

Cataract as the First Manifestation of Insulin Dependent Diabetes Mellitus

Aljawhara T Aldamri¹, Mohammed Alshamrani²
Saleh A. Al-Khaldi³

¹⁻³Ophthalmology Department, King Saud Medical City, Riyadh, Saudi Arabia, ²Ophthalmology Department, King Abdulaziz University Hospital, Riyadh Saudi Arabia

PJO – Official Journal of Ophthalmological Society of Pakistan



This work is licensed under a **Creative Commons Attribution-Non-Commercial 4.0 International License**.

ABSTRACT

An 8-year-old girl presented with blurry vision. Examination revealed impaired visual acuity (VA) in both eyes and significant lamellar and posterior subcapsular cataracts requiring surgery. Preoperative laboratory tests indicated elevated urine and blood glucose levels, leading to a diagnosis of insulin-dependent diabetes mellitus by a paediatric endocrinologist. She began insulin treatment and underwent lens aspiration with posterior chamber intraocular lens implantation. Postoperatively, her VA improved to 20/30 in the right eye and 20/60 in the left eye.

Keywords: Paediatric cataract, diabetic cataract, insulin dependent diabetes Mellitus.

How to Cite this Article: Aldamri A, Alshamrani M, Al-Khaldi, SA. Cataract as the First Manifestation of Insulin Dependent Diabetes Mellitus. 2024;40(4):455-457. **Doi:10.36351/pjo.v40i4.1828**

*Correspondence: Saleh A. AlKhaldi
King Saud Medical City, Riyadh, Saudi Arabia
Email: sask1@outlook.com*

*Received: March 17, 2024
Accepted: September 03, 2024*

INTRODUCTION

One of the most common conditions leading to impairment of vision associated with Diabetes mellitus (DM) is cataract. Research shows that its prevalence in diabetic patients exceeds that of the healthy population,¹ where prevalence of 1-3.3% has been reported.² Cataract can affect both eyes in children and adolescents who have a long history of poorly controlled hyperglycemia, and it is believed to be associated with rapid correction of dehydration in diabetic ketoacidosis or hyperosmolar coma.³

According to a recent study, “hyperglycaemia-induced osmotic damage to lens fibres at diabetes onset might be the main Patho mechanism. Long term glycaemic control is associated with cataract development”, where female patients showed strong preponderance. In addition, the risk of developing cataract might be higher in individuals with type 2 diabetes than those with type 1 diabetes.⁴

In this study, we present a case of a young child who was diagnosed with cataract as the first manifestation of type 1 DM.

Case Presentation

An 8-year-old girl was examined at the paediatric ophthalmology clinic with a chief complaint of blurry vision while doing her homework. Her past medical and surgical history was unremarkable. Ocular examination of the right eye revealed a visual acuity (VA) of 5/200 and normal intraocular pressure. The anterior segment examination showed lamellar and posterior subcapsular cataracts, while the posterior pole examination revealed a healthy macula and optic disc. The left eye had a VA of 7/200 and normal intraocular pressure, with similar findings of lamellar and posterior subcapsular cataracts, and a normal optic disc and macula. The diagnosis was bilateral developmental visually significant cataracts. Preoperative laboratory analysis was significant for urine glucose showing a level of 65 mmol/L, and a random blood glucose test of 24.7 mmol/L. The patient was evaluated by a paediatric endocrinologist and was diagnosed with insulin-dependent DM. She was scheduled for sequential lens aspiration with posterior chamber intraocular lens implantation,

starting with the left eye. She started insulin treatment and underwent lens aspiration with posterior chamber intraocular lens implantation. Postoperatively, her VA improved to 20/30 in the right eye and 20/60 in the left eye.

