STANDARDS OF DIABETIC CARE — SUCCESSES AND FAILURES OF A PATIENT EDUCATION POLICY

Alice Oldjohn, Colleen Osler, W John Kalk

Objective. To determine: (*i*) some aspects of the quality of medical care provided for adult diabetic patients in primary care settings; and (*ii*) changes in these variables 1 year after attending a specialist diabetes clinic that provided 2 - 3 hours of self-care education.

Design. An analysis of the prevalences of obesity, uncontrolled diabetes, hypertension and hypercholesterolaemia at entry and 1 year later.

Setting. Diabetes Clinic, Johannesburg Hospital, South Africa.

Patients. Ninety randomly selected adult diabetic patients (46 black), with duration of diabetes ≥ 1 year at the first assessment.

Results. At entry insulin-treated ($N = 46$) and non-insulin-treated ($N = 44$) subjects showed prevalences of obesity (body mass index > 30) of 17% and 36%, respectively; there was unsatisfactory glycaemic control (haemoglobin $A_{1C} \geq 9.5\%$) in 72% and 64%; untreated hypertension (blood pressure > 160/90 mmHg) in 24% and 23%; and untreated hypercholesterolaemia (> 7.0 mmol/l) in 15% and 11%. One year later weight had increased only in the non-insulin-treated patients (+ 1.9 kg, $P < 0.01$). Mean HbA_{1C} had improved ($P < 0.01$ in both groups), but remained unsatisfactory in 49% of patients. Blood pressure control was poor in 14 of the 22 hypertensive patients; and hypercholesterolaemia persisted in 11 subjects. At presentation the patterns of poor control were similar in black and white patients, and the rates of improvement were comparable.

Conclusion. There was a low rate of overall metabolic control of diabetes and its associations in primary care settings, with only limited improvements as a result of attending a dedicated diabetes clinic.

S Afr Med J 1999; **89**: 445-451.

Diabetes Clinic, Johannesburg Hospital, and Division of Endocrinology and Metabolism, University of the Witwatersrand, Johannesburg

Alice Oldjohn, RN

Colleen Osler, RN

W John Kalk, MB BCh, FRCP (Lond)

SAMJ

Diabetes mellitus (DM) is recognised as a growing public health problem in developing countries,[1] where its incidence is increasing.[2,3] Numerous standards of care for diabetic patients have been drawn up, mainly in developed countries.[4-6] However, little information is available as to the feasibility of using these guidelines or of attaining such standards in the poorer and often illiterate populations of South Africa.

In 1989 guidelines for the management of diabetes considered suitable for local South African conditions were developed[7] and were subsequently put into practice at Johannesburg Hospital. In this paper we report on the efficacy of the first full year following the introduction of this new policy in a multi-ethnic diabetes clinic. Patients new to the clinic but with established diabetes that had initially been managed elsewhere were selected for the study. Their initial assessments reflected the standard of diabetic care outside of an academic hospital, often in (then) racially segregated facilities and in private sector primary care settings. We have also evaluated the effect of our policy of patient education on measures of metabolic control in the deprived and impoverished black diabetic population in comparison with better educated and wealthier white and Indian patients.

PATIENTS AND METHODS

The records of 120 patients (60 receiving and 60 not receiving insulin) who were new to the Diabetes Clinic at Johannesburg Hospital in 1992, and who had had diabetes diagnosed at least 1 year before, were randomly selected for review. In 1992 some 400 patients joined the clinic, mostly self-referred. In addition to information on sex, race and height, data were recorded for weight, blood pressure (BP), glycated haemoglobin, serum total cholesterol and triglycerides concentrations (non-fasting) on admission to the clinic and after 1 year. Only those patients with complete initial and follow-up data (excluding lipid data) were used in the analyses.

