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# Routine haemoglobin electrophoresis screening in day case herniotomy in Nigerian children: Is it evidence-based?

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## ABSTRACT

**Background:** To determine the prevalence of haemoglobinopathies in children who require day case herniotomy in our centre and ascertain if routine screening is necessary in all patients who require herniotomy. **Materials and Methods:** A 12-month retrospective analysis of patients requiring herniotomy in our centre. Data including age, sex, diagnosis, haemoglobin electrophoresis status, surgical outcome and hospital stay were analysed. **Results:** Ninety-five patients had complete records. There were 84 boys and 11 girls. M:F ratio: 7.6:1. The mean age was 3.2 ± 0.6 years. Fifty-five point eight per cent of the patients had right inguinal hernias while 35.8% had left inguinal hernias. Eight patients (8.4%) had bilateral inguinal hernias. Twenty-six patients (27.4%) had haemoglobinopathies while 69 patients (72.6%) had homozygous Haemoglobin A. The Sickle Cell trait (HbAS) was found in 22 patients (23.2%) while the HbAC was found in three patients (3.2%). One patient (1.1%) had Sickle Cell disease (Haemoglobin SS). He had had blood transfusion and previous history of jaundice. All patients survived and all patients were discharged on the day of surgery (mean hospital stay: 4hrs (range: 2.5 hrs–12 hrs)) except the patient with Sickle Cell disease who was admitted a day before surgery and discharged a day after the operation. **Conclusion:** One in four children coming for day case herniotomy in our centre had the Sickle Cell trait while only 1% had the Sickle Cell disease. These findings are in keeping with the prevalence in the Nigerian population. Routine screening may not be necessary for all patients coming for herniotomy in our centre. Clear indication(s) should be outlined for screening.

**Key words:** Haemoglobin electrophoresis, paediatric day case surgery, routine screening

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## INTRODUCTION

Inguinal herniotomy is one of the commonest surgical procedures performed by Paediatric Surgeons.[1] Preoperative preparation for this procedure includes routine investigations such as Packed Cell Volume, serum electrolytes, and urea and creatinine estimation as well as haemoglobin electrophoresis. Some workers have advocated these investigations as the minimum for any child undergoing surgery.[2]

The packed cell volume (or haemoglobin) is used to determine the oxygen carrying capacity of the blood during surgery while electrolytes, urea and creatinine assess the renal function and hence the body's ability to excrete anaesthetic drugs. The haemoglobin electrophoresis is performed to rule out sickle cell anaemia, which is endemic in sub-Saharan Africa. The heterozygous carrier state (sickle cell trait) is as high as 25% in the population while the homozygous disease state (sickle cell anaemia) ranges between 1% and 3%.[3-5]

However, based on the low prevalence of homozygous disease state and in view of the high cost of performing haemoglobin electrophoresis analysis, which ranges between $10 and $15 depending on the laboratory, the investigation is considered not cost effective. This is especially pertinent in sub-Saharan Africa where more than half of the population live below the poverty line.

The aims of this study were to determine the prevalence of sickle cell anaemia in patients for herniotomy in our centre and determine if the practice of routine screening for sickle cell anaemia is justified.

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## MATERIALS AND METHODS

This was a retrospective review of all the patients who had herniotomy for inguinal hernias in our centre over a 12-month period. Consecutive patients above 6 months of age and less than 15 years of age were recruited into the study. Children below age of 6 months were excluded from this study because in our centre, further tests apart from the haemoglobin electrophoresis are done to ascertain the genotype in this age group. Data including age, gender, diagnosis, pre-operative haemoglobin electrophoresis result, surgery performed, hospital stay and outcome were collated and analysed using statistical package for social sciences version 16. Chi — square test was used for categorical variables and a *P* value of 0.05 was taken to be significant.

## RESULTS

There were 95 patients with 84 boys and 11 girls with a male to female ratio of 7.6:1. The mean age was 3.2 years (±0.6).

There were 53 (55.8%) patients with right inguinal hernias while 34 (35.8%) had left inguinal hernias. Eight patients (8.4%) had bilateral hernias. In all, 103 herniotomies were performed in the study period.

Sixty-five patients (67.7%) were between the age of 1 year and 5 years. Nine patients were between the ages of 6 months and 12 months while four patients were in the 11-15 years age bracket [Figure 1].

Sixty-nine patients (72.6%) had homozygous haemoglobin A (HbAA) while a patient (1.1%) had homozygous haemoglobin S (HbSS). Others are as shown in Table 1.

All the patients survived with no mortality. Ninety-four patients (99%) had their surgery as a day case; median hospital stay is 4 hours (range 2.5 hrs-12 hrs). The patient with homozygous haemoglobin S had prolonged stay of about 72 hrs. This was on request by the anaesthetists who demanded that he should be admitted a day before surgery and was discharged a day after surgery. This patient had a past history of recurrent jaundice and previous hospital admissions on account of anaemia necessitating blood transfusion.

