Improving diabetic patients' outcomes in family medicine in the United Arab Emirates

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تحسين نتائج معالجة مرضى السكّري في أقسام طب الأسرة في الإمارات العربية المتحدة

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الخلاصة: يمثّل الداء السكّري سبباً رئيسياً للمراضة والوفيات في الإمارات العربية المتحدة. وقد تم في هذه الدراسة تقييم عيادة صغيرة لمعالجة مرضى السكري وذلك بقياس مدى التزامها بالدلائل الإرشادية للجمعية الأمريكية للسكري وقياس التغيُّرات في مستويات الهيموغلوبين الغليكوزيلاتي. وقد بيَّنت الدراسة أن 721 من المرضى البالغ عددهم 1063 يترددون على العيادة عدة مرات. ولم تلاحظ فروق بين من يترددون مرة واحدة ومن يترددون عدة مرات من حيث العمر، أو الجنس، أو الفترة التي مرت منذ تشخيص حالتهم، أو مَنْسَب وزن الجسم. كما لوحظ انخفاض ملحوظ في مستويات الهيموغلوبين الغليكوزيلاتي بين الإناث المترددات عدة مرات على العيادة في الإثني عشر شهراً الأولى وبين الذكور المترددين عدة مرات في الثمانية عشر شهراً الأولى من العلاج. وبعد عامين تماثلت هذه المستويات مع مثيلاتها المقيسة عند دخول العيادة. ولوحظ مستوى عال من التزام العيادة بالدلائل الإرشادية المعيارية. كما تبين أن نموذج عيادة السكري الصغيرة، الفعّال في البلدان المتقدمة، قد ثبتت نفس درجة فعاليته في هذا الموقع، مما يشير إلى إمكانية تعميم هذا النموذج لرعاية المرضى على نطاق واسع.

ABSTRACT We evaluated a diabetic mini-clinic by assessing adherence to American Diabetes Association guidelines and changes in glycosylated haemoglobin levels. Of 1063 patients, 721 were multiple attenders. Single and multiple attenders showed no significant differences in age, sex, time since diagnosis or body mass index. Female and male multiple attenders showed significant declines in glycosylated haemoglobin levels over the first 12 and 18 months respectively. After 2 years, these levels were similar to those at entry to the clinic. The clinic's compliance with standard measurement guidelines was high. The diabetic mini-clinic model, which is effective in industrialized countries, was equally effective in this setting.

Améliorer les résultats thérapeutiques pour les patients diabétiques en médecine familiale aux Emirats arabes unis

RESUME Nous avons évalué une « mini-clinique » du diabète en analysant l'observation des directives de l'Association américaine du diabète et les modifications des taux d'hémoglobine glycosylée. Sur 1063 patients, 721 consultaient régulièrement. Il n'y avait aucune différence significative en ce qui concerne l'âge, le sexe et le temps écoulé depuis le diagnostic ou l'indice de Quételet entre ceux qui consultaient régulièrement et ceux qui n'avaient consulté qu'une fois. Les consultants réguliers de sexe féminin et masculin présentaient une réduction significative des taux d'hémoglobine glycosylée durant les 12 et 18 premiers mois respectivement. Après deux ans, ces taux étaient similaires à ceux mesurés à l'entrée à la clinique. Le degré d'observation des directives standard relatives à la mesure de l'hémoglobine glycosylée par la clinique était élevé. Le modèle de la « mini-clinique » du diabète, qui est performant dans les pays industrialisés, a été tout autant efficace dans cet environnement.

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Introduction

Diabetes, a chronic metabolic disease with a high degree of associated morbidity and mortality, is a principal cause of coronary artery disease, which in turn is a leading cause of death in the United Arab Emirates (UAE) [*1*]. In 1996, although the overall prevalence of diabetes in the UAE was 6%, it was 11% and 7% respectively in males and females aged 30–64 years [*2*]. The prevalence of diabetes in other ethnically and culturally similar locations is comparable. The age-adjusted prevalence rates in Saudi Arabia in 1997 were 12% in urban males, 14% in urban females, 7% in rural males and 8% in rural females [*3*]. In 2000, the prevalence in a rural Palestinian village in those aged 30–65 years was 9.8% [*4*]. In contrast, the estimated 1994–8 prevalence rate in Sweden was 3.2% [*5*]. Hence, effective strategies for the management of diabetes could have a profound impact on population health in the UAE, a country where diabetes is prevalent.