Hypertension was diagnosed if a patient was taking antihypertensive medication or had a BP persistently above 160/90 mmHg. Obesity was defined as a body mass index (BMI) (kg/m^2) of 30 or over. Capillary blood glucose was measured using Glucostix strips and an Ames Elite glucose meter. Initially total haemoglobin A_1 was measured by affinity chromatography (Glyco-Affino/GHb, Isolab), and later HbA_{1C} was measured using an immunoturbidometric method (BMI Hitachi HbA_{1C}) (both carried out by the South African Institute for Medical Research). These methods correlated well (r^2 = 0.926), and the regression equation was $HbA_{1C} = 0.88\ HbA_1 - 0.93$. All data are expressed as HbA_{1C} (reference range 3.5 - 6.0%). Satisfactory control was defined as $HbA_{1C} \leq 9.5\%$. Total cholesterol and triglycerides were measured by automated enzymatic methods (Hitachi Analyzers; reagents from Boehringer Mannheim GmbH Diagnostics, Germany). Hypercholesterolaemia and hypertriglyceridaemia requiring pharmacological treatment were defined as levels ≥ 7.0 mmol/l and > 3.0 mmol/l, respectively. Data are expressed as group means (SD) and the paired and unpaired *t*-test were used in the statistical analyses.

Clinic procedures

At their first clinic visit all new patients were interviewed and assessed by an experienced diabetes nurse educator who initiated diabetes education, as well as by a dietician, and all baseline measurements were made. At the second visit patients were evaluated by a podiatrist and diabetes education was continued by a nurse educator. Education, which lasted 2 - 3 hours in total, was aimed at patient understanding of diabetes and its therapy (weight control, diet, exercise and medication), self-monitoring of blood glucose, and recognition of, and response to, deteriorating glycaemic control (hyperglycaemia and hypoglycaemia). Interpreters were used for black patients when language barriers were significant. At the third visit patients were formally assessed by a doctor. Long-term management by a nurse or doctor depended on the presence of significant diabetic complications or concurrent diseases. Patients allocated to a consultant or nurse had continuity of individual care; those allocated to a medical officer or registrar were seen by a series of doctors who changed every 3 months.

RESULTS

Of the 120 randomly selected patient files, only 90 had complete data — 46 for whites, 38 for blacks and 6 for Indians. Initially 46 patients were treated with insulin and 44 without. Most of the other 30 patients did not attend the clinic regularly or had not had glycated haemoglobin checked after 1 year.

Insulin-treated patients

Initial and 1-year follow-up data are shown in Table I. Nineteen of the 46 patients in this group had developed insulin-dependent diabetes before the age of 30 years; the remainder were classified as insulin-requiring. On presentation to our clinic 8 were obese and 2 were underweight (BMI < 20 kg/m^2); 11 (24%) were hypertensive on no treatment, and 4 had proteinuria. Total serum cholesterol exceeded 7 mmol/l in 7 subjects (15%), and 5 had hypertriglyceridaemia (> 3.0 mmol/l). Glycaemic control was satisfactory in 13 patients (28%).

One year later the mean HbA_{1C} had improved significantly (–21%), but only 23 (50%) had achieved satisfactory control. Improved glycaemia was associated with a significant increase in mean insulin dose, although doses were reduced by more than 4 units in 7 patients and insulin was discontinued in 1. Mean weight and BMI in the group did not change significantly: 8 subjects gained 5 kg or more, appropriately in 6 patients, whose BMI remained under 25 kg/m^2. Only 1 of the 8 obese patients reduced her BMI to under 30 kg/m^2.

Non-insulin-treated patients

Initial and 1-year data are shown in Table I. This group (N = 44) was older than the insulin-treated group, and had a shorter mean known duration of diabetes and higher mean BMI when first seen. Nine patients (20%) were treated by means of diet alone; 16 (36%) were obese and 10 (23%) had uncontrolled hypertension; 5 (11%) had a serum cholesterol level above 7 mmol/l and 6 (14%) had hypertriglyceridaemia. Sixteen patients (36%) had a satisfactory HbA_{1C} level.

One year later glycaemic control had improved significantly (–17%, satisfactory in 52%). This was associated with an increased use of oral hypoglycaemic agents and the introduction of insulin therapy in 6 patients (14%). Four patients were controlled using diet alone. There was a small but significant (1.9 kg) increase in mean weight. The number of patients with elevated cholesterol increased by 2, and the number with high triglycerides decreased by 2.

