Impact of personalized structured health education in achieving better glycemic control in Diabetes Mellitus.

George Thomas[1], Anulekha Mary John[2]

1(Assistant professor,Department of Otorhinolaryngology,Believers Church Medical College Hospital)
2(Assistant professor of Medicine, Department of Endocrinology & Metabolism, Believers Church Medical College Hospital, India)
Corresponding author: Dr Anulekha Mary John

Abstract: *Diabetes Mellitus is an ever growing global problem with lot of economic, social and health impact. Though there are plenty of tools in the armamentarium to control diabetes , personalized diabetes education is used the least, considering the large burden of disease in our country and the lack of resources. Providing a structured and personalized health education on various aspects of diabetes goes a long way in achieving better glycemic control and thus preventing complications. The aim of our study was to find the impact of structured health education delivered in a personalized manner in adult patients suffering from type two diabetes. This prospective observational study was conducted in type-2 Diabetes mellitus patients who were seen in an outpatient clinic in the southern state Kerala, in India, during the period January to April 2014. A total of 184 patients were included in the study. Glycosylated Hemoglobin(HbA1c) before, 3 months and 6 months after structured health education was performed and compared. There was significant improvement in glycemic control after the education with 70.65% of patients achieving HbA1c reduction and 40.76% achieving target glucose levels. Mean HbA1c reduction by the addition of health education alone was 1.283 ± 1.336 at 3 months and 1.917 ± 1.313, at 6 months , which is higher than any other drug therapy alone. The reduction achieved was statistically significant and clinically meaningful. The HbA1c reduction persisted at 6 months follow up.*
Keywords:*HbA1c, structured diabetes education*

I. Introduction

Diabetes mellitus is an ever growing, major health problem with a lot of economic, social and health impact in our country. Both the Microvascular and macrovascular complications of diabetes are debilitating. Hyperglycemia is the key factor that leads to complications in diabetes [1]. Glycemic control delays complications and each 1% reduction in HbA1c resulted in 21% risk reduction in death as well as any end point in diabetes in the UKPDS [2]

Most diabetic patients are on at least 3 to 5 oral medications and a large sector of these patients depend on parenteral injections like insulin [3]. Despite the availability of good medications and healthcare facilities, several diabetic patients do develop complications due to uncontrolled glucose [4, 5]. Our health Care sector, both private and public are well aware and equipped in managing diabetes and its complications. However life of an individual after having suffered a micro or macrovascular complication of diabetes is never the same as before. Still less attention is given to prevention of complications.

There are also a lot of misconceptions which even educated persons believe about diabetes. For example, the idea of controlling diet is restricted only to sweets. In our culture, the concept of quantity of food has not changed from the days of active physical labour like in the hunter gatherer / agricultural days. Thus allowing the Barker's hypothesis of thrifty gene to take its toll on us[6]. In the management of diabetes, medical nutrition therapy along with motivated physical activity and correct administration of medications are all extremely important [7].

Physical activity is ignored till a cardiovascular complication occurs. Usage of simple devices like glucometer is considered wrong. Insulin injection techniques are severely misguided. Very often insulin dosages are adjusted incorrectly by self, leading to severe hypoglycemic episodes.

When interviewed, many diabetic patients were not aware of how well to manage their lifestyle or how to make use of the available facilities. Many of our patients were not aware of physical activity or about the correct dietary practices. Learning self-management of diabetes is of paramount importance for better glycemic control.[8,9,10] There are also a lot of taboos even today, despite the social status and education. Correct insulin

administration are practiced by few patients on parenteral therapy [11]. Often complications arise from incorrect usage of medications.

Educating the public on Lifestyle diseases through mass media and periodicals had been in place for a long time. However the impact of this at a personal level may not be sufficient to create behavioral change [12].

Spending quality time with the patient regarding all aspects of diabetes and its management goes a long way in controlling glucose levels as well as delaying complications. This also avoids unnecessary frustrations. More over When education is given in a structured and personalized manner, a diabetes educator can motivate , give confidence to the individual and it becomes much more effective. In fact good diabetes education can achieve better glycemic control and can prevent several complications of diabetes mellitus.

In India at present there are no guidelines or specifications for structured diabetes education, though the burden is large. There are no diabetes educators in most facilities that provide treatment for diabetes. The aim of this study is to improve awareness about the necessity for a structured diabetes education.