The UAE is a union of seven sovereign sheikhdoms, formed in 1971. The lifestyle of the UAE nationals had changed little over preceding centuries until modern development began 40 years ago. The arrival of petrodollars about 30 years ago has supported a relentless pace of development, with UAE nationals now having one of the highest *per capita* incomes in the world [*6*]. However, the UAE still shares the problems seen in developing countries, where rapid social change leaves the nation between conflicting goals—wanting to advance technologically, and at the same time wanting to preserve cultural traditions [*7*].

The first hospital was built in 1949, but in the late 1970s a modern, Western-style health infrastructure began to be created, providing free health care.

A variety of approaches have been evaluated in improving diabetic outcomes in the primary health care setting. One of these interventions, often referred to as 'mini-clinics', involves offering diabetes clinics staffed by family medicine practitioners within a primary care environment, for which several studies have demonstrated improved diabetic outcomes [*8–11*]. However, there are no studies regarding mini-clinics from non-Western countries.

Other studies have shown that selecting doctors with a professed interest in diabetes and using a diabetic mini-clinic setting in general practice enhances glycaemic control [*12,13*]. Regular audit with feedback has been shown to improve outcomes [*14,15*]. Several studies have demonstrated that computer prompting of required actions is also an effective method of improving diabetic outcomes [*16,17*]. However, there are no studies detailing interventions of this nature in this cultural setting.

The aim of this study was to evaluate a diabetic mini-clinic established in a government-funded general practice clinic in Al Ain, UAE, which caters exclusively to UAE citizens.

Methods

Setting

The study was carried out in an urban federally-funded primary health care centre in Al Ain, a city of 250 000 people. The clinic clientele are exclusively UAE citizens. Most clinic physicians have undergone general practice training and have board certification in general practice. The consultations are in Arabic, while medical and computer records and staff interaction are in English. All staff members speak English, with interpreters for those who are not bilingual.

Prior to the establishment of the mini-clinic, diabetic care was provided within routine family medicine care. Continuity of care was low as the medical centre was

structured on an episodic 'patient demand' model with no expectation of seeing the same physician at each visit.

Intervention

The diabetic mini-clinic was established in 1997 by family medicine practitioners with a special interest in diabetes and was located within the primary health centre. The mini-clinic was open 5 days per week and all patients from within the primary health centre identified as having diabetes were encouraged to attend for all their diabetes-related care. Computerization and data collection commenced in June 1998.

All diabetic patients attending the primary health care centre in Al Ain were offered an appointment at the mini-clinic. After their initial visit, patients were encouraged to attend for monthly reviews and to continue to attend other family medicine practitioners in the same centre for inter-current illness or other problems. The medical and nursing staff of the clinic had a special interest in diabetes care and received further education about diabetes management and computer-assisted records. They also remained involved with other activities of the medical centre.

Guidelines were established for frequency of measurement of: blood pressure, blood sugar levels, glycosylated haemoglobin levels, renal function and lipids measurement, as well as electrocardiogram (ECG), neurovascular examination of the feet and ophthalmologic examination. The guidelines for care at the mini-clinic followed the American Diabetic Association recommendations, adapted for local use [*18*].

In addition to traditional paper medical records, computer-assisted medical records were used. This included computer-aided prompting of staff to adhere to clinic guidelines.

Outcome variables

Five variables were evaluated in this study to measure guideline compliance. Glycosylated haemoglobin (HbA1c) was chosen as the primary outcome variable, as this is a valid and objective measure of the degree of short-term to medium-term diabetic control [*19*].

Statistical analysis

SPSS version 7.5 and *Epi-Info* version 6 were used. Comparative statistics were calculated using chi-squared analysis for categorical variables and one-way analysis of variance for continuous variables. The paired sample Student *t*-test was used to compare HBA1c on entry to the programme and later. The level of clinical significance was defined as $P < 0.05$.

Results

At the time of the study, 1063 patients had attended the mini-clinic at least once since it started in 1997. Their demographic characteristics are detailed in Table 1. Compared with the women, male patients were older, had a lower body mass index (BMI), and had been diagnosed with diabetes for longer. Of the 1063 patients, 721 had attended more than once. There were no significant differences between these two groups of patients in age, sex, time since diagnosis or BMI (Table 1). The majority had long-term diabetes, with 65.9% of cases diagnosed more than five years previously, and 35.1% more than 10 years previously.

