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**Abstract** Pendred's syndrome was described in a Sudanese family and its affected members were studied in details. They were a boy (aged 14 years) and a girl (11 years of age) each showing a goitre, a positive perchlorate discharge test, marked sensorineural deafness and evidence of mild hypothyroidism. This study adds an entity to the congenital dysmorphogenesis recognised so far in the Sudan.

**Key words** Deafness-sensorineural; Goitre; Children; Sudan

### INTRODUCTION

The relationship between endemic goitre and deafness was recognised for a few centuries. However, the association of goitre and deafness in patients living in non-iodine deficient areas was only recently described. In 1896, an English general practitioner - Pendred - described the syndrome in two deaf mute sisters with pronounced goitre<sup>1</sup>. In 1958, Morgans and Trotter<sup>2</sup> introduced the third feature of the disease: an abnormal perchlorate discharge test. Potassium perchlorate given to a patient, following a tracer dose of iodine<sup>131</sup>, results in 15-80% decrease in the neck activity due to the discharge of radioiodine from the thyroid. In normal subjects there is only a slight - if any - fall in the activity above the gland.

The onset of goitre, in Pendred's syndrome, mostly occurs at the time of puberty<sup>3</sup> but it may be noticed at birth<sup>4</sup>. The goitre is initially diffuse and soft with a tendency to become nodular and hard, particularly in women. Most patients are euthyroid with normal intelligence although a minority are hypothyroid<sup>5</sup>.

The hearing loss is congenital but usually manifests in the first or second year of life and progresses slightly during childhood. It is mostly pronounced in the higher frequencies of the perceptive type and with recruitment<sup>6</sup>. The disease is familial and appears to have an autosomal recessive mode of inheritance<sup>7</sup>.

This paper describes the disease in a Sudanese family living in a non-iodine deficient area.

#### PATIENTS AND METHODS

The family, resulting from the marriage of double first cousins, consisted of 4 boys and 3 girls and had lost a female child - at 2 years of age - following an attack of diarrhoea and vomiting (Fig. 1). The mother (Fig. 1, V.1) - at the time of examination - had a pregnancy of seven months duration; and she brought her children with the complaint of deafness and inability to talk.

The elder patient was a boy, at 14 years of age, who was born at home following an uneventful pregnancy and delivery (Fig. 1, VI.2). No abnormality was noticed during his infancy and his bowel habits were normal. He walked at one year but he never talked. At three years of age he sustained an attack of diarrhoea and vomiting and was admitted to hospital for 40 days. His parents were told that he had anaemia and malnutrition. Thereafter, he remained well apart from the deaf-mutism, with a good appetite although he seemed not to tolerate the cold weathers. His thyroid swelling was noticed about a year ago.

On examination, he looked healthy with coarse features and texture of the skin, when compared to his siblings. He weighed 28 kg and had a height of 128.3 cm (i.e. below the third centile of weight and height for

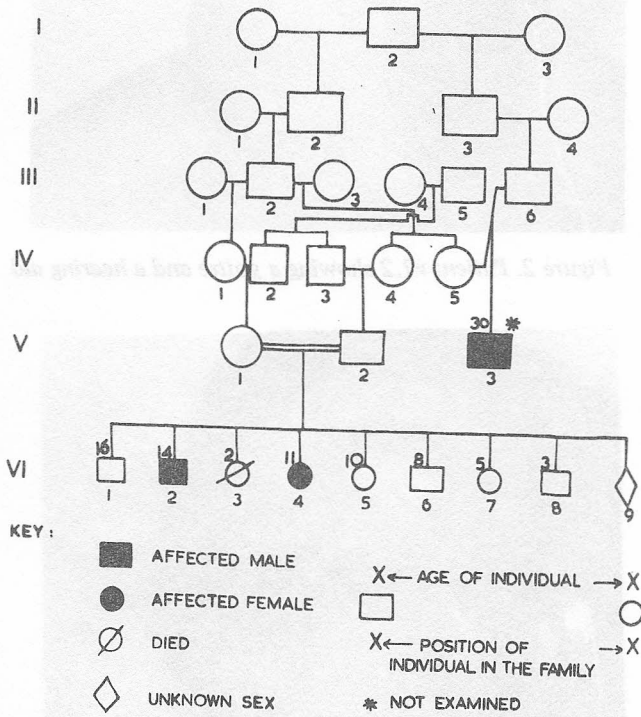
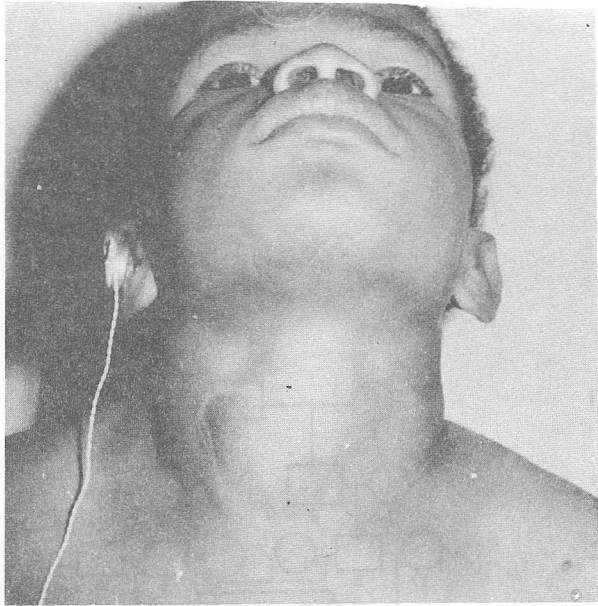
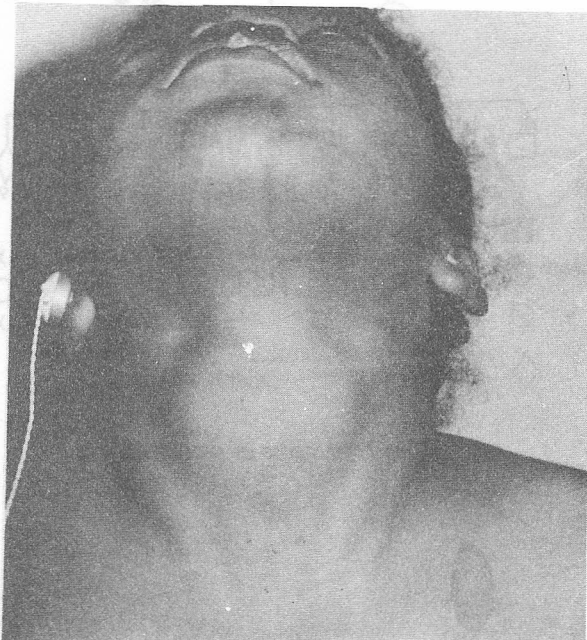