Ethnic comparisons

Table II compares black patients (A) with combined groups of white and Indian patients (B). Group ages were comparable, but at presentation mean BMI among black patients was significantly greater than among group B patients, and mean diastolic BPs tended to be higher among blacks. Prevalences of untreated hypertension were similar (A 21%, B 26%). The proportions with satisfactory glycaemic control were similar (A 31%, B 34%), although mean HbA_{1C} levels tended to be higher in black patients. At follow-up there was a significant improvement in glycated haemoglobin in both groups. Mean BMIs and BPs did not alter significantly in either group.

Table II. Comparison of some variables in black (group A) and white and Indian patients (group B) on admission to the clinic and 1 year later (mean (SD))

	Black (group A) (N = 46)		White/Indian (group B) (N = 44)	
	Initial	Follow-up	Initial	Follow-up
Age (yrs)	46.0 (13.0)	–	48.3 (14.0)	–
Systolic BP (mmHg)	128.5 (21.6)	128.1 (21.6)	135.7 (26.9)	134.5 (23.4)
Diastolic BP (mmHg)	84.5 (11.7)*	83.1 (10.9)	79.4 (12.9)	80.1 (12.6)
BMI	29.6 (7.3)†	30.2 (7.6)	26.8 (5.4)	27.0 (5.1)
HbA_{1C} (%)	13.3 (5.5)	10.6 (3.5)‡	11.6 (3.5)§	9.4 (2.8)

* v. white/Indian P = 0.06.
† v. white/Indian P < 0.05.
‡ P = 0.0049.
§ P = 0.00002.

Analysis of failures

Glycaemic control. Glycaemic control remained very poor (arbitrarily defined as HbA_{1C} > 12.0%), or deteriorated (from HbA_{1C} ≤ 9.5% to > 12%) in 18 patients (20%) (7 on oral agents and 11 insulin-treated). Information as to probable causes was available for 17 patients. The major associations were poor compliance as regards medication (especially with insulin, N = 7) despite regular clinic attendance, and excessive weight

Table I. Initial and 1-year follow-up data (mean (SD)) for patients initially treated with insulin (N = 46) or with diet and/or oral hypoglycaemic agents only (N = 44)

	Insulin			Diet and/or oral hypoglycaemic agents		
	Initial	Follow-up	Significance	Initial	Follow-up	Significance
Age (yrs)	43.2 (15.2)	-		51.7 (9.9)	-	
Duration DM (yrs)	10.0 (11.1)	-		3.2 (3.5)	-	
Weight (kg)	74.8 (20.6)	75.7 (19.1)		81.0 (18.0)	82.9 (18.3)	P = 0.007
BMI (kg/m²)	25.9 (5.4)	26.2 (4.8)		30.1 (6.6)	30.8 (6.8)	P = 0.02
Obese (N)	8	8		16	18	
Systolic BP (mmHg)	130.5 (28.9)	127.4 (22.0)		134.8 (24.0)	135.6 (21.2)	
Diastolic BP (mmHg)	77.5 (12.5)	77.9 (11.0)		85.9 (11.2)	85.2 (11.6)	
Hypertension uncontrolled (N)	11	6		10	8	
HbA_{1C} (%)	13.0 (5.0)	10.3 (4.3)	P = 0.0001	11.3 (3.8)	9.4 (2.6)	P = 0.007
≤ 9.5% (N)	13	23		16	23	
Serum cholesterol (mmol/l)*	5.85 (1.79)	5.53 (1.17)		6.07 (1.79)	6.23 (1.75)	
> 7 mmol/l (N)	7	4		5	7	
Serum triglycerides (mmol/l)†	1.67 (1.45)	1.38 (0.64)		3.97 (6.05)	4.03 (6.29)	
> 3.0 mmol/l (N)	5	0		6	4	
Medication						
Insulin dose (U/day)	48.5 (31.8)	53.4 (32.8)	P = 0.01	N/A	N/A	
Tablets (No.)	N/A	N/A		1.3 (1.3)	2.4 (2.0)	P = 0.005

* N = 27.
† N = 20.

gain associated with poor social circumstances ($N = 5$). Poor medical management (too little insulin or too few oral hypoglycaemics prescribed by junior doctors) contributed to persistent hyperglycaemia in 8 patients. Two patients missed the appointment immediately before their annual assessments and were therefore without any treatment.

