Review
EVIDENCE FOR BENEFITS FROM DIABETES EDUCATION PROGRAM

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ABSTRACT

Comprehensive patient education is required to provide the patient with the self management skills necessary to achieve good glycemic control. In order to convey the importance of patient education, the American Diabetes Association (ADA) has labeled self-management education as the corner stone therapy for the patient with diabetes. Previous research has shown that patient education adds value to diabetes management and that specific interventions aimed at improving patient knowledge can improve diabetes control. Many patients who have had diabetes for several years do not know exactly how diabetes affects the foot. Patients with less formal education have less knowledge of diabetes and this is usually more common in women. When patients are evaluated on their knowledge about diabetes, those who attend education programs seem to have a better knowledge than the non-attenders. The value of patient education is evident from research demonstrating that patients who never received diabetes education are at increased risk of a major complication. The basic objectives in the handling of type-2 diabetes mellitus patients are reaching normal metabolic control and preventing complications. Intensive efforts to increase awareness among health professionals and diabetic individuals to improve diabetes management through education are urgently needed as it provides a useful benchmark to plan future strategies in diabetes care.

KEY WORDS: Patient education; Self-management; Interventions; Education; Behavior modification; Glycemic control.

INTRODUCTION

Diabetes has emerged as one of the world's biggest health problems and its prevalence is increasing at an alarming rate. People with diabetes who want to live their lives without limits will need to know a lot about their illness. Comprehensive patient education is required to provide the patient with the self management skills necessary to achieve good glycemic control. Epidemiologic data indicate that large numbers of patients do not receive the proper care or education necessary to develop such self management abilities. In order to convey the importance of patient education, the American Diabetes Association (ADA) has labeled self-management education as the corner stone therapy for the patient with diabetes (1). The National Standards for Diabetes Self-Management Education defined patient education as "an exchange of knowledge, tools, and practices that will address the client's needs"(2). These standards state that, diabetes education results in more informed choices and beneficial changes in behavior which, in turn, improves clinical parameters and reduces the risk of secondary complications associated with diabetes.

The structuring of a hygienic and dietetic educational plan for diabetic patient can be the road that demonstrates the benefits of behavior modifying education for metabolic control. Setting appropriate goals for patients to meet, along with a physician directed diabetes education team can significantly reduce the risks of developing diabetic retinopathy, nephropathy and neuropathy. Diabetes self-management education (DSME) has gained in importance over the past decade as research has documented the benefits of such interventions in improving glucose control and reducing diabetes related complications. The importance of education in the management of diabetes is often talked about, but is education given to patients in the normal clinical settings? Unless education is imparted and awareness is created among people it is difficult to control the epidemic of diabetes. Diabetes education, awareness and improving motivation for self care not only enhances care and reduces the burden of complications but also indirectly reduces the overall economic costs of diabetes (3). The evidence on the impact of education on people with diabetes is rarely discussed. This article will briefly review some of the studies done to evaluate the effectiveness of education in managing diabetes.

CREATING AWARENESS THROUGH EDUCATION

Studies have been carried out in Chandigarh (4), Trichy (5) and Pondicherry (6) to elicit knowledge and practices regarding diet, self care, complications and medication regarding diabetes among the diabetic individuals. In the cross-sectional study conducted at Chandigarh (4) of the 60 diabetic individuals 48 subjects knew that sweets and fatty foods should be avoided but only 18.3% were avoiding them, monitoring of blood sugar was poor (46.7%), oral anti-diabetic drug compliance rate was 62.9% and none of the patients on insulin injections knew about self therapy. In the study conducted in 150 diabetic residents of Pondicherry (6) most of the patients were aware of the need for dietary care or medication, but only 50% modified their diet. Of the 97% using anti-diabetic agents, some were using them wrongly and only 10.6% of the subjects tested their urine, although 71% were aware of the need. None of the patients had any formal education regarding diabetes and only 34% consulted the physician regularly. The results of these studies showed a large gap between knowledge and action and a need to reorient and motivate health personnel toward patient education regarding diabetes.

