

Patient Education In The Management Of Diabetes Mellitus

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ABSTRACT

Aim: A patient education programme in the management of diabetes mellitus (DM) was piloted in a government polyclinic. This study aimed to evaluate the effectiveness of the education programme in improving knowledge of DM and skills in self-care in order to achieve long term control of DM.

Method: The 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. The patients were assessed on their knowledge of diabetes and their practice for good control of the disease (dietary practice, compliance, home monitoring) through a questionnaire. Long term control was assessed by their glycosylated haemoglobin levels. The education programme comprised individual counselling using a diabetes education guide, talks, videoshows and food displays.

Results: 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 fibre food, reducing calories intake and cutting down oily/fatty food) when compared to the control group. Compliance with medication and the mean HbA_{1c} levels were also improved in the intervention group.

Conclusion: In this study the 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. Patient education is thus an important component in the management of diabetes mellitus.

Keywords: diabetes mellitus, patient education, evaluation, knowledge and practice

INTRODUCTION

Diabetes mellitus is a disease affecting about 8.6% of the adult population aged 18 years to 69 years in Singapore in 1992⁽¹⁾. This was an increase from a prevalence of 4.7% in 1984. It is one of the top 10 causes of death in Singapore and has been the sixth leading cause of death for many years now⁽²⁾. It is also one of the 10 most common diseases seen at the Family Health Service (FHS) clinics. In 1994, it was the third most common disease seen and 11.0% of attendances (ie 180,701) at FHS clinics were for

diabetes including repeat attendances⁽³⁾. Diabetes is associated with many complications. It increases the risk of ischaemic heart disease which is also one of the top killers in Singapore.

Research has shown patient education to be effective in changing behaviours, improving health status and saving health care costs⁽⁴⁾. Diabetes health education is an integral part of good diabetes care and should aim at motivating the patient for maximum self-care⁽⁵⁾. Studies have shown that education and training of diabetic patients in self-care helped to reduce the incidence of complications and improve patient outcomes^(6,7).

A study of this matter has not been done locally. Hence, a pilot project to evaluate the effectiveness of a systematic patient education programme for diabetic patients was carried out in one of the government primary health care clinics in Singapore. The project looked at the effectiveness of the education programme in improving knowledge of the disease and its complications, and skills in self-care in order to achieve long term control of the disease as measured by the glycosylated haemoglobin levels (HbA_{1c}).

METHOD

Queenstown Polyclinic was selected for the project based on logistical considerations. It is an average-sized polyclinic with about 2,500 patients on the diabetic register. It is large enough to provide enough patients for the project and yet not too busy for the project to interfere with its daily work.

All diabetic patients who were 65 years and younger seeking treatment at the polyclinic at the time of the project were recruited. They were either known diabetics or newly diagnosed cases. The patients were recruited for the project as and when they came for treatment. The first 100 patients who came for treatment were assigned to the control group. They were then booked for appointments on 2 days of the week to see the nurse for the pre-programme assessment. This was carried out over a period of one month for the control group. The next 202 patients were recruited into the intervention group in a similar way. In addition to the assessment, patients in the intervention group went through an education programme. The sample size was limited by the time allotted for the assessment and for the project. More patients were recruited for the intervention group than

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the control group as we wanted more people to benefit from the education programme.

Patients in both groups were assessed on their knowledge, practice, blood sugar and HbA_{1c} levels before and after the educational intervention. A questionnaire was used to assess the knowledge and practice of the patients. Trained nurses interviewed the patients in English, Chinese or Malay as chosen by the patients. The patients were also tested for their blood sugar and HbA_{1c} levels to check for control of their disease. One year after the patients in the intervention group had completed the educational intervention, patients in both groups were assessed again in the same way.

The questionnaire (which can be obtained from the authors) comprised 17 knowledge questions and 5 practice questions. Some questions had more than one part to the question. The knowledge questions included questions on the disease, complications, control and self-care. One point was given for each correct answer and the knowledge score was computed by summing the score of all the knowledge statements. The practice questions included asking the patients whether they tested their blood/urine sugar at home, took medicine/injection given by the doctor, made changes in the diet and smoking.

The outcome measures were the knowledge scores, the proportion of patients who practised the right habits, and control of the disease as measured by the blood sugar and HbA_{1c} levels. Paired t-test was used to analyse the changes in the knowledge scores and the blood sugar and HbA_{1c} levels. Measurements of knowledge scores are basically ordinal and the appropriate tests for ordinal data are non-parametric tests. However in our study, the mean scores were found to be nearly identical to the median scores and hence the use of parametric analysis (paired t-test) is unlikely to distort the results. The chi-square test was used to analyse the change in the proportion of patients who practised the right habits.

