Effect of increased patient-physician contact time and health education in achieving diabetes mellitus management objectives in a resource-poor environment

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ABSTRACT

Introduction: Diabetes mellitus remains a significant universal health problem. Globally, the prevalence of diabetes mellitus is projected to grow from 135 million in 1995 to 300 million in 2025. Due to inadequate healthcare facilities and providers, poverty, and illiteracy coupled with increasing prevalence of diabetes mellitus, there is limited patient-physician contact time. As a result, patients with diabetes mellitus develop complications and die early in life due to poor management. This has grave economic implications as diabetes mellitus principally affects people in their most productive years of life. A cross-sectional and longitudinal study on patients with type 2 diabetes mellitus was carried out to demonstrate how diabetic management objectives can be achieved in a resource-poor environment by increasing patient-physician contact time and with health education.

Methods: One group of 105 consecutive patients with type 2 diabetes mellitus were recruited and managed in the metabolic research unit (MRU), where health education was emphasised for five years, served as the intensively-treated cohort (ITC). Another group of 115 patients with type 2 diabetes mellitus were also recruited and managed over the same five-year period in the medical outpatient department (MOPD) of the same hospital, where there was patient congestion at the clinic, served as the control cohort (CC). The CC also reported to the MRU during their follow-up for measurement of their blood pressure and urinalysis. Other measurements for the CC were obtained from the MOPD on the same day of their visit to the MRU. Morbidities were recorded on recruitment, at each visit, and at the end of the study in each cohort.

Results: There was a marked reduction of morbidity at the end of the study in the ITC (222 versus 106, p-value is 0.0013), compared to the CC (138 versus 130, p-value is greater than 0.05). There was also a significant reduction in the number of patients with individual morbidities in the ITC, while significant reduction was only noticed in hypertension, eye problems, neuropathies, infections/boils, and ulcer/blisters in the CC. In 85 percent of the ITC, plasma glucose clustered around the target of the study as compared to only 58 percent of the CC.

Conclusion: Diabetes mellitus management objectives can be achieved by increasing both patient-physician contact time and health education in addition to other conventional forms of treatment, especially in a resource-poor environment.

Keywords: diabetes mellitus, health education, management objectives, patient-physician contact time, resource-poor environment.

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INTRODUCTION

Diabetes mellitus remains a universal significant health

problem despite enormous research being undertaken in this field[1]. Globally, the prevalence is projected to grow from 135 to 300 million in 30 years (1995–2025), and the number of adults affected by diabetes mellitus in developing countries is projected to grow by 170% in the same period with a greater increase expected in Africa and Asia[2]. In Africa, the prevalence ranges from 0.7% to 10.4%[3] and in Nigeria, it affects 1%–7% of the population[4,5]. It principally affects people between the ages of 45 and 64 years, i.e. during the most productive years of life, and costs an average of 8% of the total health budget, which has grave economic implications.

Residents of developing countries typically have limited lifestyle options available to them, often live subsistent lifestyles and have many other demands on their limited resources to add to their own and their familial needs[6-9]. Lack of community and government understanding of diabetes mellitus[10-16], competing priorities for limited available resources, and inadequate healthcare providers[6,13], complicate the life of patients in this environment. This has resulted in many African and other developing countries having a poor standard for diabetes care[1]. It is therefore a great challenge to manage diabetes mellitus and achieve good glycaemic control in these difficult circumstances. However, it seems possible to provide reasonable care for most patients, even in resource-poor settings, using low-cost non-pharmacological therapies. With this background, a prospective longitudinal study was carried out on a cohort of patients with type 2 diabetes mellitus for a period of five years to establish how best to achieve healthcare objectives in this resource-poor environment. The emphasis in the study was on non-pharmacological therapies such as increased patient-physician contact time, health education, dietary therapy, exercise, cessation of smoking, and long-term compliance.

METHODS

This prospective study was approved by the University College Hospital (UCH)/University of Ibadan ethical committee. 105 consecutive patients with type 2 diabetes mellitus were recruited within the first six months of the study period from the metabolic research unit (MRU) of Chemical Pathology Department, UCH, Ibadan, Nigeria, and were regularly followed-up for five years (1996-2000), during which this intensively-treated cohort (ITC) received longer consultation and participated in health education forums. Another group of 115 patients with type 2 diabetes mellitus were recruited from the MRU and medical outpatient department (MOPD) and served as the control cohort (CC). Consent was obtained from all participants of the study and control groups. 95% of the CC were managed at the MOPD where there was clinic congestion, and only reported to MRU on each visit to record their blood pressure and urinalysis results. Patients with type 1 diabetes mellitus were excluded.