DISCUSSION

Type 1 DM presents with symptoms of polyuria, polydipsia, and weight loss in some instances with symptoms of diabetic ketoacidosis. Rarely, patients may have atypical presentations such as this 8-year-old female patient whose developmental cataract was the first sign indicating that she may be diabetic. The pathogenesis of cataracts in DM is complicated and found to be linked with oxidative stress, high osmotic environment, and accumulation of sorbitol inside the lens which impairs membrane permeability.² Such alterations increase potassium, amino acids and myo-inositol concentrations inside the lens which in turn leads to nuclear opacification, lens swelling and fibre breakdown. Glycosylation of lens proteins may occur causing them to coagulate.^{1,2} At a genetic level, patients with early-onset diabetic cataract and monogenic-type diabetes were described. The diabetes was brought on by a mutation in the insulin gene *INS*, which wasn't linked to diabetic cataract.⁵ Although it is unclear how this influences the development of early diabetic cataract, it is known that *INS* mutations are more common with neonatal diabetes. These pathways may contribute to the progression of this condition, but more investigations are required to identify the precise pathophysiological mechanism underlying this condition in the young population.

Similar to senile cataracts, juvenile cataracts have vacuoles, small needle-shaped cortical opacities, and anterior and/or posterior subcapsular snowflake opacities. The most typical shape is referred to as the most typical kind of diabetic cataract in children, posterior subcapsular cataract.⁵ Its development often takes place quickly, in a matter of days to months.^{1,2}

In a case series included 14 paediatric patients, seven children had visual loss owing to cataract as primary complaint at presentation. The remaining patients developed cataracts after a mean interval of 2 years.⁶ Datta and colleagues reported five cases of cataracts in newly diagnosed DM paediatric patients. One of them was diagnosed with diabetes at the time of cataract presentation with symptoms of diabetes presenting since the year before. Investigations

revealed a blood glucose level of 24 mmol/L with a high HbA1c. The rest of the cases presented with cataracts after more than 3 months of diagnosis.³

One case report investigated a case of cataract in a nine years old girl, complained of vision deterioration in both eyes which developed in 11 days. The patient's eyes were examined two years ago and were healthy. She had a negative family history of diabetes and cataracts but a positive personal history of polyuria and polydipsia. Blood tests and eye examinations were confirmative of hyperglycaemic cataract.²

Another case report described a case of a 13 years old girl complained of gradual decline vision in both eyes within two months. Ophthalmic evaluation confirmed bilateral visually significant cataracts that required surgical intervention. Laboratory tests revealed a blood glucose level of 442 mg/dL. Although the patient had symptoms of polydipsia and polyuria, her family initially dismissed them as insignificant. Further evaluation confirmed a diagnosis of type 1 diabetes mellitus, and the patient began insulin treatment.⁷

Early detection and strict management of diabetes may reverse the occurrence of cataract. However, once coagulation of proteins occurs, cataract will become permanent and will need to be extracted to preserve vision.^{1,3} Iafusco et al, noted in their study that the likelihood of developing early diabetic cataracts increases 3.6 times for each percentage point rise in HbA1c, from 12.8% to 14.1%.⁷ These findings collectively emphasize the need to maintain appropriate control of blood sugar and HbA1c levels as one of the risk factors for this condition.

Majority of the experimental medicines being explored today for the treatment of diabetic cataract are at laboratory-level; only a small number were evaluated in clinical trials, and there is no information specifically for the paediatric population. Previous publication showed that several aldose reductase inhibitors delay the development of cataract in induced diabetic mice; however, majority of them have a variety of negative side effects.⁹ Unrefined nutrients that are derived from plants, teas, and fruits that inhibit aldose reductase have recently come under scientific attention.¹⁰

Nutritional antioxidants including pyruvates and vitamins C and E are also mentioned in the literature as potential preventive supplements, although further research is required to properly understand their

function. In a diabetic mouse model, hyperbaric oxygen therapy has also been shown to lower blood sugar levels and delay the onset of cataracts. It is thought that this action is connected to the inhibition of aldose reductase and other oxidative stress-related mechanisms.¹¹

CONCLUSION

Cataracts have been strongly associated with DM. Careful assessment for all children presenting with developmental cataracts is crucial for diagnosing and treating certain metabolic diseases mainly insulin-dependent DM. Prevention of long-term hyperglycaemia and rapid implementation of intensive insulin therapy are likely to reduce the prevalence of early diabetic cataracts in children and adolescents.

