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Six interesting case discussions of adult type 1 diabetes from Karnataka, South India

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Type 1 diabetes can affect adults, although it is more common in children and young adults. We are presenting six cases of adult-onset type 1 diabetes. The etiology was autoimmune in five persons and idiopathic in one person. Two persons had diabetic ketoacidosis at presentation and four persons had symptoms of hyperglycemia. Fasting c-peptide was measured after blood glucose control and all six persons had very low c-peptide levels. Type 1 diabetes may present at any age so when there is strong clinical suspicion of type 1 diabetes in adults, physicians should do fasting C-peptide levels to diagnose type 1 diabetes for precise management.

Keywords: Adult Type 1 Diabetes, Autoimmune, C-Peptide Levels

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Introduction

T-cell-mediated death of pancreatic beta islet cells causes type 1 diabetes mellitus, which quickly progresses to complete insulin deficiency. While 20% of people with type 1 diabetes are antibody-negative at diagnosis, 80% of newly diagnosed patients have positive GAD or IA2 antibodies. [1]. A family history of type 1 diabetes in a first-degree relative increases the likelihood of acquiring diabetes by three times during ten years based on positive GAD and IA2 antibody tests [2].

The cases presented in this study emphasize a crucial diagnostic point that adults who exhibit abnormally fast-onset hyperglycemia should be evaluated for type 1 diabetes. Other related autoimmune diseases were not seen in these instances. Up to 10% of individuals with type 1 diabetes are known to develop celiac disease [3], and autoimmune thyroiditis is strongly linked to type 1 diabetes. [4]

Even though many immunological markers have been found in type 1 diabetes, [5] the anti-GAD and anti-IA2 antibodies are the commercially available assays that are sensitive and specific for the disease. In adulthood, early identification of autoimmune diabetes mellitus guarantees proper management of the illness and early euglycemia [6], supporting a legacy impact of blood sugar control, [7] and lowering the chances of complications including diabetes retinopathy and nephropathy.

Human leukocyte antigen (HLA) genetic predisposition and the presence of islet cell autoantibodies can be used to predict the onset of type 1 diabetes. None of the treatments tested in type1diabetes so far has been able to stop the progressive loss of insulin secretion brought on by beta islet cell destruction [8], [9],[10]

Additional investigation has made it possible to identify zinc transporter-8 (ZnT8), another important islet autoantigen linked to beta islet cell secretory granules. About 70% of people with type 1 diabetes have antibodies against ZnT8, which may be able to forecast the onset of the disease and allow for treatment to begin before autoimmune beta cell damage occurs. [11]

In this article, we present six interesting cases of adult type 1 diabetes in different age groups. This will be very useful in clinical practice so that it will help clinicians to make a precise diagnosis and manage effectively.

Case 1: Adult autoimmune type 1 diabetes with age of onset of diabetes at 56 years.

A female person aged 58 years presented with a history of frequent hypoglycemic episodes. She had a history of diabetes for 2 years since February 2021. There is no family history of diabetes. At diagnosis, her random blood glucose was 400 mg/dl.

She was started on premix insulin on 10-0-10 and continued for 1.5 years. She went to a local doctor one month back and he had stopped insulin and started oral drugs. The patient developed diabetic ketoacidosis and she was admitted for treatment.

BMI 20.06, Waist circumference -78 cm, Duration of diabetes – 2 years, No family history of diabetes, BP – 129/84 mm. General and systemic examinations were normal. Her FPG-180 MG/DL, PPPG- 263 MG/DL, HBA1c-11.4%, Urine glucose 4+, ketone bodies – positive, and lipid profile was normal.

Liver and renal function tests were normal. Fasting C-peptide – 0.070 nanogram/ml and GAD antibodies >2000 IU/ML. The points which help in the diagnosis of type 1 diabetes in this person are no family history of diabetes, history of diabetic ketoacidosis on stopping insulin, fasting C-peptide – 0.070 nanogram/ml and GAD antibodies - >2000 IU/ML.

Case 2: Adult autoimmune type 1 diabetes with age of onset of diabetes at 55 years

A male person aged 55 years presented with a history of increased urination, increased thirst and loss of weight. He had a history of diabetes for 3 months. The family history of diabetes was present, his mother had diabetes.

