Introduction

Diabetes mellitus is a growing global health concern. It is a metabolic disease of multiple etiologies, characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both, and associated with disturbance of carbohydrate, fat, and protein metabolism.\(^1\)

Saudi Arabia is among the top 10 countries with a high prevalence of diabetes, with 10.8% reported prevalence rates among children and adolescents.\(^2\) Diabetes is the most challenging health problem facing Saudi Arabia.\(^3\) The increasing burden of diabetes in Saudi Arabia is due to various factors, including a rising obesity rate and an aging population.\(^4\)

The most common types of diabetes are type 1 diabetes mellitus and type 2 diabetes mellitus. Causes of type 1 and type 2 diabetes differ, as do their clinical manifestations and treatments. Type 2 diabetes mostly develops in adulthood, whereas type 1 diabetes usually develops in childhood and is considered relatively rare among adults.\(^5,6\) Type 2 diabetes mellitus has been observed in young individuals and is correlated with the increase trend in childhood obesity. A survey conducted in 2008 showed that the prevalence of T2D increased from 9% to 23% over the span of 8 years, between 2000 and 2008.\(^7\) Although three-quarters of all type 1 diabetes cases are diagnosed in individuals found <18 years of age.\(^8\)

Abstract

Objective: To report a Saudi young patient with early onset type 2 diabetes, who was misdiagnosed for 6 years as type 1 diabetic.

Case Report: A Saudi male aged 18-year old presented with uncontrolled diabetes. He was diagnosed 6 years earlier to have type 1 diabetes mellitus. He was kept insulin, but he was not compliant to treatment and his blood glucose kept on fluctuating and not controlled. He came to our diabetes center for management of his uncontrolled diabetes. There was no past history of hospitalization. His father was type 2 diabetic. His body mass index was 46.7 kg/m\(^2\). His glycosylated hemoglobin (HbA1c) level was 9.9%. Immune dysfunction was evaluated using serum antibody levels of glutamic acid decarboxylase, which proved to be negative (0.7 U/mL), while serum C-peptide level was not low (2.2 ng/mL). Therefore, the patient was diagnosed as early onset type 2 diabetic, not type 1 diabetic. The patient was advised to start physical exercise through daily walking for at least 1 h. The dietitian planned a strict diet plan for him to follow. Insulin injections and Metformin tablets were started. The patient received detailed health education on nature and management of his condition. After 4 months, his body mass index became 39.4 kg/m\(^2\) and his HbA1c became 6%. Insulin was stopped, and he was advised to continue on metformin, the diet, and daily walking. Two months later, his body mass index was 37.7 kg/m\(^2\) and his HbA1c became 5.41%.

Conclusions: Early onset type 2 diabetes should be suspected among obese children with symptoms of diabetes. Proper health education and patient’s compliance to medication, diet, and physical activity are essential for successful management of early onset type 2 diabetes. Moreover, primary care physicians need to be aware that type 2 diabetes is not necessarily adult-onset.

Keywords: Compliance, diet, early onset type 2 diabetes, physical exercise

Case Report

Early onset type 2 diabetes mellitus in a Saudi child misdiagnosed as type 1 diabetic: A case report

Hassan M. Al-Musa\(^1\)

\(^1\)Department of Family and Community Medicine, College of Medicine, King Khalid University, Saudi Arabia

Access this article online

Quick Response Code:
Website: www.jfmpc.com
DOI: 10.4103/jfmpc.jfmpc_426_18

How to cite this article: Al-Musa HM. Early onset type 2 diabetes mellitus in a Saudi child misdiagnosed as type 1 diabetic: A case report. J Family Med Prim Care 2019;8:313-5.
This study aims to report a Saudi young patient with early onset type 2 diabetes, who was misdiagnosed for 6 years as type 1 diabetic.

**Case Report**

In January 2017, a Saudi male aged 18-year old presented to our diabetes center in Abha City, Saudi Arabia, with uncontrolled diabetes. He was diagnosed 6 years earlier by a primary care physician to have type 1 diabetes mellitus, totally based on being a diabetic child.

The patient was kept on “Lantus Solostar,” a single dose at night before bed, and “Novorapid” with meals. However, he was not compliant to treatment and his blood glucose kept on fluctuating and not controlled.

In October 2016 (3 months earlier), he almost stopped taking treatment for type 1 diabetes. He came to our diabetes center for management of his uncontrolled diabetes and to explore the possibility of using insulin pump for management of his condition.

A thorough history was taken from the patient. There was no history of hospitalization for ketoacidosis, hyperglycemic, or hypoglycemic coma. His father was type 2 diabetic, but none of the siblings were diabetic. He was physically inactive and frequently on fast foods with daily several intakes of soft drinks and power drinks. His height was 170 cm and his weight was 135 kg, with body mass index of 46.7 kg/m$^2$, i.e., morbid obesity.

The patient’s vital signs were within normal range. His glycosylated hemoglobin (HbA1c) level was 9.9% [Photo 1]. Immune dysfunction was evaluated using serum antibodies levels of glutamic acid decarboxylase, which proved to be negative (0.7 U/mL), whereas serum C-peptide level was not low (2.2 ng/mL). Therefore, the patient was diagnosed as early onset type 2 diabetic.

Our patient was advised to completely stop fast foods, soft and power drinks, and to start physical exercise through daily walking for at least 1 h.

