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ORIGINAL ARTICLE

The Impact of Two Diabetes Educational Programs on Patients with Diabetes in Malaysia

AL-HADDAD MA*, IBRAHIM M I M **, SULAIMAN S A S ***, MAARUP N ****

ABSTRACT

Aims: This study was conducted to measure the effectiveness of 2 different diabetes educational programs (less structured vs structured).

Setting: Universiti Sains Malaysia Health Center.

Design: Prospective observational study design.

Methods and Materials: Patients were invited to attend one monthly session of an educational program for a period of 4 months. The first group attended the less structured program while the second group attended the structured program. Patients' glycated hemoglobin (HbA1c), Body Mass Index (BMI) and Blood Pressure (BP) were compared at the baseline, end of the program and after four months of the end of the program.

Statistical Analysis: Repeated Measures ANOVA test was used to compare the three periods while Mann Whitney U test was used to compare between both groups. All data were analyzed using SPSS version 12 at a significance level of less than 0.05.

Results: Results showed that HbA1c level significantly increased in the less structured group while significantly reduced in the structured group. BMI showed a slight increase in both groups, but was not statistically significant. On the other hand, systolic BP showed a significant reduction in the less structured group while no significant reduction was found in the structured group. Diastolic BP reduced slightly in both groups but was not statistically significant. Structured diabetes educational program was shown to be more effective than the less structured program. Patients' BMI has been increased slightly which requires further research to find the reasons behind that. Most other results showed improvements even though some of them were not statistically significant.

Conclusion: This study provides evidence on the effectiveness of diabetes educational program as well as the importance of communication skills in developing any patient-educational programs. As result, it can be used as a guideline for the policymakers in Malaysia for developing diabetes educational programs at the national level.

Key Words: diabetes; education; structured program; Malaysia; outcomes.

*, **Discipline of Social and Administrative Pharmacy, *** Discipline of Clinical Pharmacy, [School of Pharmaceutical Sciences], **** Health Center, Universiti Sains Malaysia, 11800 Penang, (Malaysia)

Corresponding Author:

Mahmoud Al-Haddad
School of Pharmaceutical Sciences,
Universiti Sains Malaysia, 11800 Penang,
Malaysia. Email: dr_mahmoud77@hotmail.com
Tel: +6 012 5534547

Introduction

Background

Diabetes is of high prevalence worldwide. In 2005, the number of diabetic patients in the US reached up to an alarming 20.8 million [1]. In the year 2000, data from 12 countries in the Western Pacific region showed that the prevalence of diabetes among adults exceeded 8% [2]. In 1993, the prevalence of diabetes in Malaysia was 8.2% (urban areas) and 6.7% (rural areas), 8.9% in Singapore and 10.9% in Japan [2]. The first and second National Health and Morbidity surveys found that the prevalence of diabetes in Malaysia increased from 6.3% in 1985 [3] to 8.3% in 1996 [4].

The estimated lifetime risk for developing diabetes in the US was found to be 33% for men and 39% for women [5]. Many factors play a major role in the increase of the prevalence of diabetes. Some of these factors are ageing, which is estimated to increase in Malaysia [6], over weight, stress and intake of large amounts of unhealthy food.

The patient's adherence to the recommendations of their healthcare providers is one of the main contributing factors for diabetes management. Therefore, improvement of lifestyle would not only benefit patients by preventing the development of diabetes complications, but it also improves the patient's quality of life by improving their physical activities and weight reduction [7]. Thus, the essence of diabetes management and education has been explored.

Diabetes management is not an easy task as patients need to change their lifestyle, change their daily food habits and physical activities [8], learn how to deal with diabetes medications, learn how to deal with complications and how to monitor blood glucose levels [9] which make diabetes management more difficult. Therefore, the responsibility of health professionals is to help patients make decisions that meet with their goals and overcome barriers through professional advice, education and support [10].

Thus, the main objective of this study is to measure the impact of two different diabetes educational programs on HbA1c, body mass index (BMI) and blood pressure (BP) on diabetic patients.

Materials and Methods

The course includes a group-based one monthly teaching session (90–120 min each) for a period of four months. Patients were then followed up for four months after completing their fourth (last) session.