Weight. Eleven subjects inappropriately gained over 5 kg, while appropriate weight loss of over 5 kg occurred in 9 patients, 1 of whom was able to stop insulin. At follow-up 26 patients (29%) remained or had become obese.

Hypertension. At the first annual audit 14 patients had persistent hypertension above the therapeutic target (> 160/90 mmHg). Inadequate or inappropriate therapy (e.g. angiotensin-converting enzyme (ACE) inhibitors as monotherapy in black patients) accounted for 8 cases, and patient non-compliance for 4. Only one compliant patient seemed to have resistant hypertension.

Hyperlipidaemia. Hypercholesterolaemia was successfully managed (serum cholesterol < 7.0 mmol/l) in only 3 of 12 patients and hypertriglyceridaemia (< 3.0 mmol/l) in 2 of 11 patients. In the remaining patients high lipid levels were seemingly ignored by the clinicians despite the availability of expert dietary advice and potent lipid-lowering drugs.

There were no ethnic differences in the proportions of patients successfully treated, or among the management failures.

Discussion

Initial assessments at our clinic indicated that the standard of health care delivery for diabetes had been poor for most patients, as evidenced by high rates of chronic hyperglycaemia (68%), uncontrolled hypertension (23%) and untreated hyperlipidaemia (22%). It seemed that few patients had been screened for diabetic complications, had been taught urine or blood glucose monitoring, or had received dietary advice. These results suggest poor diabetic patient care in both public and private community settings.

Glycaemic control improved substantially after attendance at a specialised diabetes clinic that provided patient education on self-care and blood glucose monitoring. This was generally associated with increased insulin and oral hypoglycaemic drug doses. However, HbA_{1C} levels remained high in a substantial proportion of patients, especially black patients. Obesity was common in black, white and Indian subjects. The small overall weight changes after 1 year indicate some success[8] as a result of the dietary advice offered to all patients; other studies have found greater degrees of weight gain as glycaemic control improved.[9,10] Nevertheless most obese subjects did not lose much weight; 24% of whites and 38% of blacks had a BMI above 30 kg/m^2 1 year after dietary intervention. The higher prevalence of obesity in the latter is probably a reflection of lower socio-economic status.[11]

Ethnic comparisons revealed that similar proportions of black, white and Indian patients had satisfactory glycaemic control after 1 year. This finding was in keeping with a reported observation that social class does not necessarily influence glycated HB.[11] Many patients in each group appeared to benefit from diabetes and dietary education and pharmacotherapy, indicating that the potential barriers of poverty, lack of education and language can be overcome in some cases.

The failures encountered are more instructive than the anticipated improvements resulting from diabetes education and treatment. Reasons for the high drop-out rate and irregular attendance (25% of the original sample) are not known, but are characteristic of poorer patients attending other services for chronic diseases in the region.[12] Explanations cited by patients included the inability to afford transport to the hospital or hospital fees, and the fear of losing employment because of lengthy dispensary attendances every 4 weeks. As health services are restructured these difficulties could potentially be remedied. For example, medications could be supplied for more than 1 month to stable patients, and services could be free for indigent individuals.

Most of the patients studied kept all their clinic appointments; discontinuation of medication because of missed visits was noted in only 2 cases. Surprisingly, poor medical care, predominantly from rotating junior doctors, led to many therapeutic failures, namely the inadequate control of glycaemia, hypertension and hyperlipidaemia.[13] Over-reliance on junior doctors,[5] their inexperience in the care of ambulatory patients, and lack of continuity of care probably contributed to poor management. The second major cause of failure, especially in glycaemic control, was probably insufficient or inappropriate patient education, which resulted in poor adherence to medication and poor self-monitoring in some individuals. Few of these patients were referred for follow-up education. Moreover, at that time no experienced educators fluent in black languages were available to us.