The level of compliance with measurement guidelines at the clinic was high (Table 2). Fasting blood glucose, HbA1c and fasting lipid measurements showed significant improvement in the second year of mini-clinic operation, while compliance

Table 1 **Characteristics of patients attending the diabetic mini-clinic once or more than once**

Characteristic	Patients attended once only: group A (n = 342)		Patients attended more than once: group B (n = 721)		Comparison of groups A and B
% of patients					
Male	42.4	$P = 0.005^a$	43.6	$P = 0.001^a$	$P = 0.72^a$ (NS)
Female	57.6		56.4		
Age (mean years ± s)					
Male	55.8 ± 12.6	$P = 0.064^b$ (NS)	56.8 ± 13.2	$P = 0.004^b$	$P = 0.428^b$ (NS)
Female	53.1 ± 13.0		53.7 ± 12.5		
Time since diagnosis (mean years ± s)					
Male	8.3 ± 6.8	$P = 0.022^b$	7.8 ± 6.3	$P = 0.26^b$ (NS)	$P = 0.497^b$ (NS)
Female	6.6 ± 5.7		7.1 ± 5.5		
Body mass index (mean kg/m² ± s)					
Male	26.6 ± 4.8	$P = 0.001^b$	26.9 ± 4.0	$P < 0.001^b$	$P = 0.622^b$ (NS)
Female	30.1 ± 6.7		29.5 ± 5.1		

[a]*Chi-squared test.*
[b]*ANOVA.*
s = *standard deviation.*
n = *number of patients.*
NS = not significant.

Table 2 **Level of compliance with American Diabetes Association measurement guidelines at the diabetic mini-clinic**

Parameter measured	Guidelines on frequency of measurement	% compliance with guidelines 1st year of clinic (n = 656)	2nd year of clinic (n = 669)	Comparison of 1st and 2nd years
Blood pressure	Each visit	100.0	100.0	–
Weight	Each visit	99.7	99.4	$P = 0.69^a$ (NS)
Fasting blood glucose	Each visit	84.5	92.2	$P < 0.001^b$
Glycosylated haemoglobin	At least annually	91.8	94.9	$P = 0.02^b$
Fasting lipids	Annually	83.1	92.1	$P = 0.001^b$

[a]*Fisher exact test.*
[b]*Chi-squared test.*
n = *number of patients.*
NS = not significant.

with blood pressure and weight measurements were already almost universal in the first year of mini-clinic operation. The mean HbA1c values for all patients after five different intervals of attending the mini-clinic are detailed in Table 3. The difference between the HbA1c levels at time intervals up to two years from patients' entry to the mini-clinic is detailed in Table 4. The HbA1c levels declined significantly in the first 12 months for females and the first 18 months for males. By two years, the levels were not significantly different to that on entry to the mini-clinic for either sex.

Table 3 Mean glycosylated haemoglobin (HbA1c) levels grouped over defined time intervals

Time interval	Range (months)	No. of patients	HbA1c levels (%) Mean	s
Males and females				
T0[a]	−1 to 1	514	8.10	1.87
T1	1 to 4	308	7.56	1.57
T2	4 to 9	406	7.56	1.48
T3	9 to 15	383	7.75	1.53
T4	15 to 21	316	7.66	1.43
T5	21 to 27	202	7.63	1.39
Males				
T0[a]	−1 to 1	213	8.14	1.91
T1	1 to 4	123	7.41	1.52
T2	4 to 9	155	7.50	1.52
T3	9 to 15	155	7.67	1.50
T4	15 to 21	117	7.50	1.47
T5	21 to 27	66	7.74	1.56
Females				
T0[a]	−1 to 1	300	8.06	1.85
T1	1 to 4	185	7.65	1.60
T2	4 to 9	250	7.61	1.45
T3	9 to 15	228	7.81	1.55
T4	15 to 21	199	7.79	1.40
T5	21 to 27	136	7.58	1.30

[a] *Includes those HbA1c tests that were done in the month prior to being seen at the clinic.*
s = *standard deviation.*

Discussion

Patients attending this diabetic mini-clinic experienced improved short-term and medium-term outcomes, as demonstrated by a sustained and statistically significant fall in HbA1c levels over the first 12–18 months. This should result in a clinically significant reduction in the risk of diabetic complications [*20*]. By two years, the HbA1c values of patients in this study were not significantly different to that on entry, even though the natural history of diabetes, as seen in the United Kingdom Prospective Diabetes Study [*21*], shows a progressive rise in glycosylated haemoglobin over time.