Awareness of diabetes and its complications before diagnosis of the disorder may result in earlier diagnosis. It was observed in the Bangalore Urban district Diabetes (BUD) study (7) that the mean age at diagnosis was 48.3 years for those who were aware of diabetes compared to 50.1 years for those not aware and 47.7 years for those with a family history compared to 50.5 years for those without. While in another study, the Cost of diabetes in India (CODI) study (8), 61% of study patients were aware of diabetes as a disease before diagnosis. These studies stress the importance of diabetes education in the prognosis in diabetes.

In the study done by Hampton et al (9) a structured two-session education programme was introduced for newly diagnosed 59 consecutive type 2 patients. When patients were evaluated on the knowledge about diabetes, those who attended the education programme seemed to have a better knowledge than the non-attenders.

Previous research has shown that patient education adds value to diabetes management and that specific interventions aimed at improving patient knowledge can improve diabetes control. A cross sectional study (10) conducted to examine whether the patients who reported receiving education had increased diabetes knowledge, and how this has impacted on the control of diabetes, demonstrated that diabetes education and increased patient participation in their disease management led to increased diabetes knowledge.

Of the routine in-house studies conducted to assess the quality and benefits of education at M.V Diabetes Speciailties Center, a study on awareness of SMBG machine (Glucometer) was done in 224 diabetic patients, which included 110 review patients (who have attended the education programme) and 114 new patients (visiting the centre for the first time). The study revealed that awareness of glucometer was significantly higher among those who attended the education programme (review patients) compared to new patients (89.1% vs. 61.4 %). 28.2% and 17.5% of the review and new patients were using glucometers to monitor their glycemic control. 47.8% were using them on the advice/education of the physicians. Another study to assess the impact of education on knowledge of exercise and its benefits in 100 diabetic individuals (51 new and 49 review patients) at the centre revealed that there is a significant difference observed in exercise pattern among review patients compared to the new patients. 38.6% changed their exercise pattern after attending the education programme, 11.9% continued the same exercise pattern, 20.8% were irregular and 28.7% did not exercise. A decrease in fasting blood sugar, HbA_{1c}, lipids, and weight was observed in subjects who changed their exercise pattern as compared to those who did not exercise.

Educational intervention was observed to have improved the diabetic patients' knowledge of the disease and self-care and the long term control of the disease according to the study by Tan et al (11). This study was carried out on an intervention group of 183 diabetic patients who completed the education programme and a control group of 95 diabetic patients who attended the clinic during the period of the study. When the patients were assessed regarding their knowledge of diabetes and its actual practice (dietary practice, compliance, home monitoring) the intervention group showed a significant and greater improvement in the knowledge of the disease and self-care and in the dietary practice (taking more unpolished rice/high fiber food, reducing calories intake and cutting down oily/fatty food) compared to the control group. Compliance with medication and the mean HbA_{1c} levels were also better in the intervention group.

In a study conducted by Garcia and Suarez (12) when a five year follow up was done on an interactive educational programme established for diabetic patients above 60 years of age, it was found that there was a significant increase of knowledge among the patients who attended the educational programme. The results of another study conducted in Netherlands (13) in which follow up was done after 12 months, indicated that primary care programs which integrated education into structured care were able to improve both the type 2 diabetic patient's knowledge about the disease and their self care behaviour. These improvements persisted even after the completion of the programs which suggested that they initiated lasting changes in the way patients' handled their disease. When the long term effect of a structured diabetes teaching and training programme was assessed, it showed that all the patients who could be evaluated after 2 years had a significantly better knowledge of diabetes and diet (14). According to Stankiewicz and Zablocki (15), a very significant increase in patient's knowledge was observed after introduction of an educational programme.