BMI was 19.21 and waist circumference was 78 centimeters. General and systemic examination was normal. He presented with FBS-120 MG/DL, PPBS-360 mg/dl and HBA1c 10.6%. Lipid profile, liver and renal function tests were normal. Fasting and stimulated C peptide were 0.099 and 0.207 nanogram/ml respectively. GAD antibody was 1885 IU/ml. The points in favour of type 1 diabetes are very low fasting, stimulated c-peptide and GAD antibody 1885.

Case 3: Adult autoimmune type 1 diabetes with age of onset of diabetes at 67 years

A male person aged 67 years presented with a history of breathlessness and altered sensorium with random blood glucose 450 mg/dl and urine ketone bodies positive diagnosed to be diabetic ketoacidosis. He had a new onset of diabetes.

There is no family history of diabetes. BMI was 23.2 and waist circumference was 94 centimeters. General and systemic examination was normal. He presented with FBS-240 MG/DL, PPBS-292 mg/dl and HBA1c 13.2%. Lipid profile, liver and renal function tests were normal. Fasting and stimulated C peptide were 0.15 and 0.19 nanogram/ml respectively. GAD antibody was 2000 IU/ml.

Case 4: Adult autoimmune type 1 diabetes with age of onset of diabetes at 72 years

A male person aged 76 years presented with a history of vomiting and altered sensorium with random blood glucose >500 mg/dl and urine ketone bodies positive diagnosed to be diabetic ketoacidosis. He had diabetes for 4 years.

There is no family history of diabetes. BMI was 26.5 and waist circumference was 85 centimeters. General and systemic examination was normal. He presented with FBS-300 MG/DL, PPBS-499 mg/dl and HBA1c 11.5%. Lipid profile, liver and renal function tests were normal. The fasting C-peptide was 0.02 nanogram/ml and the GAD antibody was 304 IU/ml.

Case 5: Adult idiopathic type 1 diabetes with age of onset of diabetes at 34 years

A male person aged 44 years presented with a history of increased urination and loss of weight of 10 kg and urine ketone bodies negative. He had diabetes for 10 years. The family history of diabetes was positive with the mother, maternal uncle and aunt having diabetes.

BMI was 29.44 and waist circumference was 105 centimeters. General and systemic examination was normal. He presented with FBS-326 MG/DL, PPBS-484mg/dl and HBA1c-12%. Lipid profile, liver and renal function tests were normal. Fasting and stimulated C- peptide were 0.063 and 0.14 nanogram/ml respectively. GAD antibody was 1.4 IU/ml.

Case 6: Adult autoimmune type 1 diabetes with age of onset of diabetes at 27 years

A male person aged 36 years presented with a history of increased urination and loss of weight of 10 kg and urine ketone bodies were negative. He had had diabetes for 9 years. The family history of diabetes was negative. BMI was 18.54 and waist circumference was 73 centimeters. General and systemic examination was normal. He presented with FBS-489 MG/DL, PPBS-398 mg/dl and HBA1c-12.2 %. Lipid profile, liver and renal function tests were normal. Fasting C-peptide 0.010 nanogram/ml and GAD antibody was 2000 IU/ml.

Informed consent was taken from all the patients.

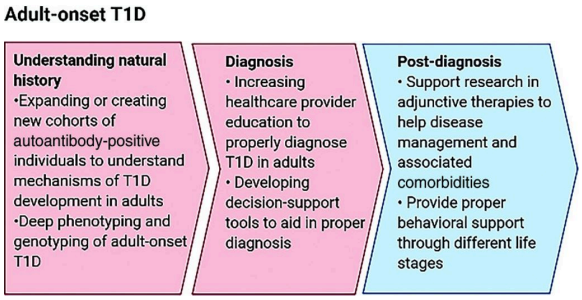
Discussion

Although type 1 diabetes is frequently identified in children, over 25% of those who have the disease receive a diagnosis in their adult years, with some receiving a diagnosis as late as their ninth decade. [12] Pancreatic autoantibodies linked to type 1 diabetes are discovered in approximately 10% of patients who were first diagnosed with type 2 diabetes. [13]

The clinical features of youth-onset type 1 diabetes and type 1 diabetes that begin in adulthood can vary, possibly affecting management in later life. [14] People with measurable C-peptide levels, which are found more frequently in the early stages of the disease and with the onset of type 1 diabetes in adulthood, tend to have improved clinical results and can reach lower A1C levels with a lower risk of serious hypoglycemia compared to those with undetectable C-peptide levels. [15], [16]