Intervention programme

An education programme consisting of individual sessions, group sessions and special sessions was the intervention for the project. A guidebook with a protocol, flow chart and background information was produced to help the health personnel conduct the education programme.

The control group did not receive the educational intervention. They were given the "usual" treatment as prescribed by the doctor and the usual advice that doctors give as part of the consultation. The intervention group in addition to the "usual" treatment went through the education programme which required the patients to attend at least 6 individual counselling sessions and 4 group sessions.

The individual counselling sessions were carried out by a nurse trained to do the counselling. This was done on a one to one basis or in small groups of less than 4 persons. The nurse counselled the patients using the 6 booklets from "My Diabetic Guide" produced by the Training and Health Education

Department. The booklets were "What Is Diabetes", "How To Control It", "Emergencies And What To Do", "Blood And Urine Tests", "Meal Planning" and "General Health Care". The patients went through at least 6 sessions - one session for each booklet. More sessions were scheduled if the nurse felt that it was necessary.

In addition to the individual counselling, the patients were scheduled to attend group sessions which included talks, videoshows and group discussions. Family members were encouraged to attend these sessions. Talks covered topics like "Diabetes: How to live with it", "Diet for a diabetic", "Prevention of complications of diabetes" and "Insulin injection for diabetes". Video programmes like "Diabetes: What is it" and "Diabetes: Self-Care" were shown. The dietitian also gave talks to the patients and set up food displays which demonstrated meals suitable for the diabetics. Special sessions were held for those with other risk factors like the smokers, the hypertensive patients and the obese patients, in between their scheduled counselling sessions.

RESULTS

About one and a half years after the commencement of the programme, 95 patients from the control group (95%) and 183 patients from the intervention group (91%) had completed the project. Twenty-four dropped out of the project for various reasons. Five patients were from the control group, of whom 2 passed away, 1 was followed up elsewhere and 2 did not turn up for the re-assessment despite reminders. Nineteen patients were from the intervention group of whom 1 passed away, 13 were followed up elsewhere and 5 did not complete the intervention. These patients were excluded from the analysis.

Socio-demographic and clinical characteristics of the patients

The socio-demographic and clinical characteristics of the patients are shown in Table I. There were more males in the intervention group (39.9%) than in the control group (27.4%). There were more Chinese in the intervention group (75.4%) than in the control group (66.3%). These differences were however not statistically significant ($p=0.053$ and 0.272 respectively). The mean age of the patients was 54.16 years in the control group compared to 53.86 years in the intervention group ($p=0.776$). The mean number of years the patients were diagnosed to have DM was 6.72 years in both groups. The control group and the intervention group were thus comparable in their socio-demographic characteristics and in the number of years diagnosed to have DM.

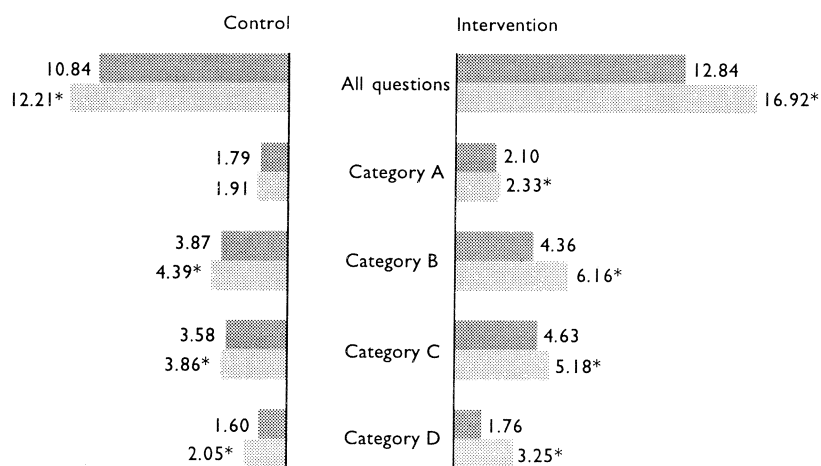
Effects on knowledge

Table II shows the change in knowledge scores before and after the intervention between the control and intervention groups. The mean knowledge score increased from 12.84 pre-intervention to 16.92 post-

