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Original Research

Evaluation of Glycemic Control, Lifestyle and Clinical Characteristics in Patients with Type 2 Diabetes Treated at King Abdullah University Hospital in Jordan

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ABSTRACT

Objectives: The study aimed to assess glycemic control in a Jordanian population with type 2 diabetes and to explore the sociodemographic, clinical and medication-related factors as well as the anthropometric indexes and laboratory values associated with and possibly contributing to unsatisfactory glycemic control.

Methods: We included 237 patients previously diagnosed as having type 2 diabetes. Data were collected through direct interviews. Sociodemographic and clinical details were collected using a questionnaire designed for the purpose of the study, anthropometric measurements were obtained at the time of the interviews, and laboratory data were extracted from the medical records of King Abdullah University Hospital. **Results:** Of the participants, 60.8% were found to have unsatisfactory glycemic control (glycated hemoglobin levels $\geq 7\%$). Unsatisfactory glycemic control was associated with younger ages at diabetes diagnosis, higher mean weights and higher prevalences of diabetic neuropathy. No relationships were found among glycemic control and body mass index, waist circumference or central obesity. Patients with adequate control were more likely to have health insurance and to have hypothyroidism as a comorbidity. Insulin use and medication plans containing insulin were associated with unsatisfactory control. Patients with unsatisfactory control had higher mean levels of low-density lipoproteins and triglycerides and lower mean levels of high-density lipoproteins. Moreover, elevated triglycerides (≥ 150 mg/dL) and dyslipidemia were associated with unsatisfactory glycemic control.

Conclusions: More than half of the participants had unsatisfactory glycemic control, highlighting the need for a change in the approach and strategies used for patients with diabetes in Jordan. Factors associated with glycemic control that were found in this study should be further studied and used in the prevention and management of diabetes.

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R É S U M É

Objectifs : L'étude visait à évaluer le contrôle glycémique d'une population jordanienne atteinte de diabète de type 2, et d'explorer les facteurs sociodémographiques, cliniques et ceux liés à la médication ainsi que les indices anthropométriques et les données biologiques associées contribuant éventuellement à un contrôle glycémique insatisfaisant.

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Méthodes : Nous avons inclus 237 patients préalablement diagnostiqués comme étant atteints de diabète de type 2. Les données ont été recueillies lors d'entretiens directs. Les renseignements d'ordre sociodémographiques et cliniques ont été collectés à l'aide d'un questionnaire conçu dans le cadre de l'étude, les mesures anthropométriques ont été obtenues au moment des entretiens, et les données biologiques ont été extraites des dossiers médicaux de l'hôpital universitaire du roi Abdallah.

Résultats : Parmi les participants, 60,8% ont été identifiés comme ayant un contrôle glycémique insatisfaisant (taux d'hémoglobine glyquée $\geq 7\%$). Un contrôle glycémique insatisfaisant a été associé à un âge plus jeune lors du diagnostic du diabète, un poids moyen plus élevé, et une prévalence plus élevée de neuropathie diabétique. Aucune relation n'a été trouvée entre contrôle glycémique et indice de masse corporelle, tour de taille, ou obésité abdominale. Les patients avec un contrôle adéquat étaient plus susceptibles d'avoir une assurance santé et d'avoir une hypothyroïdie comme comorbidité. L'utilisation de l'insuline et les planifications d'une médication contenant de l'insuline ont été associées à un contrôle insatisfaisant. Les patients ayant un contrôle insatisfaisant avaient des niveaux moyens plus élevés de lipoprotéines de basse densité et de triglycérides, et un niveau moyen plus bas de lipoprotéines de haute densité. De plus, des triglycérides élevés (≥ 150 mg/dL) et une dyslipidémie ont été associés à un contrôle glycémique insatisfaisant.

Conclusions : Plus de la moitié des participants avaient un contrôle glycémique insatisfaisant, révélant la nécessité d'un changement dans l'approche et les stratégies utilisées pour les patients atteints de diabète en Jordanie. Les facteurs associés à un contrôle glycémique qui ont été trouvés dans cette étude devraient être davantage étudiés et utilisés dans la prévention et la gestion du diabète.