Objectives
1. To assess the glycemic status of well-educated and motivated patients with diabetes mellitus .
2. To deliver high quality personalized and structured diabetes education to these patients.
3. To measure the impact of personalized and structured education in these individuals.

II. Material And Methods
This prospective study was carried out on patients who presented to the outpatient endocrine clinic in Kerala, South India during January to April 2014. A total 184 adult subjects were included.
Study Design: Prospective open label interventional study
Study Location: This was an outpatient clinic.
Study Duration: January 2014 to April 2014
Sample size: 184 patients.
Subjects & selection method: The study population was drawn from consecutive diabetic patients who presented to to the clinic during the study period.

Inclusion criteria:
1. Adult Type 2 diabetes mellitus patients

Exclusion criteria:
1. Pregnant women;
2. Patients who are wheelchair bound
3. Patients with malignancy
4. Patients with significant organ damage affecting activities of daily living.
5. Patients on concurrent steroids or therapy that can worsen glycemic control

Procedure methodology
A well-designed questionnaire was used to collect data. The questionnaire included socio-demographic characteristics such as age, gender, height, weight, BMI ,physical activity, nutrition,history of diabetes, its duration, medications, comorbid illness, anthropometric parameters and biochemistry investigations such as fasting blood glucose, and glycated hemoglobin (HbA1C).
HbA1c was measured using NGSP certified immunoassay (Cobas integra Roche diagnostics). HbA1c on enrollment in the study was termed HbA1c 1, repeated value at 3 months was termed HbA1c 2 and third value after 6 to 9 months was termed HbA1c 3. All biochemical assays were carried out by the same team of laboratory technicians using the same method, throughout the study period.

Information about the illness and medications were collected by detailed history taking and from all available prescriptions. Baseline characteristics of the patients were collected and height and weight were measured and using standardized methods. The body mass index (BMI) was calculated as the weight in kilograms divided by height in meters squared.

All eligible patients were interviewed in detail. Structured health education on various aspects of diabetes and lifestyle was delivered in detail. Every patient was educated on pathophysiology of diabetes, glycosylated hemoglobin, complications, medical nutrition therapy, correct practices of insulin administration (if they were on insulin), use of glucometer, self monitoring of blood glucose using glucometers, dose adjustment of insulin(when

required), diabetic foot care, management of hypoglycemia etc. Required daily calories were calculated for each person according to ideal body weight and amount of physical activity. Each person was encouraged to do physical activity according to their ability. Upper Limb exercises and air cycling were advised to those individuals who had problem with walking. Every patient on insulin was encouraged to call back with glucose readings and were helped with insulin dose adjustment. Each patient was educated by two health care providers individually and by one provider at follow up. Repeat education was given to those who demanded it or required it.

Medications were not increased in the first three months, but on follow up, changes were made according to the glucose levels.

Statistical analysis

All data was entered into Microsoft excel and summary statistics, mean, standard deviation and odds ratio were calculated with 95% confidence intervals.

Student's *t*-test was used to ascertain the significance of differences between mean values. Chi-square test was performed to test for differences in proportions of patients achieving target HbA1c before and after education. The level $P < 0.05$ was considered as the cutoff value for significance.

III. Result

There were total of 184 participants, with 124 females and 60 males. Mean age was 58.6 years. Mean duration of diabetes was 8.86 years. Mean BMI was 27.08 kg/m^2. Mean of HbA1c1 was 8.77%.

Table no 1 Shows the baseline characteristics

Table no 1

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Mean Age in years	58.63
Mean duration of diabetes in years	8.86
Male : female	1 : 2
Number of patients on insulin therapy	21
Mean BMI (kg/m^2)	27.08
Mean HbA1c at baseline % (HbA1c 1)	8.77
BMI >25 (%)	67.93 (125)

Follow up after 3 months

Three months after delivering structured health education, HbA1c was repeated. Mean of HbA1c2 was 7.44%. The mean ± s.d of reduction was 1.283± 1.336 %. HbA1c reduction was observed in 70.46% of our patients and 40.76% were able to achieve target HbA1c of less than 7%. The difference in mean HbA1c was statistically significant , *P value* <0.001. When an odds ratio was performed, it was observed that, not giving a structured education put the patient at a risk of 3.53 (95% CI 2.163 - 5.76) times for not achieving better glycemic control.