At the MRU, three consultants and four residents managed the ITC, while at the MOPD, three consultants and six residents managed the CC. However, even though the doctors in the two departments have almost the same qualifications and amount of experience, those at the MOPD had to treat more patients at each clinic compared to doctors at the MRU. In addition to the usual time spent for consultation, health education forums were conducted only at the MRU, where there was an interactive educational session between the doctors and the patients held between the sampling period of fasting plasma glucose (FPG) and two-hour post-prandial (2HPP) glucose levels. Patients saw different doctors at follow-up visits at both the MOPD and MRU. The recorded patient-physician contact time at the MRU was longer, usually a minimum of ten minutes, while that in the MOPD was shorter, with a maximum of five minutes.

The characteristics of both categories of subjects are summarised in Table I. Each morbidity observed in a patient was recorded, as a unit, and then total morbidity was determined. The morbidities recorded were hyperglycaemia (FPG and 2HPP), obesity/overweight, hypertension, hypercholesterolaemia, eye problems (blurred vision, retinopathies, cataract), neuropathies (pain, paraesthesia, hyperaesthesia, diplopia, ptosis, orthostatic hypertension, gastroparesis, hyperhidrosis, hypoglycaemia unawareness), infections/boils, ulcers/blisters (non-infective), erectile dysfunctions/impotence, and proteinuria/nephropathies.

Besides a thorough history and physical examination, the following tests were done for each patient. Blood pressure ≥140/90mmHg was considered hypertensive. Weight and height measurement for calculation of body mass index [BMI = weight (kg)/height (m^2)]. BMI from 27kg/m^2 to 29.9kg/m^2 were considered overweight while BMI ≥30kg/m^2 were considered obese. FPG and 2HPP glucose tests were done after each patient's usual meal (to eliminate the effect of the normal digestive system on plasma glucose). Urea and creatinine were checked while urinalysis was carried out to check for proteinuria, and the leukocyte and nitrite pads were used to check for asymptomatic urinary tract infection. Patients who tested positive for both pads with or without proteinuria underwent urine microscopy, culture and sensitivity (m/c/s) and were treated accordingly. Those who still had proteinuria ≥1+ was recorded as such. Due to financial constraints, only total plasma cholesterol was analysed for each patient initially. Selective lipid profile was carried out in hypertensive and/or obese patients, or those with total plasma cholesterol ≥240mg/dL (6.2mmol/L).

Subjects were sent to nutritionists/dietitians for dietary education and quantifications of local food items

Table I. Demographical characteristics of study subjects.

Variable	ITC	CC	Total
Total number recruited	105	115	220
Number who completed study	96	82	178
Males	56	51	107
Females	40	31	71
Number lost to follow-up	9	33	42
Mean (SD) age (years)	51.4 (11.3)	50.8 (10.3)	
Mean (SD) duration of disease (years)	6.7 (2.8)	6.9 (3.5)	
Number that developed frank nephropathy	4	8	12
Number that required insulin	0	5	5

ITC: Intensively-treated cohort; CC: Control cohort

based on prescribed calories/day by the physicians ranging from 1,800 to 2,500 kcal, depending on their BMI and daily activities. The physicians advised the dietitians to give foods that contain about 55%–65% carbohydrates, 25%–30% protein and 10%–15% lipids. Fortnightly appointments were given to those diagnosed on recruitment for the initial stabilisation period. Otherwise, follow-up was on a monthly basis, except for patients with good glycaemic control (defined in this study as FPG ranging from 3.9 to 5.6mmol/L [70–100mg/dL] and 2HPP 5.6–7.8mmol/L [100–140mg/dL])[11,17,18] where follow-up appointments were made every two to three months. Subjects were stabilised on the lower dosages of glibenclamide and/or metformin, and increased to maximum dosage, where necessary. They were advised to come in before their appointment day if there was any problem. The clinics were run weekly.

On each clinic day, the patients' weight and blood pressure were taken, and FPG, 2HPP, urinalysis, urea and creatinine were done for all patients. Other investigations were dependent on the patient's condition or upon request. Health education was emphasised. Electrocardiography was done where deemed necessary. Patients were encouraged to exercise, starting with mild activities, such as walking, jogging, squatting/standing repetitions, and swimming, and were instructed to gradually increase the cardiovascular intensity of the activities, if tolerated. They were educated on the signs and symptoms of both hyper- and hypoglycaemia, and on the measures to be taken, especially with hypoglycaemia. On each clinic day, patients were grouped to discuss their experiences between appointment days and allowed to express their opinions freely. During these forums, health education was re-emphasised. Patients also learnt much from their group at the forum. They were discouraged from going to traditional healers.