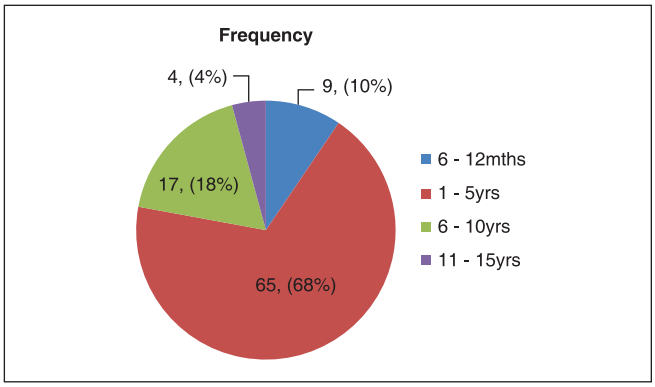


**Figure 1:** Pie chart showing frequency of age distribution

## DISCUSSION

Sickling test has been suggested as part of the minimum work up for surgery.[2] If the sickling test is positive, haemoglobin electrophoresis is then advised. While surgery can be classified as "major" and "minor"; Anaesthetists want to say "there is no minor anaesthesia" as catastrophes can occur if patients are not well prepared for anaesthesia and surgery. In our centre, anaesthetists had always insisted on a haemoglobin electrophoresis result before day case surgery including herniotomy and we decided to audit this practice.

Patients with sickle cell anaemia (HbSS) are prepared for surgery following well-defined protocols.[6] This protocol includes exchange blood transfusion with HbAA blood for major and complex surgery.[7] Others include avoidance of precipitating factors for sickling such as sepsis, hypoxia, hypothermia, dehydration and pain.[8] Preoxygenation with 100% oxygen and close peri and post-operative monitoring are also ensured. In our centre, our approach follows the above guidelines although we have not done any exchange blood transfusion for any of our day case patients. Homozygous haemoglobin S patients are excluded from day case surgery. Such patients are admitted the day before surgery for full Anaesthetist's review and discharged at least 24 hours after surgery following post-operative administration of 50% oxygen or more for 12-24 hours with oxygen saturation monitoring. As a result, patient(s) with sickle cell anaemia have prolonged hospital stay with more morbidity and health costs.

While it is important to identify patients with HbSS in view of their peculiar perioperative management, the low prevalence does not justify routine haemoglobin electrophoresis screening in all patients. In this study, the prevalence of HbSS was 1.1%. This is within the national prevalence figure for Nigeria, which is 1-2%.[3,5] The age and gender distribution is also similar to epidemiological characteristics from other centres in the West African subregion.[9] Considering the prevalence rate of 1%, the authors do not think it is cost effective to require all patients for day case herniotomy to have a routine haemoglobin electrophoresis screening done. This is against the

**Table 1: Frequency of haemoglobin electrophoresis results**

| Haemoglobin electrophoresis | | |
|---|---|---|
| Haemoglobin electrophoresis | Frequency | Valid percent |
| AA | 69 | 72.5 |
| AS | 22 | 23.2 |
| SS | 1 | 1.1 |
| AC | 3 | 3.2 |
| Total | 95 | 100.0 |

**Table 2: Suggested guidelines before haemoglobin electrophoresis screening in children**

| | Condition | Hb electrophoresis required | Hb electrophoresis not required |
|---|---|---|---|
| Parents' factors | If one or both parents genotype is known and it is HbAA | X | √ |
| | If neither parent's Hb genotype is known and no symptom in patients' factor (below) in child** | X | √ |
| | If one parent is HbAS and other is unknown | √ | X |
| | If one parent is HbSS | √ | X |
| Patients' factors | If none of the following symptoms is present<br>history of jaundice,<br>bossing of forehead,<br>hand and foot syndrome,<br>no past history of anaemia requiring blood transfusion,<br>no past history of repeated hospital admission | X | √ |
| | If any two of the following is present:<br>history of jaundice,<br>bossing of forehead,<br>hand and foot syndrome,<br>past history of anaemia requiring blood transfusion,<br>past history of repeated hospital admission | √ | X |

** Sickling test should be done first and if positive to do a haemoglobin electrophoresis

backdrop of pervading poverty of most populations who are without health subsidies or insurance in sub Saharan Africa. Hence, it is believed that guidelines should be set before haemoglobin electrophoresis screening is done for patients.

The suggestion of screening all paediatric patients requiring surgery with a sickling test may not also be justified considering the fact that heterozygous haemoglobin S prevalence is about a quarter of the population.[3] So the question arises: Why should three out of four children be routinely screened knowing they may come out negative? It is thus important that clear guidelines should be set forth to streamline those categories of patients that will require any form of screening (sickling test or haemoglobin electrophoresis).

These guidelines should take into consideration the parents' haemoglobin electrophoresis status (if known previously) as well as some patients' factors. If any of the parents' haemoglobin electrophoresis status is known and it is homozygous HbAA, it is unnecessary to screen the child as such patient cannot be homozygous HbSS. On the other hand, if any of the parents' haemoglobin electrophoresis is AS and the other parent's haemoglobin electrophoresis status is unknown, the patient should have haemoglobin electrophoresis done [Table 2]. If neither of the parents' electrophoresis is known or if any of the patient's factors are present, a sickling test only should be done and if positive, a haemoglobin electrophoresis should be performed. Patients' factors include past history of unexplained hospital admission, anaemia requiring blood transfusion, jaundice, bossing of the forehead and hand and foot syndrome.

In conclusion, this study has shown that there is a low prevalence of HbSS in patients requiring day case herniotomy in our centre and this prevalence mirrors the national average. The current practice of routine haemoglobin electrophoresis is unjustified and the suggested guidelines should be able to streamline patients who will require screening and thus make it more cost effective.

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