Funding: This study was not funded by any organization.

Patient's Consent: Researchers followed the guidelines set forth in the Declaration of Helsinki.

Conflict of Interest: Authors declared no conflict of interest.

REFERENCES

1. **Lang-Muritano M, La Roche GR, Stevens JL, Gloor BR, Schoenle EJ.** Acute cataracts in newly diagnosed IDDM in five children and adolescents. *Diabetes Care.* 1995;**18(10)**:1395-1396. Doi: 10.2337/diacare.18.10.1395.
2. **Santiago AP, Rosenbaum AL, Masket S.** Insulin-dependent diabetes mellitus appearing as bilateral mature diabetic cataracts in a child. *Arch Ophthalmol.* 1997;**115(3)**:422-423. Doi: 10.1001/archophth.1997.01100150424021.
3. **Šimunović M, Paradžik M, Škrabić R, Unić I, Bućan K, Škrabić V.** Cataract as Early Ocular Complication in Children and Adolescents with Type 1 Diabetes Mellitus. *Int J Endocrinol.* 2018;**2018**:6763586. Doi: 10.1155/2018/6763586.
4. **Reiter UM, Eckert AJ, Dunstheimer D, Bechtold-Dalla Pozza S, Lüllwitz C, Golembowski S, Freff M, Herrlinger S, von Dem Berge T, Rehberg M, Lilienthal E.** Cataract in children and adolescents with type 1 diabetes. Insights from the German/Austrian DPV registry. *Pediatric Diabetes.* 2022 May;**23(3)**:362-9.
5. **Wasserman H, Hufnagel RB, Miraldi Utz V, Zhang K, Valencia CA, Leslie ND, et al.** Bilateral cataracts in a 6-yr-old with new onset diabetes: a novel presentation of a known INS gene mutation. *Pediatr Diabetes.* 2016;**17(7)**:535-539. Doi: 10.1111/pedi.12335.
6. **Wilson ME Jr, Levin AV, Trivedi RH, Kruger SJ, Elliott LA, Ainsworth JR, et al.** Cataract associated with type-1 diabetes mellitus in the pediatric population. *J AAPOS.* 2007;**11(2)**:162-165. Doi: 10.1016/j.jaapos.2005.10.005.
7. **Uspal NG, Schapiro ES.** Cataracts as the initial manifestation of type 1 diabetes mellitus. *Pediatr Emerg Care.* 2011;**27(2)**:132-134. Doi: 10.1097/PEC.0b013e318209bf0a.
8. **Iafusco D, Prisco F, Romano MR, Dell'omo R, Libondi T, Costagliola C.** Acute juvenile cataract in newly diagnosed type 1 diabetic patients: a description of six cases. *Pediatr Diabetes.* 2011;**12(7)**:642-648. Doi: 10.1111/j.1399-5448.2010.00749.x.
9. **Sampath C, Sang S, Ahmedna M.** In vitro and in vivo inhibition of aldose reductase and advanced glycation end products by phloretin, epigallocatechin 3-gallate and [6]-gingerol. *Biomed Pharmacother.* 2016;**84**:502-513. Doi: 10.1016/j.biopha.2016.09.073.
10. **Chang KC, Li L, Sanborn TM, Shieh B, Lenhart P, Ammar D, et al.** Characterization of Emodin as a Therapeutic Agent for Diabetic Cataract. *J Nat Prod.* 2016;**79(5)**:1439-1444. Doi: 10.1021/acs.jnatprod.6b00185.
11. **Nagatomo F, Roy RR, Takahashi H, Edgerton VR, Ishihara A.** Effect of exposure to hyperbaric oxygen on diabetes-induced cataracts in mice. *J Diabetes.* 2011;**3(4)**:301-308. Doi: 10.1111/j.1753-0407.2011.00150.x

Authors Designation and Contribution

Aljawhara T. Aldamri; Consultant: *Concepts, Design, Literature search, Data acquisition.*

Mohammed Alshamrani; Consultant: *Concepts, Design, Literature search, Data acquisition.*

Saleh A. AlKhalidi; Senior Researcher: *Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.*