Summary descriptive statistics were determined for BMI, FPG and 2HPP, at the beginning and end of the study. The percentages of each morbidity in the two cohorts as well as that of total morbidity contributed by each morbidity were determined. Test of significance was carried out using chi-square linear trend, in comparing the morbidity at the beginning and end of the study. The level of significance was taken as $p<0.05$ at 95% confidence interval.

RESULTS

The mean age and duration of disease were similar in both cohorts of patients (Table I). 91.4% of the ITC successfully completed the study, compared to 71.3% of the CC; only 8.6% of the ITC were lost to follow-up, compared to 28.7% of the CC. 3.8% of the ITC developed frank nephropathy, while 7.0% of the CC were affected. At the end of the study, none in the ITC required insulin, while 4.4% of the CC were on insulin. There is a male preponderance in both cohorts. None was below 30 years of age; however, 52.8% were younger than 50 years and only 24.7% were 60 years or older.

Comparisons of the morbidities between the ITC and the CC at recruitment and at the end of the study are shown in Table II. There was a statistically significant difference in the total morbidity between the two cohorts (222 versus 139, $p<0.05$) at recruitment, while at the end of the study, most of the individual as well as total morbidity were less in the ITC, compared with the CC (total morbidity of ITC was 106 versus 130 in CC, $p<0.05$). In both cohorts, most of the morbidities at the end of the study were due to chronic metabolic disorders associated with diabetes mellitus, namely: obesity/overweight, hypertension, and hypercholesterolaemia, although the degrees of these morbidities were milder in the ITC than in the CC.

Table II. Comparison of diabetic morbidities at recruitment and at end of the study between ITC and CC.

Morbidity	At recruitment		p-value	At end of study		p-value
	ITC	CC		ITC	CC	
Obesity	22 (9.9%)	18 (13.0%)	p<0.05	13 (5.9%)	17 (13.1%)	p<0.05
Overweight	16 (7.2%)	16 (11.6%)	p>0.05	15 (6.8%)	20 (15.4%)	p<0.05
Hypertension	28 (12.6%)	23 (16.7%)	p<0.05	22 (22.9%)	19 (13.8%)	p>0.05
Hypercholesterolaemia	22 (9.9%)	19 (13.8%)	p<0.05	15 (6.8%)	17 (13.1%)	p>0.05
Eye problems	36 (16.2%)	29 (21.0%)	p<0.05	14 (6.3%)	16 (12.3%)	p<0.05
Neuropathies	36 (16.2%)	15 (10.9%)	p<0.05	10 (10.4%)	10 (7.7%)	p>0.05
Infections/boils	14 (6.3%)	16 (11.6%)	p<0.05	2 (0.9%)	7 (5.4%)	p<0.05
Erectile dysfunctions	27 (12.2%)	8 (5.8%)	p<0.05	10 (4.5%)	10 (7.7%)	p>0.05
Proteinuria (≥1+)	14 (6.3%)	10 (7.3%)	p<0.05	5 (2.3%)	12 (9.2%)	p<0.05
Ulcer/blisters	7 (3.2%)	3 (2.2%)	p<0.05	0 (0%)	2 (1.5%)	p<0.05
Total morbidity	222 (100%)	138 (100%)	p<0.05	106 (100%)	130 (100%)	p<0.05

Value in parentheses is the percentage of the individual morbidity against the total morbidity within each cohort.

Tables III and IV show the comparisons of the degrees of FPG and 2HPP glycaemic control, respectively, in the two cohorts at the beginning and end of the study. There was a significant difference in the percentage of patients who had good fasting glycaemic control in the ITC when compared to those in the CC (52.1% versus 48.8%, p<0.05). Similarly, there was a significant difference in the percentage of patients who had good 2HPP glycaemic control in the ITC as compared to those in the CC, (47.9% versus 35.4%, p<0.05). About 85% of the ITC's plasma glucose clustered around the target of the study, compared with only about 58% of the CC. The plasma glucose of the ITC, unlike that of the CC, had gradually but persistently reduced over the period of study until most patients were stabilised to around the study target values.