Study Design

A prospective observational study design was used to make a comparison between two different diabetes self management programs (DSMPs) at the Universiti Sains Malaysia (USM) Health Center.

Study Population

Staff, dependents and pensioners who were type 2 diabetics at the USM main campus were eligible to be included in this study. They were expected to be able to attend all the classes and also to be able to communicate in the Malaysian national language.

Program structures

The Diabetes Self Management Program was launched in August 2005. During this period, patients were invited to attend the educational sessions. They were given four

different sessions on diabetes education. Surprisingly, the HbA1c levels of the patients at the end of the program were higher than the baseline. This prompted the researchers and the educators to hold a meeting to investigate the reasons for these negative outcomes. It was concluded that the way classes were conducted, could be the possible reason for these negative outcomes. The classes were mainly a one-way communication in which patients had limited opportunity to share their experiences and opinions during the discussion. As a result, in February 2006, the researchers and educators decided to improve the way the program was conducted. The main change made was, the decision to make the sessions to be conducted in 2-way communications by encouraging patients to participate and to share their experiences with their colleagues and educators. In addition, the researcher and educators gave their contact numbers to patients to assist them at any time when they needed consultation or assistance. This was believed to strengthen the provider-patient relationship which was assumed to increase the patient's adherence. Therefore, the first group who joined the program in August 2005 was referred to as the less structured group, while those who joined the program in February 2006 were referred to as the structured group.

Patient Recruitment

The less structured program started in August 2005. During this period, a list of patients with diabetes was obtained from the USM Health Center and patients were randomly selected and contacted. During the phone calls, patients were briefed about the program and specific dates were given for their first appointment. During the meeting, patients were given details about the program and verbal informed consent was obtained from them for participation in the study. During the period between August 2005 and February 2006, a total of 33 patients agreed to join the program and successfully completed the 4 sessions. In February 2006, all the patients in the list

who had not participated in the previous program were invited. Appointments were given and verbal informed consents were obtained from those who agreed to participate in the study. A total of 41 patients successfully completed the four sessions between February 2006 and January 2007.

Program Instructors

A team of health professionals was involved as diabetes care program educators. This program included two clinical pharmacy lecturers from the School of Pharmaceutical Sciences, one medical doctor, one nurse from the USM Health Center, one pharmacist from the School of Pharmaceutical Sciences and three pharmacists from the National Poison Center, Malaysia. A time table was carefully designed to make sure that each group of patients met at least one pharmacy lecturer, medical doctor and pharmacist during their four sessions.

Program Sessions

Both programs, the structured and the less structured, comprised of four different sessions.

Session One: Diabetes Overview And Diet

During this session, patients were briefed about the chronic nature of the disease, different types of diabetes and the role of insulin in the body. Furthermore, patients were given information on the type and amount of healthy food that should be consumed. They were then taught how to calculate the calories in different types of food.

Session Two: Diabetes Medications

The main purpose of this session was to provide an overview of medications used in the treatment of diabetes and the strategies for self-management of diabetes. Patients were also briefed on the different regimens of oral anti-diabetics and insulin. In addition

to that, patients were briefed about drug-food interactions and the side effects of each regimen.

Session Three: Diabetes Complications

This session was aimed to provide an overview of the major complications of diabetes. The intention was not to frighten the patient, but to convey the good news that the self management of diabetes with the goal of optimal diabetes control can help to delay the onset and reduce the severity and the complications associated with the disease. Patients were taught about the long term complications of diabetes and the relationship between diabetes and high blood pressure, cardiovascular disease, retinopathy and neuropathy. Lastly, patients were taught about the importance of self care management in avoiding the development of diabetes complications.

Session Four: Exercise And Foot Care

This session emphasized on providing patients with an overview of the role of exercise in the management of diabetes and guidelines for safe and effective exercise. Patients were briefed about the role of exercise in delaying or preventing the development of complications. Patients were also taught safe exercising methods and were given practical training in performing some of these safe exercises.

Data Collection Procedure

Classes were conducted every Wednesday. Patients were contacted one day before each class and were reminded to attend their session the following day. Before starting each session, the following measurements were taken from patients, which were considered as key measurements for the program evaluation:

1. At the first session (class), a blood sample was taken for measuring HbA1c. In addition, the patient's blood pressures

(BP) and body mass indexes (BMI) were measured.