An earlier onset of type 1 diabetes is also linked to an increased burden of the disease and more complications related to diabetes in the older population. A lower quality of life in adults with type 1 diabetes is connected to poorer glycemic control, the existence of chronic complications like renal disease, and a background of severe hypoglycemia. [17],[18] All these elements are crucial to take into account when tailoring management strategies for older adults with type 1 diabetes. The literature review shows 3 cases of diagnosis of type 1 diabetes over 90 years of age, a 94-year-old female patient from the UK in 2002 [19], a 96-year-old person from Japan in 2016 [20] and 93 a woman from the UK in 2022. [21]

Proposed roadmap to better understand, diagnose, and take care of adults with type 1 diabetes



Adult-onset type 1 diabetes is more frequently seen than childhood-onset type 1 diabetes, as indicated by epidemiological data from both high-risk regions like Northern Europe and low-risk regions such as China.

In southeastern Sweden, the incidence of the disease among individuals aged 0–19 years is comparable to that among those 40–100 years old (37.8 per 100,000 persons per year and 34/100,000/year, respectively) [12]. Since the comparable incidence covers only two decades in children, it implies that adult-onset type 1 diabetes is more widespread. Likewise, an analysis of U.S. data from commercially insured individuals revealed a generally lower incidence in individuals aged 20–64 years (18.6/100,000/year) than in youth aged 0–19 years (34.3/100,000/year), but the total new cases in adults over 14 years amounted to 19,174 compared to 13,302 in youth [22].

Although the incidence of childhood-onset type 1 diabetes in China ranks among the lowest globally, prevalence data exhibit similar trends throughout the lifespan. From 2010–2013, the incidence was 1.93/100,000 among individuals aged 0–14 years and 1.28/100,000 among those 15–29 years old compared to 0.69/100,000 among older adults [23]. Overall, adults constituted 65. 3% of all clinically defined newly diagnosed type 1 diabetes cases in China, which aligns with estimates derived from genetically stratified data from the population-based UK Biobank utilizing a childhood-onset polygenic genetic risk score (GRS) [24].

Older individuals with type 1 diabetes represent a diverse group and have not received extensive research attention. With a long history of diabetes, experiencing hypoglycemia is frequent, independent of A1C levels.

Tailored treatment strategies involving more advanced insulin regimens and lower glycemic targets, accompanied by regular SMBG, are advised for adults. For those with compromised health and frailty, adjustments to the treatment approach are recommended.

It is essential to evaluate older adults for hypo and hyperglycemia, hypertension, physical limitations, impairments in vision, hearing, and cognition, pain, support systems, urinary incontinence, multiple medications, depression, nutritional issues, risk of falls and the requirement for social services.

The focus of the treatment plan should be on reducing the occurrence of hypoglycemia, especially severe hyperglycemia while addressing recognized physical, emotional, and social obstacles to improve safety and quality of life. In the future, new insulin preparations and technological advances are expected to contribute to better therapeutic approaches for the elderly population.

It is also essential to take into account the psychological impacts of a type 1 diabetes diagnosis in adults. Major adjustments in all facets of life are typically required, and the illness can influence both workplace and family environments. Similar to other chronic disease diagnoses, patients can be expected to go through the typical stages of grief and general practitioners have a crucial role in assisting these patients to navigate the sorrow associated with the diagnosis.

In addition to providing a precise and timely diagnosis of the illness, educating and fostering confidence in the adult newly diagnosed with type 1 diabetes is vital for the individual's capability to manage their condition independently. There is a requirement not only for guidance and assistance from the general practitioner but also for considering supplementary counselling from allied health professionals like psychologists to achieve the best possible support and patient results.

Conclusions

The six cases presented in this study indicate that type 1 diabetes can be diagnosed at any age. The age of onset of diabetes was 27,34,55,56,67 and 72 years in these adults. So diabetologists/physicians when they come across persons with classical symptoms of polyuria, polydipsia,

Polyphagia profound weight loss and diabetic ketoacidosis should suspect type 1 diabetes and subject them to fasting and in a few cases stimulated C peptide, to precisely diagnose type I diabetes and avoid inadvertent use of oral hypoglycemic drugs. In the present scenario if SGLT2 inhibitors are used in adult-type diabetes without precise diagnosis the chances of precipitating diabetic ketoacidosis are higher.

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