The doctors in the mini-clinic demonstrated a high rate of compliance with examination and investigation guidelines. This contrasts with other studies showing that guidelines alone are not successful in changing practitioner behaviour in general practice [*22*]. That the compliance levels were sustained during the second year of the study is an encouraging result. Other studies have shown a tendency for compliance with guidelines to wane after a period of time [*23*]. The sustained compliance with guidelines may reflect the combination of providing written guidelines to medical staff and the prompting provided by the computer-aided record, in addition to having a diabetes-oriented clinic within a general practice setting.

The majority of patients attending the mini-clinic had diabetes for many years and most were long-term patients of the same medical clinic, consulting the same physicians who now staff the mini-clinic. This suggests that the positive results were related to the change in approach to patient

Table 4 **Comparison of changes in glycosylated haemoglobin levels over time intervals using paired *t*-tests**

Time interval	*df*	Mean difference[a]	*s*	Significance
Males and females				
T0 to T1	188	–0.84	1.87	$P < 0.001$
T0 to T2	281	–0.47	1.90	$P < 0.001$
T0 to T3	262	–0.33	1.70	$P = 0.002$
T0 to T4	214	–0.35	1.86	$P = 0.007$
T0 to T5	144	–0.22	1.78	$P = 0.135$ (NS)
Males				
T0 to T1	75	–0.96	1.70	$P < 0.001$
T0 to T2	104	–0.71	1.76	$P < 0.001$
T0 to T3	102	–0.34	1.72	$P = 0.048$
T0 to T4	77	–0.51	1.80	$P = 0.014$
T0 to T5	45	–0.14	2.05	$P = 0.643$ (NS)
Females				
T0 to T1	112	–0.76	1.98	$P < 0.001$
T0 to T2	175	–0.30	1.95	$P = 0.037$
T0 to T3	159	–0.33	1.70	$P = 0.015$
T0 to T4	136	–0.26	1.90	$P = 0.116$ (NS)
T0 to T5	98	–0.26	1.65	$P = 0.120$ (NS)

[a]*Later reading compared with reading on entry to mini-clinic.*
s = *standard deviation.*
df = *degrees of freedom.*

management, rather than introducing treatment to patients previously not receiving treatment.

Only objective measures were used to assess outcomes. This precluded observer bias in assessment, which would have been problematic in this setting, as some of the investigators were also the attending physicians of the subjects.

The analysis compared all patients from entry point to a later time. However, patients actually entered the mini-clinic at different points in time over a two and a half year period. During this time, there were improvements in the computer programmes used at the clinic and possibly also in the skills of the attending physicians. Hence, the patients who began attending in 1997 may have initially experienced different care to those joining more recently. This is reflected in the smaller mean difference in HBA1c levels seen in those patients who entered the clinic earlier, and thus have been participating for longer periods of time, compared with those who entered the clinic more recently (Table 3).

There were some limitations to the study. Improvements were judged by comparing each patient before and after intervention. However, the lack of a control group creates uncertainty as to the cause of

improvement. The increased personal care and attention given to patients attending the diabetic mini-clinic may alone account for the change, rather than the changes in management strategies, a phenomenon known as the 'Hawthorne effect' [*24*]. However, the sustained changes in adherence to guidelines are not consistent with this. The mini-clinic had a substantial dropout rate, with 31% choosing to attend only once. This may reflect the difficulty of establishing a unique identity for a mini-clinic that is geographically located within the building of the patient's usual family practice, and often staffed by their usual doctor. However, the presence of the mini-clinic may have altered the 'usual care' given by family medicine practitioners to those diabetic patients who chose to return or remain with their usual general practitioner.

Conclusion

The diabetic mini-clinic model, which has been effectively applied in the western hemisphere, was shown in this study to be equally effective in this geographically and ethnographically different setting, suggesting that this model of care is robust and can be disseminated widely.

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