In conclusion, these results indicate a generally low standard of community care for diabetic patients in Johannesburg. Many patients, irrespective of background, benefited from attending a diabetes clinic that provided some self-care education. However, glycaemic control of nearly half the patients in the study did not reach satisfactory levels, especially among black patients, because of a combination of inadequate patient education, poor medical management by inexperienced junior doctors, and probably socio-economic hardship.[14] Responding to the observed failures, several improvements have been made at our diabetes clinic. Three nurses fluent in black languages have been recruited and trained as diabetes educators; efforts have been made to identify patients in need of ongoing education; formal protocols for the management of hypertension and hyperlipidaemia have been developed; and closer supervision of junior staff has been introduced. These

measures are expected to improve overall patient care.

These as well as data from other regions[12,15,16] pose a challenge to South African health professionals and administrators to meet locally developed and internationally accepted standards for the care of people with diabetes.[17,18]

Our thanks to Barby Head for excellent secretarial assistance.

References

1. Reiber GE, King H. The importance of diabetes and impaired glucose tolerance in developing countries. *Diabetes Res Clin Pract* 1993; **20:** 173-174.
2. Mollentze WF, Moore AJ, Steyn AF, *et al.* Coronary heart disease risk factors in a rural urban Orange Free State black population. *S Afr Med J* 1995; **85:** 90-96.
3. Amos AF, McCarty DJ, Zimmet P. The rising global burden of diabetes and its complications: estimates and projections to the year 2010. *Diabet Med* 1997; **14:** suppl 5, S7-S85.
4. Reiber GE, King H. *Guidelines for the Development of a National Programme for Diabetes Mellitus.* Geneva: WHO, 1991.
5. Darnan T. What is feasible in a diabetic clinic: the diabetologist charter. *Diabet Med* 1994; **11:** 134-136.
6. Mbanya J-C, Bonnici F, Magati K, eds. *Guidelines for the Management of Non-Insulin Dependent Diabetes Mellitus (NIDDM) in Africa* (A consensus document of the Pan African Diabetes Study Group). Athens: Novo Nordisk A/S, 1996.
7. Kalk WJ, Huddle K, eds. *Practical Diabetes Management.* Johannesburg: Wits Diabetes Group, 1989.
8. Scottish Intercollegiate Guidelines Network. *Obesity in Scotland.* Edinburgh: SIGN, 1996.
9. The University Group Diabetes Program. Effects of hypoglycaemic agents on vascular complications in patients with adult onset diabetes. VIII Evaluation of insulin therapy: formal report. *Diabetes* 1982; **31:** 1-20.
10. Genuth S. Insulin use in NIDDM. *Diabetes Care* 1990; **13:** 1240-1264.
11. Connoly VM, Kesson CM. Socioeconomic status and clustering of cardiovascular disease risk factors in diabetic patients. *Diabetes Care* 1996; **19:** 419-422.
12. Beattie A, Rispel L, Broomberg J, Price M, Cabral J. *The Quality of Primary Care in South Africa: The Results of a Facility Based Assessment.* Johannesburg: Centre for Health Policy, University of the Witwatersrand, 1995.
13. Raal FJ, Taylor DR, Joffe BI, Seftel HC. Comprehensive management of non-insulin-dependent diabetic mellitus. *S Afr Med J* 1996; **86:** 1007-1013.
14. Helman C. *Culture, Health and Illness.* 3rd ed. London: Butterworth & Heineman, 1994.
15. Magombo B, Cabral J. *Quality of Care in PHC Clinics in the North West and Northern Cape Province: Potential Areas of Action Arising from the Initial Appraisal.* Johannesburg: The Centre for Health Policy, University of the Witwatersrand, 1996.
16. Levitt NS, Bradshaw D, Zwarenstein MF, Bawa AA, Maphumolo S. Audit of public sector primary diabetes care in Cape Town, South Africa: high prevalence of complications, uncontrolled hyperglycaemia, and hypertension. *Diabet Med* 1997; **14:** 1073-1077.
17. Busch-Sarensen M, Elphink AJ, Home PD, Thorstensson B. Diabetes care: a guideline to the facilities needed to support internationally endorsed standards. *Diabet Med* 1995; **12:** 833-838.
18. Type II diabetes mellitus clinical guidelines at primary health care level. *S Afr Med J* 1997; **87:** 497-512.

Accepted 20 Sep 1998.