Figure 1. Pedigree of the family



*Figure 2. Patient v1.2 showing a goitre and a hearing aid*



*Figure 3. Patient v1.4 showing a goitre and a hearing aid.*

his age). The thyroid gland which was smooth and soft showed an enlargement of the isthmus and the right lobe measuring 4x3x2 cm (Fig. 2). The pulse rate was 78 per minute and no abnormality was detected in the cardiovascular system. His intelligence seemed to be normal and the tendon jerks showed normal relaxation phase. Pubertal signs were absent.

The other patient (Fig. 1, VI.4) is an 11-year-old girl who was born normally at term. At five months of age she had diarrhoea and vomiting and was kept in hospital for a week. At one and half years, she fell ill again with diarrhoea and vomiting followed shortly by measles and kwashiorkor for which she was admitted to hospital for a month. The mother did not recall any history of discharge from the ears during that attack. The deaf-mutism was noticed since early childhood. The goitre appeared about a year ago and the child seemed to be indifferent to changes of weather.

Examination showed an apparently healthy-looking girl with height of 126.4 cm and weight of 25.4 kg (i.e. height and weight below the third centile for her age). The thyroid gland was soft with a diffuse swelling measuring 6x5x2 cm (Fig. 3). The pulse rate was 80 per minute and no abnormality was detected in the cardiovascular nor other systems. The tendon jerks were normal.

The mother (Fig. 1, V.1) was normal apart from a soft smooth enlargement of the thyroid gland measuring 4x3x2 cm.

The father (Fig. 1, V.2) gave a history of a first cousin who was thirty years old and deaf-mute. He was not sure whether he had a goitre or not and we could not confirm that because the patient lives in a village far away.

Investigations involved audiograms recorded on Amplivox Model 84 Clinical Audiometer - for the parents and all the siblings except VI.8 (Fig. 1) who did not co-operate. The thyroid function tests done included the residual binding capacity of serum by Thyopac-3 method (Radiochemical centre - Amersham) for the parents and the affected children who had the thyroid organification

process tested as well. 600 mg of potassium perchlorate was given to each of the patients one hour after an oral dose of  $I^{131}$ . The resulting discharge of the radioactive iodine was expressed as a percentage of the maximal uptake. Tests for thyroid antibodies and serum cholesterol were done for the patients too.

## RESULTS

Table I shows the result of the tests done for the patients. Both had marked sensorineural deafness while the rest of the family was normal. They had elevated residual binding capacity of serum together with their mother but the father had a normal values. The perchlorate test significantly reduced the thyroid activity in both patients and they had no circulating thyroid antibodies.

## DISCUSSION

The clinical picture and the results seen in these children are typical of Pendred's syndrome. However, no further in vitro studies are available in Khartoum to document the mild hypothyroidism that manifests clinically. Evidence for that are the coarse features, growth retardation and the elevated residual binding capacity of serum. It is worth mentioning that their younger sister (aged 10 years) is taller than both of them (height = 132 cm). In vivo tests for thyroid uptake were deferred to limit the hazards of radiation. Their mother too had a goitre and showed an elevated binding capacity of serum, both can be accounted for by her pregnancy. The absence of circulating thyroid antibodies excluded autoimmune thyroid disease which is known to give a positive perchlorate test.

The previous studies dealing with thyroid diseases in the Sudan concentrated mainly in endemic goitre which is prevalent in Darfur<sup>8</sup>. Omer, in a study covering that area, did not recall any deaf-mute amongst the cretins he saw (personal communication). The contribution of dys-hormonogenesis in the aetiology of goitre in non-endemic areas of the country was revealed by Mukhtar<sup>9</sup>. He found abnormal secretions of iodoproteins to be the cause in

Table I. Results of the investigations in the patients studied

Subject No	Age (yrs)	Hearing loss in DB*		Serum Thyopac-3†	% fall after potassium perchlorate	Serum cholesterol††
		At 250 CPS**	At 3,000 CPS**			
VI.2	14	80	100	127	71	139
VI.4	11	90	100	116	36	270

\*Decibels  
 \*\*Cycles per second  
 †Normal = 90 - 110  
 ††Normal = 150 - 250 mg/dl

that series and the perchlorate test was normal in the cases he tested. Pendred's syndrome is unhitherto reported although associated goitre and deaf-mutism was seen in a case by Omer (personal communication) and in a family by Mukhtar (personal communication), but in both occasions no perchlorate studies were done. However, the disease is rare event in countries where it is carefully looked into. Its reported incidence varies from 1/100,000 in Sweden<sup>4</sup> to 8/100,000 in England<sup>7</sup> - and because the goitre develops slowly, the incidence in children is reported to be only 0.58/100,000. This report will inspire diagnosing more cases.

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