The dietitian planned a strict diet plan for him to follow. He was instructed to resume using “Lantus Solostar,” a single dose at night before bed and “Metformin” 500 mg tablets once daily with the evening meal was started.

The patient received detailed health education on nature and management of his condition, as well as the importance of compliance to treatment, diet, and physical exercise. He was also advised to keep daily self-monitoring of his blood glucose level and to maintain regular monthly visits to his physician at the diabetes center for follow-up.

After 4 months (May 2018), his body weight became 114 kg (body mass index = 39.4 kg/m$^2$). His HbA1c became 6%.

Therefore, insulin was stopped, and he was advised to continue on metformin, the diet, and daily walking. Two months later (July 2018), his body weight was 109 kg (body mass index = 37.7 kg/m$^2$) and his HbA1c became 5.41% [Photo 2].

**Discussion**

Type 2 diabetes mellitus was considered a disease of older adults, whereas type 1 diabetes mellitus, which was considered a disease of children.

Perhaps, this misbelief is the main reason why our patient was misdiagnosed and managed as type 1 diabetic, based totally and solely on being a 12-year-old child.

Type 1 diabetes mellitus is an autoimmune disorder, with evidence of autoantibodies. Immune dysfunction in such patients can be confirmed by positive antibodies to GADA (>1.0 U/mL). In addition, there is decreased beta-cell function, manifested as low serum C-peptide levels (≤0.8 ng/mL). On the other hand, type 2 diabetes results from a combination of insulin resistance and diminished beta-cell function. Wilmot and Idris added that early onset type 2 diabetes mellitus patients are likely to be obese, lead a sedentary lifestyle, have a strong family history of type 2 diabetes mellitus.

Therefore, our patient was diagnosed as “early onset type 2 diabetic,” not type 1 diabetic, based on the lack of past history of diabetic ketoacidosis despite his prolonged noncompliance to treatment, the negative result of serum antibodies levels of antibodies against glutamic acid decarboxylase (0.7 U/mL), whereas his serum C-peptide level was not low (2.2 ng/mL). Moreover, he was morbidly obese and physically inactive, with a diabetic father.

Our patient could be successfully managed first by the correct diagnosis of his condition and then by educating him as regard his disease and its medical management, with
emphasis on proper diet and daily physical exercise to manage obesity. He presented with a very high HbA1c level (9.9%), but after 6 months, his HbA1c significantly improved and reached 5.41%.

Wilmot and Idris\(^9\) stated that patients with early onset type 2 diabetes should be cared for in a multidisciplinary specialist diabetes clinic, with access to dietary and bariatric support. Structured health education is a cost-effective and acceptable way of empowering those patients to optimize their self-management skills. Moreover, management of obesity through diet planning and physical activity should be fulfilled.

In conclusion, early onset type 2 diabetes should be suspected among obese children with symptoms suggestive of diabetes. Type 1 diabetes, which is an autoimmune disorder, can be confirmed with laboratory evidence of immune dysfunction and low C-peptide serum levels. Proper health education and patient’s compliance to medication, diet, and physical exercise are essential for successful management of early onset type 2 diabetes. Moreover, primary care physicians need to be aware that type 2 diabetes is not necessarily adult-onset and more CMEs and seminars should be conducted to sensitize the primary care physicians to give attention of such conditions, whereas diagnosing type-1 and type-2 diabetes in children may help in management of diabetes.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References
1. Alotaibi A, Perry L, Gholizadeh L, Al-Ganmi A. Incidence and prevalence rates of diabetes mellitus in Saudi Arabia: An overview. J Epidemiol Glob Health 2017;7:211-8.
2. Al-Rubeaan K. National surveillance for type 1, type 2 diabetes and prediabetes among children and adolescents: A population-based study (SAUDI-DM). Epidemiol Community Health 2015;69:1045-51.
3. Alhowaish AK. Economic costs of diabetes in Saudi Arabia. J Family Commun Med 2013;20:1-7.
4. Kearns K, Dee A, Fitzgerald AP, Doherty E, Perry IJ. Chronic disease burden associated with overweight and obesity in Ireland: The effects of a small BMI reduction at population level. BMC Public Health 2014;14:143.
5. Nathan DM. Diabetes: Advances in diagnosis and treatment. JAMA 2015;314:1052-62.
6. Chatterjee S, Khunti K, Davies MJ. Type 2 diabetes. Lancet 2017;389:2239-51.
7. May AL, Kuklina EV, Yoon PW. Prevalence of cardiovascular disease risk factors among US adolescents, 1999-2008. Pediatrics 2012;129:1035-41.
8. Oram RA, Patel K, Hill A, Shields B, McDonald TJ, Jones A, et al. A type 1 diabetes genetic risk score can aid discrimination between type 1 and type 2 diabetes in young adults. Diabetes Care 2016;39:337-44.
9. Wilmot E, Idris I. Early onset type 2 diabetes: Risk factors, clinical impact and management. Ther Adv Chronic Dis 2014;5:234-44.
10. Siraj ES, Homko C, Wilson LA, May P, Rao AD, Calles J, et al. Islet cell associated autoantibodies and C-peptide levels in patients with diabetes and symptoms of gastroparesis. Front Endocrinol (Lausanne) 2018;9:32.
11. Soota K, Kedar A, Nikitina Y, Arendale E, Vedanarayanan V, Abell TL. Immunomodulation for treatment of drug and device refractory gastroparesis. Results Immunol 2016;6:11-4.