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Glycemic control among patients with type 2 diabetes at a primary health care center in Oman



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ABSTRACT

Aims: To determine the status of blood sugar control by using fasting blood sugar (FBS) of ≤ 6.1 mmol/l and glycosylated hemoglobin A1c (HbA1c) of $< 7\%$ as indicators of glycemic control and to assess the influence of demographic, blood pressure (BP) and lipid characteristics on glycemic control.

Methods: This retrospective study included all Omani patients with type 2 diabetes ($N = 177$) attended a primary health care center in Al-Dakhiliya region, Oman.

Results: The overall mean age of the cohort was 53 ± 12 years (range: 24–91) with females representing 60% ($n = 106$) of the study sample. The study found that only 9.6% ($n = 17$) and 35% ($n = 62$) of the patients attained optimal FBS and HbA1c levels, respectively. Higher HbA1c was significantly associated with higher diastolic BP (84 versus 80 mm Hg; $p = 0.006$), higher total cholesterol (5.2 versus 4.7 mmol/l; $p = 0.002$) and higher low-density lipoprotein cholesterol (3.8 versus 3.0 mmol/l; $p = 0.034$).

Conclusions: The results demonstrated poor glycemic control in Oman type 2 diabetic patients comparable to local and global studies especially in those hypertensive and dyslipidemic patients. Implementation of early and aggressive management of diabetes mellitus at the primary care setting is warranted.

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1. Introduction

The prevalence of diabetes mellitus (DM) continues to increase worldwide both in developing and developed countries [1]. The total number of people with DM is projected to rise from 171 million in 2000 to 366 million in 2030 [1]. Studies have shown

that diabetes and pre-diabetes are highly prevalent among the population in the Middle East [2]. Among these countries is Oman were it ranks among the top ten countries worldwide in the prevalence of DM [3]. Two surveys that were conducted a decade apart indicated how rapidly is the rise of diabetes among Omani adults aged 30–64 years (12.2% in 1991 versus 16.1% in 2000) [2,4].

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DM has several short- and long-term complications, thus efficient management is required to prevent/delay these complications and to reduce the growing cost of their management [5]. Such management is often very challenging because of many factors influencing glycaemic control. Some of these are attributed to health care provision while others to patient factors [6]. Therefore DM management requires a multidisciplinary approach that encompasses several health team members.

Due to the progressive increase in diabetes and low availability of endocrinologist, majority of diabetic patients are managed at primary care level and only 20% of them are seen by endocrinologist [6]. Therefore several studies have been published emphasizing the role and the outcome of primary care physician in the management of diabetes [7].

One of the crude laboratory tools to check for the success of such management is fasting blood glucose (FBS) and glycated hemoglobin A1c (HbA1c). FBS is commonly used as short-term measure of glycaemic control while HbA1c offers an insight on the average plasma glucose over the previous eight to 12 weeks [8,9]. Both tests are useful in patients with DM to assess their glycaemic control.

Medical care of diabetic patients in developing countries, similar to the developed countries, is primarily done at primary health care facilities due to various logistic, economic and social obstacles. In Oman, most of DM patients are followed-up at diabetic clinics that are run by general practitioners and/or internist at primary health care centers that are spread across the country. Therefore, the results of biochemical tests performed for DM patients in these centers should reflect the level of primary care management of Omani diabetic patients. However, there is limited data about glycaemic control at primary health care centers in Oman. Hence, the aim of this study was to evaluate the level of glycaemic control and the influence of various demographic and clinical parameters among type 2 DM patients at a primary health care center in Al-Dakhliya region, one of the regions in Oman.

2. Methods

This was a retrospective study where the 2011 data was collected from patients' electronic medical records at Fanja Primary Health Center in the Al-Dakhiliya region in Oman. The study enrolled Omani type 2 DM patients ($N=177$) who were registered at the diabetic clinic. A data sheet was constructed to collect demographic information such as age, sex, body mass index (BMI), duration of the disease, FBS, HbA1c as well as other relevant information including diabetic complications and drug therapy. In Oman, according to "Diabetes Mellitus Management Guidelines for Primary Health Care": fasting plasma glucose (mmol/l) should be between 4.4 and 6.1, while HbA1c should be $<7\%$ to rank the glycaemic control as optimal which is similar to most of the international guidelines [10].

Descriptive statistics were used to describe the data. For categorical variables, frequencies and percentages were reported. Differences between groups were analyzed using Pearson's χ^2 tests (or Fisher's exact test for cells less than 5). For continuous variables, means and standard deviations (\pm SD)

were presented and analyses were conducted using the Student's t-test. For diabetes duration, median and interquartile range was used to summarize the data while analyses were conducted using Mann-Whitney test. For differences among variables a p -value of <0.05 was considered statistically significant. Analyses were performed using IBM SPSS® software version 19 (Chicago, IL, USA). Ethical approval for the study was obtained from the Medical Ethics Committee at the Sultan Qaboos University, Muscat, Oman.

3. Results

Out of the total 177 patients included in the study, 60% ($n=106$) were females. The overall mean age of the cohort was 53 ± 12 years (range: 24–91 years). The median diabetic duration was 5 (range: 3–7) years. The mean BMI, systolic blood pressure (SBP), diastolic blood pressure (DBS), total cholesterol and triglyceride of the study cohort were 30 ± 12 kg/m², 135 ± 16 mm Hg, 83 ± 9 mm Hg, 5.1 ± 1.2 mmol/l and 1.7 ± 1.0 mmol/l, respectively. Low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) were not reported in about 73% and 67% of the cases, respectively.

Hypertension and obesity were reported in 45% ($n=79$) and 23% ($n=41$) of the subjects, respectively. Monotherapy regimen was found in 33% of patients. Seventy two (41%) of the patients were taking metformin and sulfonylurea while 13% of the patients were on diet regimen alone. Seven percent of the patients were on combined oral hypoglycaemic agent and insulin.

Only 9.6% ($n=17$) of the patients had FBS ≤ 6.1 mmol/l with a mean of 9.5 ± 3.2 mmol/l while only 35% ($n=62$) of the patients had attained optimal HbA1c $<7\%$ with a mean of 8.2 ± 2.2 . The association between HbA1c and various demographic and clinical parameters are outlined in Table 1. Higher HbA1c was significantly associated with higher FBS ($10.6 \pm$ versus $7.6 \pm$ mmol/l; $p < 0.001$), higher DBP (84 ± 9 versus 80 ± 8 mm Hg; $p = 0.006$), higher total cholesterol (5.2 ± 1.3 versus 4.7 ± 0.8 mmol/l; $p = 0.002$) and higher LDL-C (3.8 ± 1.0 versus 3.0 ± 1.2 mmol/l; $p = 0.034$). There was no significant association between FBS and the various demographic and clinical parameters (Table 2).

4. Discussion

There is no dispute that good diabetic management well worth the effort. However such management is a challenging clinical task. Improving glycaemic control, both in the developed and developing world, is largely undertaken by primary health care practitioners. The results of this study showed that the majority of our subjects could not attain adequate glycaemic control as 59% of them had HbA1c $>7\%$ and 88.7% had FBS >6.1 mmol/l. These results were not unexpected due to the progressive nature of the disease and because studies from Oman and other parts of the world have demonstrated similar finding [5,8]. However, the average age of our subjects was 53 ± 12 year which is quite alarming. Oman demography is undergoing major changes from two perspectives. Firstly is the lifestyle changes that borne the people toward more

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