Table I - Socio-demographic and clinical characteristics

Characteristics	Control (n=95)		Intervention (n=183)		p-value
	No.	%	No.	%	
Sex					
Male	26	27.4%	73	39.9%	0.053
Female	69	72.6%	110	60.1%	
Age-group					
Mean age (SD)	54.16	(8.45)	53.86	(8.20)	0.776
Below 40 years	7	7.4%	11	6.0%	0.868
40 to 49 years	17	17.9%	32	17.5%	
50 to 59 years	41	43.2%	88	48.1%	
60 and above	30	31.6%	52	28.4%	
Ethnic group					
Chinese	63	66.3%	138	75.4%	0.272
Malay	18	18.9%	26	14.2%	
Indian/Pak/Sikh	14	14.7%	17	9.3%	
Others	0	0.0%	2	1.1%	
No of years since diagnosed					
Mean years (SD)	6.72	(5.67)	6.72	(5.80)	0.994

Table II - Mean knowledge scores



Category A : Knowledge of diseases
 Category B : Knowledge of complications
 Category C : Knowledge of control/self-care
 Category D : Knowledge of footcare

Pre-intervention
 Post-intervention

* p < 0.05

intervention in the intervention group compared to the control group's change in knowledge score from 10.84 to 12.21. Although both groups showed a statistically significant increase, the difference in mean score was greater in the intervention group (4.08) than in the control group (1.37).

The knowledge questions were categorised into 4 groups to assess any differences in the different types of knowledge questions. The 4 categories are: A) knowledge of disease, B) knowledge of complications, C) knowledge of control/self-care, and D) knowledge of footcare. In general, the mean scores after the programme were increased in all categories for both groups. The increase in knowledge score was statistically significant for all categories in the intervention group. In the control group, the differences were statistically significant (p<0.05) for all categories except Category A. However, when the differences in the control and intervention groups were compared, they were of greater magnitude in the intervention group.

Effects on practice

Table III shows the change in proportion of patients who had the right practices before and after the intervention between the 2 groups. There was no significant change in the percentage of patients who tested their blood/urine sugar at home before and after the intervention, for both groups.

The percentage of patients who tested their blood/urine at home once a week as well as those who tested their blood/urine 2-3 times a week increased in both groups. The percentage who tested 4 times a week decreased in both groups. These changes were statistically significant for the intervention group (p<0.05) but not for the control group.

The percentage taking medicine/injection everyday or as advised by doctor increased significantly in both groups.

The percentage who changed their diet increased significantly (p<0.05) and were higher in the intervention group compared to the control group for all practices except for the practice of eating less sugary foods/using sugar substitutes. There were no significant changes in any of the dietary practices in the control group.

There was also no significant change in the number who smoked in both groups.

Effects on blood sugar and HbA_{1c} levels

Table IV shows the changes in blood sugar and HbA_{1c} levels before and after the intervention between the control and intervention groups. There was no significant reduction in the fasting blood sugar levels in the 2 groups. However, the mean HbA_{1c} level was significantly reduced (p<0.001) in the patients in the intervention group from 8.96% to 8.55% compared to the control group where the reduction was not significant (from 9.14% to 9.13%).

Table III - Change in practice

Practice question	Control				Intervention			
	Pre		Post		Pre		Post	
	No.	%	No.	%	No.	%	No.	%
1) Use urine or blood sugar test to test urine/blood sugar at home	86	90.5	82	86.4	174	95.0	171	93.4
2) No(%) who do blood/urine sugar test at home								
a. Once a week	5	5.8	7	8.5	22	12.6	27	15.8*
b. 2-3 times per week	12	14.0	18	22.0	35	20.1	57	33.3
c. 4 times per week	69	80.2	57	69.5	117	67.2	87	50.9
3) Taking medicine/injection given by doctor								
a. Everyday/advised by doctor	81	87.1	91	97.8*	169	93.9	179	99.4*
b. Sometimes or if I do not feel well/Didn't take	12	13.0	2	2.2	11	6.1	1	0.6
4) Change in diet after being told you have diabetes?								
a. Eat less sugary food/use sugar substitute	89	93.7	82	86.3	177	96.7	177	96.7
b. Take more unpolished rice/take more high fibre food	21	22.1	30	31.6	36	19.6	83	45.3*
c. Reduce total calories intake if overweight	52	54.7	49	51.6	65	35.5	128	69.9*
d. Cut down oily/fatty food	29	30.5	29	30.5	43	23.5	77	42.1*
5) Do you smoke?								
a. No/Yes, previously	80	84.2	82	86.3	165	90.2	163	89.1
b. Yes, currently	15	15.8	13	13.7	18	9.8	20	10.9

*p-value = <0.05

DISCUSSION

After the intervention programme, the intervention group showed an improvement in knowledge. Although knowledge scores improved significantly in both groups, the improvement in the intervention group was much higher. The smaller improvement in the control group could be explained by the advice that they received in the normal course of treatment and from other ongoing sources of education like video programmes being screened in the clinics. When the knowledge score was broken down into various categories, the conclusion drawn was the same - that although knowledge scores improved significantly in all categories for both groups (except Category A of the control group), the intervention group had a greater improvement. This bigger improvement in the intervention group as compared to the control group for both the overall score as well as the score for the different categories could thus be attributed to the intervention.