A review on educational intervention and outcomes in diabetic adults in a total of 82 studies (16) to determine the effects of patient education on specific outcome variables showed that the largest effect was observed in composite knowledge (1.05 CI:0.94-1.16), biomedical effect was more modest in dietary compliance (0.57 CI:0.44-0.70) and weight loss (0.17 CI:0.08-0.27). Review of theses studies reported that the mean age of the subjects negatively correlated with knowledge and cholesterol, indicating that the older the mean age of the subjects, the lower the effects of patient education on these variables. Findings of this meta-analysis lend support to the effectiveness of diabetes patient education in improving their outcomes.

EFFECT OF EDUCATION ON METABOLIC CONTROL

Several studies have been done to determine whether attendance at the education programme had any effect on the patient's glycemic control. To assess the long term-effect of structured diabetes teaching and training programme (STTP) on metabolic control and knowledge of diabetes in patients with type 2 diabetes a study was conducted in which 64 patients were included (14). Of the 52 patients who could be evaluated after 2 years, HbA_{1c} was found to have decreased in all. This study revealed that STTP for patients with type 2 diabetes was found effective in improving the long-term glycemic control.

Chandalia et al (17) assessed the nutritional knowledge and control of diabetes in 43 non-ketosis-prone diabetic subjects. The patients were exposed to a 1-h nutritional counseling program in groups of three to five. It was observed that the patients' nutritional knowledge and the control of diabetes improved significantly after counseling in those patients in whom control had been inadequate.

The results of a study on the evaluation of the effectiveness of an ambulatory teaching / treatment programme for type-2 diabetic patients suggested that a programme, applied through family doctors, may constitute an efficient tool to improve the compliance and clinico-metabolic control of type-2 patients at the primary health care level (18). The programme was aimed at improving the overall treatment quality in these patients through measures involving self-care, diet, exercise and weight reduction. Clinical and biochemical parameters were recorded at the beginning of the programme and 1 year after its completion in 40 patients who attended the programme and in 39 patients of similar clinical characteristics under conventional diabetes treatment, but receiving no structured teaching before or during the survey period (control group). The drop-out percentage in the intervention group was significantly lower than in the control group, suggesting greater compliance in the former. At the end of the 1-year follow-up, it was found that the control group maintained the same body weight as compared to lowering of body weight in intervention group. It was also noted that there was a reduction in HbA_{1c} in the intervention group as compared to an increase in HbA_{1c} in the control group. The number of oral hypoglycemic agents taken was also reduced in intervention group compared to the control group.

To evaluate the efficiency of education and rehabilitation programme for patients suffering from diabetes on the level of metabolic control, a study was conducted by Stankiewicz and Zablocki (15). Two modules of education were introduced for the patients. The first was group education which was conducted in groups of 20 patients. This covered basic information concerning diabetes, self-monitoring interventional actions and using the insulin-injector. The second model was repeated every three months: one-day observation in a room for daily-basis patients, which was combined with an individual educational programme. The state of metabolic control was also tested, by means of evaluating the average glycemia, HbA_{1c} level and the dosage of insulin. The average glycemia was lowered and the average serum

cholesterol level was lowered and there was an increase in the HDL cholesterol. There was also a reduction in HbA_{1c}. The daily dose of insulin required was also reduced and weight reduction was observed.

According to a study by Hampton et al (9), it was inferred that attendance at the education sessions improved patient's knowledge about diabetes and led to a reduced dependence on oral hypoglycemic therapy. A reduction in HbA_{1c} was achieved and a reduction in weight was also attained as a result of the education programme. Although the initial therapy was diet alone in all 59 patients studied, after six months of introduction of education programme, significantly fewer attendees required the addition of oral therapy than non-attendees.

A continuing interactive educational model was established for elderly patients with diabetes mellitus (12) and the effects were studied in 148 diabetic patients aged above 60 years who participated in 60 monthly scheduled interactive meetings over a 5-year period. Empowering patients with skills, perceptions and ability to cope with diabetes and metabolic control was emphasized, rather than clinical aspects. Comparison between pre-program and 5 years post-program demonstrated improvement in the HbA_{1c} levels and a reduction in body weight and anti-diabetic medications. There were less diabetes related conditions requiring emergency services and hospital admissions.