Follow up after 6 months

At 6 months follow up mean HbA1c(HbA1c3) was 7.35%. Mean HbA1c reduction was 1.917 ±1.313 from the baseline. 34.61% of the patients continued to have HbA1c < 7% at 6 months follow up.

Table no2 : Mean and Percentage Change in HbA1c before and after structured education.

	HbA1c 1	HbA1c 2	HbA1c 3	P value
Mean ± s.d (%)	8.774 ± 1.8	7.443 ± 0.8	7.35 ± 0.7	<0.05
change from baseline (%)		14.62	21.84	<0.05
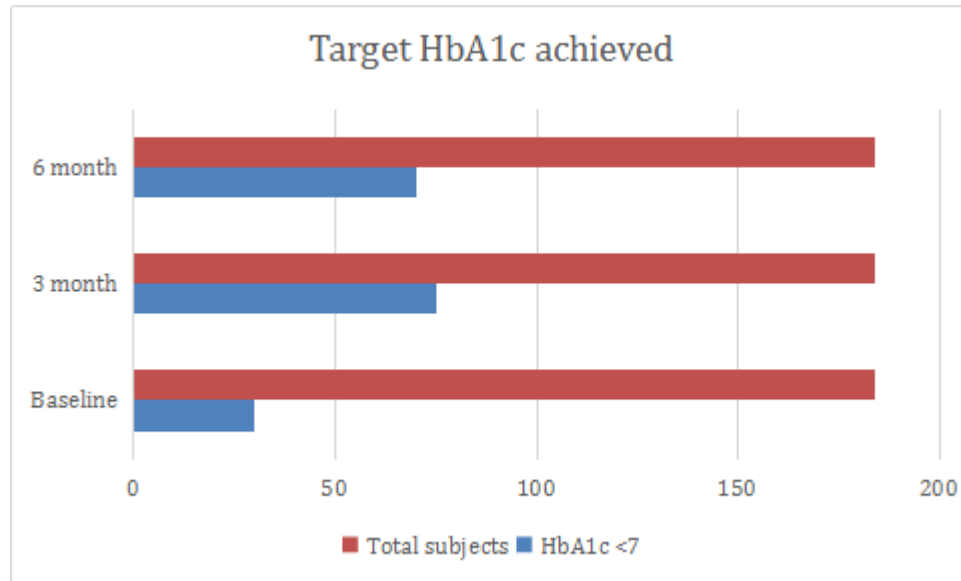
IV. Discussion

Glycemic control in patients with diabetes plays an important role in development of complications, both micro vascular and macro vascular.

Medical nutrition therapy, physically active lifestyle and antidiabetic drug therapy are the three pillars of management of hyperglycemia. Even when all standard therapies are given, glycemic targets are seldom achieved. Personalized, structured education on diabetes, and lifestyle in addition to the standard therapy proved to be efficient in achieving better glycemic indices.

Some of the reasons why structured , personalized education works better than drugs could be because of the longer time spent with the patient, empathetic listening, addressing the issue of hypoglycemia and alleviating fear of using insulin and glucometer. When a contact number is given and patients are encouraged to call, it boosts their confidence in therapy and builds rapport. Teaching to adjust insulin according to self monitored glucose value, increases the freedom to live more liberally, but responsibly.

In 34% of patients, number of medications and there by pill burden could be brought down and in 13% of those on insulin, dose could be decreased because Somogyi effect was recognized. Suboptimal insulin injection related dermatological problems also could be addressed when correct techniques were taught.

Diabetes self management education (DSME) was in place in the West for a very long time and trained diabetes educators play a key role in managing diabetes. Irish study DAFNE and DESMOND have clearly stated the beneficial effect of diabetes education [13,14,15]

However in India with the huge burden of diabetes, though there had been some attempt at training diabetes educators, the benefit is yet to reach masses of people suffering from diabetes[16].

This paper is the work done in a single peripheral clinic during a four month period. It is possible to achieve more and better results if there are adequate resources. Managing diabetes and diabetes education should become part of all paramedical curriculum as well. That way more personnel will be available to educate the large number of growing diabetic population. I t is time for authorities concerned to consider having more trained diabetes educators along with treating physician to look after this need.

V. Conclusion

Diabetes education is an integral part of managing diabetes patients. The need for adequate human resource in terms of educators who can reach out to the community and effectively control the disease progress and thereby complications needs to be considered part of health policy planning of the country.

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