Although blood tests for the sugar levels are more accurate than urine tests, the patients were assessed on the practice of doing both as many of them were used to doing urine tests for many years now. There was no improvement in the home monitoring of the blood and urine sugar. In fact, more patients did the tests less frequently. Although this was statistically not significant for the control group, it was for the intervention group. One possible reason was that the patients who went through the intervention developed

a sense of security (because they saw the nurses regularly for their education) and hence did not see the need to test their blood/urine so often. To find out the actual reasons would need further investigations. However, the reduction of frequency need not alarm us as the number of times the patients need to monitor their blood/urine varies according to the severity of their disease and this has to be decided by their doctor. What was more important was that the total number of patients monitoring their blood/urine sugar at home did not increase even after the intervention. This shows the need to have a greater emphasis on home monitoring in our education programme if we want more patients to monitor the control of their disease.

There was an improvement in the percentage taking medicine/injections as advised by the doctor. The increase though significant, was small. This could be explained by the fact that the pre-intervention percentage was already high.

The intervention group also showed an improvement in the dietary practice after the intervention. With the exception of eating less sugary foods/using sugar substitute, where there was no significant increase in the percentage of patients making this change, significantly more patients took more unpolished rice and high fibre foods, reduced their calorie intake and cut down on oily/fatty foods. This could be attributed to the intervention as the control group showed no significant changes.

Table IV - Change in blood sugar and HbA_{1c} levels

Measurement	Control (n=95)			Intervention (n=183)		
	Pre	Post	Mean difference	Pre	Post	Mean difference
Mean blood sugar (mmol/dL)	9.78 (3.70)	9.57 (3.27)	0.22	8.68 (3.41)	8.43 (3.14)	0.25
Mean HbA _{1c} (%)	9.14 (1.89)	9.13 (1.91)	0.01	8.96 (1.71)	8.55 (1.67)	0.41*

Number in parenthesis is standard deviation

* p<0.001

There was no significant change in the smoking habit. Although there were special sessions for smokers, this educational intervention focused more on diabetes, thus the focus and emphasis to help smokers stop smoking was not there.

The limitations in this study include the non-random selection and allocation of patients to control and intervention groups. The lost to follow-up rate is 5% in the control group and 9.5% in the intervention group. The small scale study carried out in one clinic also limits extrapolation of the findings to the general population.

Another limitation in this study is in the self-reporting of the practices that the patients should be doing. As it is self-reporting, the patients may actually report on what they should do (which is measurement of knowledge) rather than what they actually do (which is measurement of practice). However this limitation can be checked against an objective measure like the HbA_{1c} levels.

Although the fasting blood sugar levels did not show any significant changes before and after the intervention in both groups, the HbA_{1c} levels improved significantly in the intervention group as compared to the control group. The HbA_{1c} level is a better indicator of control of the disease than fasting blood sugar. As this study showed that HbA_{1c} levels improved with the intervention, we could conclude that the educational intervention had helped to improve control of the disease and that the patients had actually changed their practices which are important factors in the control of the disease.

CONCLUSION

The educational intervention which was piloted in a polyclinic was observed to have improved the control of the disease (as measured by the HbA_{1c} levels). This could be explained by the improvement in the knowledge and practice (diet and compliance with medication) which was observed in the diabetic patients who received the intervention. Patient education is thus an important component in the management of diabetes. This intervention programme could be improved by having a greater

emphasis on home monitoring and changing other risk behaviours like smoking.

All polyclinics are now carrying out patient education for their diabetic patients. The nurses use the diabetes education guide (which has been revised since then*) to counsel their patients to help them in the self-care and management of their disease. This guide is a useful tool for counselling and we recommend it for use in patient education in the management of diabetes mellitus.

* The guide is now called "What Every Diabetic Should Know - Your Guide to Diabetic Control" and contains 3 booklets - "Diabetes and How to Control It", "Healthy Eating and Meal Planning", "Living with Diabetes" and 3 posters - "Checklist for Diabetes", "Footcare", "Insulin Injection".

ACKNOWLEDGEMENT

This study was carried out in collaboration with the Family Health Service (FHS). The authors would like to thank Dr Y Atputharajah and the FHS representatives of the working committee, and the staff of Queenstown Polyclinic for their help in carrying out this project.

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