To demonstrate the advantages of behaviour-modifying education on the metabolic profile of the type 2 diabetes mellitus patients, a quasi-experimental study (19) was performed with the control group. The experimental group was made up of 25 type 2 diabetic patients and the control group consisted of 24. The education carried out was a behavior modification module. Baseline measurements and subsequent monthly measurements of serum glucose, total cholesterol, and triglycerides were carried out for 9 months after the intervention. A reduction in serum glucose, total cholesterol and triglycerides was observed in the experimental group who received behaviour modifying education, whereas in the control group there was not much difference in any of the above mentioned studies. Thus introduction of an education programme was found to have a positive effect on the metabolic control of patients.

EFFECT ON THE TREATMENT COSTS

A co-operative Latin American Implementation study (PEDNID-LA) was done to evaluate the effect of implementation of an educational programme in Latin America on the clinical, biochemical and therapeutic aspects as well as the economic cost of diabetes (20). The study included 446 individuals with type-2 diabetes. All patients were below 65 years of age, did not require insulin for metabolic control, did not have severe complications of diabetes or life-threatening illnesses, and had not previously participated in any diabetes education courses. Clinical and therapeutic data and the cost of their pharmacological treatment were collected 6 months before participation in the educational program, on entry into the program and at 4, 8, and 12 months after the initiation of the program. All parameters measured had improved significantly by one year. At 12 months, the decrease in pharmacotherapy required for control of diabetes, hypertension, and hyperlipidemia represented a 62% decrease in the annual cost of treatment. The beneficial results of this educational model, reinforces the value of patient education as an essential part of diabetes care and suggests that an educational approach promoting healthy lifestyle habits and patient empowerment is an effective strategy with a potential to decrease the development of complications related to diabetes as well as the socio economic costs of the disease.

In a prospective controlled trial, the effects of a 5-day in-patient treatment and teaching programme for type 1 diabetes mellitus on metabolic control and health care costs were studied in Moscow (21). Two different intervention programs were compared, one based upon urine glucose self-monitoring (UGSM) and one using blood glucose self-monitoring (BGSM) and the follow-up period was 2 years. The control group of 60 people continued the standard treatment of the Moscow Diabetes Centre and was followed-up for 1 year. Costs and benefits with respect to hospitalizations and lost productivity were measured according to average wage with respect to imported drugs and test strips. In the intervention group there were significant decreases of HbA_{1c} values compared to no change in the control group. The frequency of severe hypoglycemia was less in UGSM and BGSM groups as compared to the control group.

IMPACT OF EDUCATION IN DELAYING THE COMPLICATIONS

Life style risk factors including dietary choices, cigarette smoking, alcohol consumption, overweight and physical inactivity, if effectively controlled, can lead to decreased incidence of secondary complications to diabetes. Mani et al (22) studied 60 diabetic subjects from Gujarat Refinery hospital

(Control [no education] - 30 subjects and experimental [with education] - 30 subjects) and reported that there was significant decrease in fasting blood sugar, lipids, weight, and total fat intake as compared to the baseline in the experimental group. With regard to the control group, the dietary habits remained the same.

To determine whether intensive education and care management of diabetes could improve glycemic control, alter patient behavior, and reduce complications in the setting of a dialysis unit, a study was done by McMurray et al (23). 83 patients were studied and followed up for 1 year. Patients in the study group underwent a diabetes education program and were followed up by a care manager who provided self management education, diabetes self-care monitoring/management, motivational coaching and foot checks. The control group baseline foot risk category worsened, whereas it was unchanged in the study group. There were no amputations in the study group whereas five amputations were done in the control group. Ten patients in the control group were hospitalized with diabetes or vascular-related admissions whereas in the study group there was only one admission. HbA$_{1c}$ was reduced in the study group whereas in the control group it increased. Diabetes related quality of life increased in the study group. There was improvement in self management behavior in all six categories evaluated in the study versus the control group. Thus a program of intensive diabetes education and care management in a dialysis unit was found effective in providing improvements in patient outcomes, glycemic control, and better quality of life in patients with diabetes mellitus.

