patient. IEE gave supervision and correction of the case discussion.

### References

- Hann IM, Lees PD, Palmer KM, Gupta S, Morris JPH. Renal size as a prognostic factor in childhood acute lymphoblastic leukaemia. *Cancer* 1981; **48**: 207-9.
- Pradeep R, Madhumathi DS, Lakshmidevi V, Appaji L, Patil SA, Swapnil B. Bilateral nephromegaly simulating wilmstumor: a rare initial manifestation of acute lymphoblastic leukaemia. *J PaedHeamatolOncol* 2008; **30**: 471-3.
- Han BK, Babcock DS. Sonographic measurements and appearance of normal kidneys in children. *Am J. Roentgenol.* 1985; **145**:611-16.
- Chen JJ, Zhi J, Mao W, Steinhardt GF. Mr N o r m o g r a m : A w e b - b a s e d multivariablepediatric renal normogram. *J PaedUrol* 2006; **2**:436-8.
- Hilmes MA, Dillman JR, Mody RJ, Strouse PJ. Pediatric renal leukemia: spectrum of CT imaging findings. *Pediatr Radiol.* 2008; **38**:424-30.
- Taccone A, De Bernardi B, Comelli A, Dini G, Bartolini M, Banderali A et al. Renal changes in acute leukemia in children at onset. Incidence and prognostic value. *Paediatr Med Chur* **4**:107-13.
- Kalbani NA, Weitzman S, Abdelhaleen M, Carcao M, Abla O. Acute lymphoblastic leukaemia presenting with gross haematuria. *Paediatr Child Health.*2007; **12**: 573-4.
- Bandy KA, Sirwal IA, Reshi AR, Najar MA, Bhat MA, Wani MM. Renal involvement in hematological malignancies. *Indian J Nephrol.* 2014; **14**: 50-52.
- Shahriari M, Shakibazad N, Haghpanah S, Ghasemi K. Extramedullary manifestations of acute lymphoblastic leukaemia in children: a systematic review and guideline-based approach of treatment. *Am J Blood Res.* 2020; **10**: 360-74.
- Basker M, Scott JX, Ross B, Kirubakaran C. Renal enlargement as primary presentation of acute lymphoblastic leukaemia. *Indian J Cancer.* 2002; **39**: 154-6.
- Henderson ES: Acute Leukaemia General considerations; in William WJ, Beutler E, Ersler AJ, Lichman MA (eds). *Haematology* 4th Edition. New York, McGraw-Hill, 1990:236-51.
- Sato A, Imaizumi M, Chikaoka S, Niizuma H, Hoshi Y, Tekeyama J et al. Acute renal failure due to leukemic cell infiltration followed by relapse at multiple extramedullary sites in a child with acute lymphoblastic leukemia. *Leuk Lymphoma* 2004; **45**:825–828.
- Ward E, DeSantis C, Robbins A, Kohler B, Jemal A. Childhood and adolescent cancer statistics, 2014. *CA Cancer J Clin.* 2014; **64**: 83-103.
- Vijayasekharan K, Venkatagiri AM, Godkhindi VM, Laxminarayana SL, Belurkar S. Bilateral massive nephromegaly—A rare presentation of t-cell acute lymphoblastic leukemia. *Leuk Res Rep* 2021; **15**:100246.
- Martins A, Cairoli H, Domínguez P, Martin S, Ortiz C, Potasznik J, Schenone N. Nephromegaly: as unusual presentation of acute lymphoblastic leukemia in an infant. *Archiv Argent Pediatr.* 2008; **106** :263-5
- Bordbar M, Shakibazad N, Mottaghipisheh H, Shahriari M, Zareifar S, Zekavat OR. Acute



- Renal Failure: A Rare Initial Presentation of Acute Lymphoblastic Leukemia. *Middle East J Cancer*. 2020; **11**:512-5.
17. Ali SH, Yacoub FM, Al-Matar E. Acute lymphoblastic leukaemia presenting as bilateralrenal involvement in a child. *Med Prin Pract*. 2008; **17**: 504-6
  18. Shahriari M, Shakibazad N, Haghpanah S, Ghasemi K. Extramedullary manifestations of acute lymphoblastic leukaemia in children: a systematic review and guideline-based approach of treatment. *Am J Blood Res*. 2020; **10**: 360-74.
  19. Sherief LM, Azab SF, Zakaria MM, Kamal M, Elbasset Aly MA, Ali A *et al*. Renal presentation in pediatric acute leukemia: report of 2 cases. *Medicine*. 2015; **94**: e 1461.
  20. Erdem, E., Kayıran, P., Ozcelik, G, Ozel A, Yildiz Yildimak Z. Rare Presentation of pediatric acute lymphoblastic leukemia: nephromegaly at time of diagnosis. *Indian J Hematol Blood Transfus*. 2011; **27**: 43–45.
  21. D'Angelo P, Mura R, Rizzari C, Conter V, Bellini F, Valsecchi MG *et al*. Prognostic value of nephromegaly at diagnosis of childhood acute lymphoblastic leukemia. *Acta Haematol* 1995; **94** :84–9.
  22. Neglia JP, Day DL, Swanson TV, Ramsay NK, Robison LL, Nesbit ME *et al*. Kidney size at diagnosis of childhood acute lymphocytic leukemia: lack of prognostic significance for outcome. *Am J Pediatr Hematol Oncol* 1988; **10**: 296–300.