School education and future glycaemic control of type 2 diabetes in Africa

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Abstract

We have assessed the impact of education and location on glycaemic control in rural African diabetic patients. Of 320 patients, glycated haemoglobin (HbA_{1c}) was higher in those with no education than in those with at least 1 year's education (11.8±4.8% vs 10.6±3.7%, p=0.018). Those without education, however, improved control more when structured care was introduced (HbA_{1c} fall 4.3% vs 2.7%, p=0.027). Location and accessibility to clinic care did not affect glycaemic control. These results show that structured diabetes care in Africa is highly worthwhile, and though the poorly educated may have worse control initially, they show greater improvement after management intervention.

Introduction

Diabetes mellitus is increasing in prevalence, particularly in developing countries, where provision and delivery of care is most difficult.[1] The rural areas of Africa present particular problems, due to scattered populations, difficulties in access to clinic facilities, poor provision of health care personnel, and shortage of drugs and equipment.[2] Very little research has been carried out concerning care delivery and its problems in such areas. In particular, the effect of factors such as patient educational level and access to clinic facilities on glycaemic control has not been previously objectively assessed.

We have been involved in recent years with a diabetes care delivery system in Hlabisa District, a remote and rural area of South Africa.[3] Here we describe our findings concerning the effect of education and clinic accessibility on glycaemic control, and also on the impact of intensified diabetes management.

Patients and methods

In the year 2000, we introduced a system of structured nurse-led and education-based diabetes care to Hlabisa District in northern KwaZulu-Natal, South Africa. Hlabisa is a remote rural area serviced by a central 200-bed hospital, with 14 surrounding primary health clinics (PHCs). Communications within the area are difficult, with most roads being 'un-tarred', and supplies of drugs and equipment are precarious. Doctors are often in short supply, and the major problems of HIV/AIDS and tuberculosis tend to overshadow chronic disease care.

The Hlabisa Diabetes Project utilised two main strategies. First we adapted a previously validated algorithm of treatment, designed to adjust oral agent dosages.[4] Secondly, we delivered empowerment-based patient education modelled on a system known as 'Zahke' (meaning 'help yourself'), a pictoral process not dependent upon literacy. Using these combined treatment modalities, significant improvements in glycaemic control occurred during the 2 years of follow-up since the programme was introduced.

In this study we examined the following educational[5] and geographical factors, and their effect on blood glucose control, and treatment intervention:

- Patient educational experience – assessed as those with no full-time education or those with over 1 year's education.
- Diabetes educational sessions attended, sub-divided into one or two sessions, three or four, or more than five sessions.
- Clinic accessibility, defined by the time needed to reach the clinic from home – either less than or more than 30 minutes.

The sub-divisions were decided upon to give adequate group size for statistical evaluation. Blood glucose control was measured by glycated haemoglobin (HbA_{1c}) level, at baseline and at 18 months post-intervention follow-up. HbA_{1c} was measured by an internationally accepted method (HPLC assay which was DCCT-aligned, reference range 4.5–5.7%).[6] The study was approved by our local Ethics Committee, and HbA_{1c} data were analysed at different time points using paired t tests.

Results

1. Demographic data

The study group comprised 320 patients. Mean (± 1 SD) age was 57±11 years, diabetes duration 7±6 years, 70% were female, and 96% had type 2 diabetes.

2. Education and glycaemic control

Those with no education (n=123) had a mean HbA_{1c} of

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11.8±4.8%, compared with those who had over 1 year's education (n=161) whose HbA_{1c} was significantly lower at 10.6±3.7% (p=0.018).

3. Education and effect of intervention

HbA_{1c} fell significantly following structured diabetes management intervention, but the fall was greater in those with no education, compared with those with over a year's education (4.3% v 2.7%, p=0.027). At the end of 18 months post-intervention follow-up, HbA_{1c} was similar regardless of previous educational exposure.