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Introduction

Type 2 diabetes mellitus is a chronic metabolic disease that is increasing in prevalence worldwide and particularly in the Middle East (1,2). In 2011, the International Diabetes Federation reported that the prevalence of diabetes in the Middle East and North Africa was 9.2%, with Jordan having the ninth highest prevalence in that region (12.3%) (3). A study of 1121 Jordanians in 2008 found a prevalence of diabetes of 17.1%, a significant increase from 13% in 1994, demonstrating the growing issue (4,5).

Diabetes involves numerous long-term complications that impair the quality of life and pose burdens on individuals and societies as well as increasing the risk for premature deaths (6). These complications can be divided into 2 categories: microvascular (nephropathy, neuropathy, retinopathy) and macrovascular (cardiovascular and cerebrovascular disease) (7). Cardiovascular diseases are the most common causes of death in patients with diabetes and are hard-to-prevent sequels of diabetes, particularly when associated with smoking, hypertension and dyslipidemia (8). Diabetes is the leading cause of end stage renal disease in many countries, including Jordan; it accounts for 29.2% of patients on hemodialysis in Jordan (9). Diabetes can also affect mental health; one study reports a 19.7% prevalence of depression among Jordanian people living with diabetes (10). Another study of Jordanian patients with diabetes showed that 45% of patients had retinopathy, 33% had nephropathy and 5% had had amputations due to their disease (11).

The most effective method to avoid or delay these distressing complications and to prevent target organ damage is by achieving satisfactory glycemic control (12). The International Diabetes Federation recommends glycated hemoglobin (A1C) levels as the monitoring tool for appropriate control. A1C levels are indicators of patients' glycemic control over the previous 3 months. The American Diabetes Association (ADA) defines satisfactory/good control as A1C levels lower than 7%, and unsatisfactory/poor control as A1C levels higher than or equal to 7% (13). Multiple trials and studies demonstrate an association between A1C levels and hospitalizations and show that reducing A1C levels greatly reduces microvascular complications, organ endpoints and overall mortality (14–16). There is also increasing evidence of improved macrovascular outcomes by early and effective glycemic control (17). Furthermore, data show a higher risk for microvascular, macrovascular and even mental health complications associated with unsatisfactory glycemic control (18–20).

These optimal A1C levels are hard to achieve. The progressive course of the disease, alongside patients' noncompliance and lack of awareness and physicians' cautious approaches, fearing the risk of hypoglycemia, all play roles. Accordingly, optimal glycemic control must be individualized according to the goals of treatment, patients' adherence and comorbidities and other clinical considerations (13).

The main objectives of this study were to characterize and assess clinically the glycemic control status in an ethnically and environmentally homogeneous population with type 2 diabetes living in Jordan. This study also aimed to explore the factors associated with unsatisfactory glycemic control in that population. Such factors may be of importance in the multidisciplinary approach to patients with diabetes in order to achieve the desired glycemic control and, consequently, reduce the complications related to the disease and promote health.

Methods

Participants and data collection

A cross-sectional observational study was conducted at King Abdullah University Hospital (KAUH), a teaching hospital affiliated with the Jordan University of Science and Technology. Inclusion criteria included diagnosis with type 2 diabetes more than 6 months earlier and commencement of treatment at the KAUH diabetes clinic, living in Jordan and being 30 years of age or older. Ethical approval to carry out the study was granted by the Ethics Committee of Jordan University of Science and Technology.

Data were collected through direct encounters with the patients to ensure the accuracy of the information received. Informed consent was obtained from all individual participants included in the study. Interviews were directed by experienced interviewers and were held at the diabetes clinic at KAUH in the period from January to March 2014.

Data were collected using a 4-section questionnaire designed specifically for the study and in concordance with the ADA guidelines and definitions. The first section included questions about sociodemographic details, such as gender, age, marital status, health insurance, level of education and income. The second section consisted of questions about the patients' clinical characteristics, including family histories of diabetes, hypertension or cardiovascular diseases (in first-degree relatives); age at diagnosis of diabetes;

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