The patient himself plays the crucial role in the prevention of complications and therefore education is important. It is estimated that about 40 to 50 per cent of patients who have diabetes for more than ten years, are likely to develop some form of foot problem. Many patients who have had diabetes for several years do not know exactly how diabetes affects the foot. The patient may know that a foot or leg could be amputated because of diabetes but does not know why this happens. In order to identify areas that require stress in the education programme, the knowledge of the diabetic subjects regarding the foot problems and the care of feet was evaluated by Viswanathan et al (24). Out of two hundred and fifty type 2 diabetes patients who were interviewed, it was found that women had less knowledge in foot care than men. Patients with less formal education had less knowledge of diabetes and this was more common in

women. Patients who presented with foot problems like gangrene and foot ulcers also had less awareness about diabetes. In general, the awareness of foot care principles and basic facts about foot complications were poor among the selected study subjects. This study underscores the importance of patient education on foot care principles, especially so, considering the magnitude of the problem of diabetes and the lower levels of literacy and poor socio economic status of many patients in India.

It has been demonstrated that simple measures like education and awareness about foot problems can bring about a significant reduction in amputation rates as well as the cost of management. Assal (25) has shown that the cost of 9 below knee amputations can pay the annual salary of 13 hospital staff members responsible for the care of 400 patients.

Pregnancies complicated by diabetes, including gestational diabetes (GDM) have been known to have an increased risk of mortality. Improved diabetes and obstetric care has been shown to normalize the outcomes of pregnancy among women with type 2 diabetes in several countries. Simmons et al (26) assessed the effectiveness of a diabetes midwifery educator within a diabetes-in-pregnancy service serving a predominantly Polynesian population. The midwifery educator combined the role of practicing mid-wife and diabetes educator. A retrospective audit was undertaken of the charts of all women seen by the diabetes–in pregnancy service at Middlemore hospital for 8 months prior to introduction and for the same 8 months the following year. The women were matched for age, ethnicity and past obstetric history. Previously known diabetes was present in 10 %. After introduction of the service, insulin therapy and maternal 2 hour post prandial glucose concentration were reduced and the proportion starting insulin as out patients was increased. Total antenatal length of stay was reduced and postnatal follow-up improved. The introduction of the midwifery educator was thus associated with substantial reductions in resource utilization with an improvement in glycemic control and post natal follow-up.

CONCLUSIONS

The value of patient education is evident from research demonstrating that patients who never received diabetes education showed a striking four-fold increased risk of a major complication. The basic objectives in the handling of type-2 diabetes mellitus patients are reaching normal metabolic control and preventing complications. This necessitates the

introduction of an educational intervention project that links theory with practice through a communicative-educational behavior-modifying strategy. The expected outcomes would go beyond knowledge and glycemic control to include prevention of diabetes, improved quality of life and delaying of complications. Education has also decreased the number of admissions to hospital and reduced the cost of treatment. The studies also suggest that the educational programs had a long term effect on the patients which is reflected in their overall disease management. The impact of diabetes education is summarized in Figure 1. One of the most significant advances in diabetes care has been the recognition that the most important person in the diabetes care team is the patient himself, who needs to be empowered to take the responsibility for his/her own health care rather than relying on others.
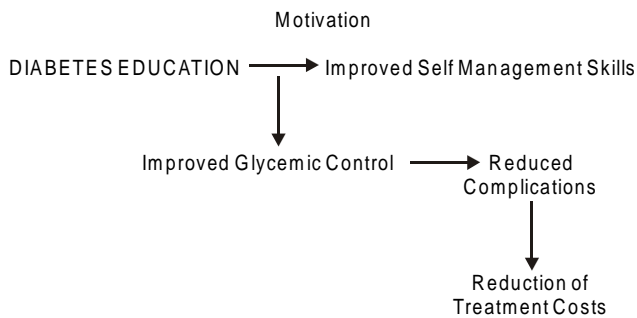

Fig 1: Impact of Diabetes Education

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