There was substantial reduction in episodes of hypoglycaemia in the ITC, enabling these patients to achieve long-term compliance with management policies, compared to those in the CC. This may be attributed to proper control of the total calorie intake as well as utilisation of the local food items available to patients. Seven (7.3%) in the ITC were off the oral hypoglycaemic agents and achieved good glycaemic control with only non-pharmacological treatment alone, while there was none in the CC. Glibenclamide and metformin were chosen in this study because they were affordable and available in the study environment.

DISCUSSION

The most important determinant of the achievement of results in this study is the increased length of patient-physician contact time. Usually at any clinic, patient load and minimum amount of patient-physician contact time required, depend, in part, on the type of care provided in relation to the care assumed by other facilities within the healthcare system. At the end of the study, the total morbidity was reduced by more than half of that at the beginning of the study, compared to the insignificant reductions in the control cohort. In addition, the difficult-to-manage diabetes mellitus-associated metabolic syndromes contributed to most of the morbidities recorded at the end of the study. The pivotal roles of health education and the vital need for its further development have been emphasised in this study. The World Health Organisation[19] recommended that physicians, who despite their large burden of patient load, should see diabetic education as their sole responsibility, starting at time of diagnosis. Therefore, even in a resource-poor environment, the aim of a diabetic education programme can be achieved, such as in this study, leading to a substantial reduction of morbidity, prevention of further development of complications, reduced medication costs, and less hospital admissions. This is in contrast to the notion that doctors are notoriously bad at patient education[20].

Initially, the compliance to dietary charts containing the prescribed diabetic diet given to the patients has been notoriously poor. This was similarly observed in the past in the same hospital[8]. Compliance was mostly poor because the sociocultural eating behaviours have not been seriously considered. More so, the difficulty involved

Table III. Range of fasting plasma glucose at the beginning and end of study in both ITC and CC patients.

Range (mmol/L)	At beginning of study		At end of study	
	ITC	CC	ITC	CC
<3.9	1	1	2	0
3.9–4.9	6	4	33	10
5.0–5.6	25	20	50	40
>5.6	64	58	11	32
Total	96	82	96	82

Table IV. Range of 2HPP plasma glucose at the beginning and end of the study in both ITC and CC patients.

Range (mmol/L)	At beginning of study		At end of study	
	ITC	CC	ITC	CC
<5.6	4	1	5	3
5.6–6.6	9	3	29	15
6.7–7.8	23	17	46	29
>7.8	60	61	16	34
Total	96	82	96	82

in making permanent changes to the entrenched eating habits is still greatly underestimated. The composition of food in standard tables, determined in vitro, is in any case only likely to be accurate to within 10%–20%[21]. This underscores the importance of providing dietary guidelines appropriate to the sociocultural situations of patients with diabetes mellitus. However, these were gradually overcome with time during the study. Studies to determine the glycaemic index of food items in each locality are highly recommended.

The management of diabetes mellitus is varied according to the clinical features, including findings of complicating risk factors, such as hypertension, overweight/obesity, dyslipidaemia, nephropathy, neuropathy, retinopathy, and smoking. Consequently, diabetes care is a complex phenomenon and mostly difficult or ineffective without adequate health education, dietary therapy, exercise, cessation of smoking, and strict adherence to instructions, especially in a resource-poor environment. Healthcare professionals in such an environment must therefore appreciate the gaps between learning (knowledge), understanding (attitude), and doing (practice), and the reasons why they occur, as patients living with diabetes mellitus require knowledge and experience, built over time. However, the quality of care for patients with diabetes mellitus is severely compromised in developing countries due to poverty, illiteracy, poor access to quality healthcare, limited lifestyle options available to them, and limited patient-physician contact time because of congestions at clinics.

Yet, to achieve optimal glycaemic control, the person with diabetes mellitus must be able to access healthcare providers who are experts in the field. That is why Thorn and Russell[23] advocated the setting up of diversified care clinics in the United Kingdom because hospital-based diabetic clinics have such a large clinical workload that they are unable to allot sufficient time to such patients. This indicates that even in the developed countries, it is difficult to meet the recommended ratio of one full-time consultant endocrinologist to 100,000 people[23,24]. When this is coupled with the increasing prevalence of diabetes mellitus worldwide, the burden and challenges of healthcare delivery systems of developing countries will be greater than before. For realistic but effective management, healthcare providers in these countries must therefore resort to low-cost therapies. In conclusion, this study serves as evidence that even in a resource-poor environment, low-cost interventional management of diabetes mellitus, such as incorporation of increased patient-physician contact time, health education, exercise, dietary therapy, and cessation of smoking, can be achieved.

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