

## A child with obesity and polydactyly: A case study

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### Abstract

**Background and objectives:** Bardet Biedle syndrome is a rare genetic disorder related to Laurence moon syndrome. It is characterized by obesity, hypogonadism, polydactyly, renal abnormalities, retinal pigmentation, and other features, some patients have mental retardation and other clinical findings. Situs inversus is very rarely reported as an association of this syndrome, the cause of this syndrome is genetic with multiple genes involved; it is usually inherited as autosomal recessive pattern. There is no any proved treatment for this syndrome apart from dealing with specific problems which might have been arisen. We presented a 6 years old boy patient exhibiting characteristic features of this syndrome with additional rare associated features that make the case unique and discrete. In the setting of this case, the literature about Bardet Biedl syndrome was reviewed.

**Keywords:** Bardet Biedl, Laurence Moon.

### Introduction

Bardet-Biedl syndrome is an autosomal recessive disease characterized by polydactyly, retinal dystrophy, marked central obesity, mental retardation with structural and functional renal abnormalities often leading to end stage renal disease.<sup>1</sup> It is a rare disease and the prevalence in Europe is 1/150000, it is higher in Asia/north Africa.<sup>2</sup> Also higher incidence has been reported in the isolated populations of Kuwait (1/17000).<sup>3</sup> Features of Bardet Biedl syndrome include primary and secondary features. Primary features include retinal dystrophy, post axial polydactyly, obesity, hypogonadism, renal abnormalities, and learning disabilities. Secondary features include, Developmental delay, Behavioural problems, Neurological problems Speech disorder, Brachydactyly; syndactyly; or clinodactyly, Dental anomalies, Nephrogenic diabetes insipidus, Diabetes mellitus, Hypertension, and Anosmia.<sup>4</sup> Other clinical features which are rarely found in cases of Bardet Biedl syndrome include situs inversus and Hirschsprung's disease.<sup>5</sup>

Diagnosis of Bardet Biedl syndrome is currently based on the clinical features; the presence of four primary features or; Three primary features and two secondary features is diagnostic.<sup>4</sup> Although the syndrome is autosomal recessive, but it is also known that additional genes are involved in modification of the expression of the primary gene, hence the inheritance is latterly designated as oligogenic rather than simple autosomal recessive.<sup>5</sup> There are 12 types of Bardet Biedl syndrome according to the mode of inheritance, In some families the mode of transmission is triallelic.<sup>2</sup>

### Case history;

A 6 years old male child named Z.R seen at a private clinic with his parents on 12<sup>th</sup> February 2011, reporting excessive obesity and small genitalia. His mother reported that the child's weight was normal at birth, but he gradually started to develop obesity and hyperphagia. Moreover, they claimed that he developed a gradually evolving visual impairment over the last 2 years, for which he has been wearing corrective glasses. The child's parents are cousins and they devoid of any chronic diseases.

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Family history is only remarkable for one of the child-grandfather's uncle who had had hypogonadism with lack of secondary sexual characteristics. Admission to Erbil teaching hospital was arranged for further evaluation regarding physical examination and investigations. An informed consent was sought and obtained from the parents before examination and taking photos

#### **Physical examination;**

General physical examination revealed a large obese child with height of 133 cm and a weight of 56 Kg. BMI = 31.8 Kg/square meter. He had six toes in both feet and a removed extra finger in his left hand beside the little finger. Lateral squint was clear in his left eye. Cardiovascular examination revealed diminished heart sounds on the left side of the precordium, while they were clearly audible on the right side with no added sound and no murmurs. The respiratory, neurological and musculoskeletal examinations were unremarkable. Genitourinary examination revealed small bilateral descended testes with small almost penis buried in adipose tissue indicating hypogonadism.

#### **Investigations;-**

- 1-Normal echocardiography, but; dextrocardia
- 2-FBS; 93 mg/dl, Blood urea; 23mg/dl, Serum creatinin ; 0.7 mg/dl, Serum cholesterol; 146 mg/dl, Serum TG;104mg/dl, Serum HDL;46mg/dl, Serum LDL; 68mg/dl, Serum sodium; 150 mg/dl, Serum Potassium; 4.5 mg/dl
- 3-Hormonal Assay revealed;
  - Serum LH; < 0.1 MIU/ml normal range is; 1.1-7 MIU/ml
  - Serum FSH; 0.82MIU/ml normal range is; 1.1-7 MIU/ml
  - Serum testosterone; 0.14ng/L normal range is; 3-10.6 n g/L
  - Serum GH; 5.9ng/ml after stimulation normal range is;0-109ng/ml
  - Serum cortisol at 8 am; 70ng/ml normal range is; 50-230 n g/ml -

T3; 2.38nmol/L 0.95-2.5, T4; 69.18nmol/L normal range is ; 60-12 n mol/L Serum TSH; 4.17µIU/L, normal range is; 0.25-5 µIU/L

4-Complete blood count parameters were within normal ranges.