4. Diabetes education session attendance and glycaemic improvement

Table 1 shows HbA_{1c} fall stratified by number of education sessions attended. Surprisingly there was no difference between 'low' (two sessions or less), 'medium' (three or four) and 'high' (five or more) attenders.

5. Clinic accessibility and glycaemic control

Table 2 divides patients into those more than, or less than, 30 minutes from their clinic. Again surprisingly, there was no difference between these groups with regard to baseline HbA_{1c}, post-intervention glycaemic improvement, and educational sessions attended.

Table 1 Diabetes education sessions attended and glycaemic control improvement (HbA_{1c} fall)

Education sessions attended	Number of observations	HbA_{1c} fall at 18 month follow-up
1 or 2	18	3.8±5.0%
3 or 4	60	3.4±4.5%
5 or more	99	3.1±3.9%

Table 2 Clinic accessibility (travel time from clinic) and glycaemic control, glycaemic improvement, and education session attendance

	<30 minutes from clinic	>30 minutes from clinic	
Baseline HbA_{1c}	10.7± 4.1% (n=137)	11.3±3.8% (n=97)	pNS
HbA_{1c} fall 18 months post-intervention	3.0±4.4% (n=90)	3.4±3.7% (n=62)	pNS
Education sessions attended			
(a) 1 or 2	41%	50%	pNS
(b) 3 or 4	49%	54%	pNS
(c) 5 or more	53% (n=103)	58% (n=106)	pNS

Discussion

These results demonstrate that diabetic patients with no formal school education have significantly poorer glycaemic control than those with even relatively brief educational exposure (1 year or more of full-time schooling). The reasons for this are uncertain, but may reflect the simple problem of illiteracy – for example, being unable to read posters in clinics, or instructions on tablet bottles, may significantly impair compliance. This may also explain why those without education responded better than those with education, when our intervention programme (which included vigorous structured diabetes education) was begun. Thus, the 'no education' group lowered their HbA_{1c} levels by an average of 4.3% at 18 months follow-up, compared with 2.7% in the group with school education (p=0.027). At the end of the study both 'no education' and 'education' groups had similar HbA_{1c} levels – mean 7.5% and 7.9% respectively.

Our data showing no relationship between the numbers of educational sessions attended and HbA_{1c} fall (see Table 1) suggest that relatively brief diabetes educational exposure may be as effective as longer courses of delivery. No educational programme for diabetic patients had existed in the district before, and it was certainly very well received. This may also explain why distance from clinic (measured as travel time) did not affect the degree of HbA_{1c} fall – the clinic visits and educational session became so popular that patients presumably did not mind travelling relatively long distances.

In conclusion, lack of formal school education is related to poor glycaemic control in type 2 diabetic patients in rural Africa. However, these patients show particular glycaemic improvement when a simple but structured education-based care system is introduced. Our results provide powerful support for the widespread introduction of similar systems elsewhere in Africa.

References

1. Wild S, Sicree R, Roglic G, King H, Green A. Global prevalence of diabetes. Estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004; 27: 1047–53.
2. Gill GV. Delivery of diabetes care. In *Diabetes in Africa*. Eds Gill GV, Mbanya J-C, Alberti KGMM. Cambridge, UK: FSG Communications Ltd, 1997; pp 51–4.
3. Gill GV, Price C, Shandu D, Dedicoat M. Effectiveness of a nurse-led diabetes care system in rural Kwazulu-Natal. *J Soc Endocrinal Metab Diab Sth Afr* 2004; 9: 31.
4. Coleman R, Gill G, Wilkinson D. Non-communicable disease management in resource-poor settings: a primary health care model from rural South Africa. *Bull World Health Organ* 1998; 76: 633–40.
5. Masike N, Luthili G, Ndvngwane M, Bonnici F. Evaluation of the effects of the Zahke Education Programme for type 2 patients. *J Soc Endocrinal Metab Diab Sth Afr* 2000; 5: 57.
6. Diabetes Control and Complications Trial Research Group (DCCT). The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *New Eng J Med* 1993; 329: 977–86.