5-Serum aspartate and alanin amino transferases , total serum bilirubin and alkaline phosphatase were normal.

6-CT scan of the pituitary gland revealed normal results with normal Sella turcica and normal circle of Willis.

7-Abdominal ultra sound revealed the following findings;

-Liver lies in left hypochondrial region and is normal in size and echogenesity with no space occupying lesions, (Situs invertus)

-Spleen lies in right hypochondrial region.

-Right kidney is small in size (6.9 x 2.9 cm) and it shows irregular margin, mild hydronephrosis with no stone is seen, with 8mm paranchymal thickness.

-Left kidney is normal in size, echogenesity and paranchymal thickness, no stone is seen with no hydronephrosis.

-Urinary bladder is normal.

Eye assessment and fundus ocular computerized tomography revealed no retinal abnormalities.

- No mass is seen in the abdomen and pelvis with no ascites.

#### **Discussion**

The syndrome was described by Bardet Biedl in the 1920. It was later erroneously coupled with another disorder described by Laurence and Moon, and was consequently referred to as Laurence- Moon-Biedl syndrome. Bardet Biedl syndrome is distinguished from the much rarer Laurence-Moon syndrome, in which retinal pigmentary degeneration, mental retardation and hypogonadism occur in conjunction with progressive spastic paraparesis and distal muscle weakness, but without polydactyly.<sup>3</sup> Trunkal obesity is one of the most common features of Bardet Biedl syndrome, Ocular manifestations are also common.<sup>3</sup> Postaxial polydactyly is one of

the earliest and most common manifestations Bardet-Biedl syndrome.<sup>3</sup> It is more common that the extra digits occur on the feet than on the hands. The extra digit is usually toward the fifth finger or toe.<sup>7</sup> Other features that have been reported in association with the Bardet-Biedl syndrome include hypertension, diabetes mellitus, heart disease, webbed neck, abnormalities of the vertebrae and ribs, dental abnormalities, iron-deficiency anemia, empty sella syndrome, epiphyseal dysgenesis and clinodactyly. There is also increased frequency of obesity, hypertension, and diabetes mellitus.<sup>7</sup> Structural renal abnormalities of Bardet-Biedl syndrome include renal parenchymal cysts, calyceal clubbing, scarring, unilateral agenesis, renal calculi, hydronephrosis, horse shoe kidney, ectopic kidney and dysplastic kidney.<sup>8</sup> The kidneys have been found to be involved in the cause of death of 50% of people with Bardet-Biedl syndrome. The mean age of death is also significantly reduced compared with the general population.<sup>7</sup> Hypogonadism in affected males is common. Most affected men have small external genitalia with primary testicular failure.<sup>3</sup> There is significant nonallelic genetic heterogeneity to Bardet-Biedl syndrome. There are at least five distinct Bardet-Biedl syndrome (BBS) loci, four of which have been mapped. The loci currently known are 11q13 (BBS1), 16q21 (BBS2), 3p (BBS3), and 15q22.3-q23 (BBS4).<sup>7</sup>

#### Current patient

The diagnosis of Bardet-Biedl syndrome in this patient was based on the presence of the following clinical features;

- 1-Post axial polydactyly
- 2-Obesity, BMI is 31
- 3-Hypogonadism, indicated by small genitalia and low serum Testosterone level
- 4-Renal abnormalities indicated by ultrasound findings

It is clear that the patient has 4 primary features of Bardet Biedl syndrome which are sufficient to for the clinical diagnosis. Absence of retinal dystrophy is explained by age and early presentation, as the mean

age of complaining of night blindness by such patients is 8.5 years and atypical retinitis pigmentosa is not seen before age of 8 years.<sup>8</sup> The presentation of this child at 6 years is an early one as the average age at diagnosis is 9 years.<sup>8</sup> The patient also has situs inversus and dextrocardia which are uncommon findings in this syndrome.

#### Conclusion

Bardett Biedl syndrome might be seen in Iraqi-kurdistan district and may be with unusual associated features

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