2. During the second and third sessions, only BP and BMI were measured.
3. At the last session (4th class), all the samples (HbA1c, BMI, and BP) were taken.
4. Patients were called in four months after the end of the program and all the measurements (HbA1c, BMI, and BP) were taken from them again.

Statistical Analysis

The Repeated measures ANOVA test [11] was used to compare the differences in HbA1c, BMI and blood pressure measurements for the less structured group and the structured group before and after the intervention. Bonferroni post hoc test [11] was used to make the pair-wise comparisons if repeated measures ANOVA showed any significant difference. In addition, the Mann Whitney U test was used to compare between both groups. All analyses were done using the SPSS software package, version 12 at a significance level of 0.05.

Results

Study participants

A total of 74 patients successfully completed the study. Of these, 33 patients (44.6%) were enrolled in the less structured program and 41 patients (55.4%) were involved in the structured program. Two thirds of the participants were males.

[Table/Fig 1] compares the outcome measures of at three different periods for both groups. HbA1c values significantly increased in the less structured group between the baseline and the end of the program (mean difference = 0.743, 95%CI: 0.198 to 1.289, $p=0.016$). However, there was no significant difference between the measurements at end of the program and the follow up ($p=0.113$). On the other hand, the structured group showed a significant reduction in the HbA1c level between the baseline and the end of the program (mean

difference = 0.479, 95%CI: 0.137 to 0.857, $p=0.004$) (5.8% reduction compared to the baseline). There was no significant difference between the measurement at the end of the program and at follow up ($p=0.495$). Both groups showed no statistically significant differences in BMI measurements during the study period, even though there was a slight increase in the BMI level at the end of the study. In addition, systolic BP showed that only the less structured group had a significant difference during the study period ($p=0.026$). The Bonferroni post hoc test showed a significant reduction in systolic BP between the end of the program and the follow up period (mean difference = 4.276, 95%CI: 0.586 to 7.966, $p=0.006$), but no significant difference between baseline and end of the program ($p=0.399$). The structured group showed no significant difference in systolic BP during the study period ($p=0.299$). In addition, diastolic BP measurements showed no significant differences during the study period for both groups ($p=0.144$ and 0.070), respectively.

(Table/Fig 1) Comparison between the three periods for both groups

Variable	Baseline mean±SD (n)	End mean±SD (n)	Follow up mean±SD (n)	p-Value
Less structured group				
HbA1c	7.856 ±1.13 (32)	8.375 ±1.61(32)	8.400 ±1.52(26)	0.009
BMI	29.069±4.54 (29)	28.181±3.43 (26)	27.443±3.57 (14)	0.388
Syst. BP	127.21±15.95 (33)	127.73±9.01 (31)	120.93±15.05 (31)	0.026
Diast. BP	81.28±6.37 (33)	78.94±7.17 (31)	79.51±5.31 (31)	0.144
Structured group				
HbA1c	7.868 ±1.50 (41)	7.408±1.49(40)	7.353±1.55 (30)	0.007
BMI	28.036±4.12 (33)	28.732±4.43 (33)	28.866±4.77 (32)	0.079
Syst. BP	124.95±11.23 (30)	122.45±9.30 (30)	121.97±8.58 (30)	0.299
Diast. BP	82.07±6.60 (30)	78.46±6.16 (30)	78.61±6.17 (30)	0.070

Comparison Between The Two Groups

[Table/Fig 2] shows the comparison between the 2 groups. HbA1c results showed no significant differences between both groups at the baseline ($p=0.969$). However, the HbA1c results of the structured group were significantly lower than the less structured group at the end (mean difference = 0.967, 95%CI: 0.234 to 1.701, $p=0.011$) and follow up periods (mean difference = 1.047, 95%CI: 0.188 to 1.905, $p=0.018$). On the other hand, BMI and diastolic blood pressure values showed

no significant differences between both the groups throughout the program. The systolic blood pressure, at the end of the program, was significantly lower in the structured group than in the less structured group (mean difference = 5.276, 95%CI: 0.536 to 10.017, $p=0.029$).

(Table/Fig 2) Comparison between the two groups

Variable	Time	Less structured group (Mean)	Structured Group (Mean)	p-value
HbA1c	Baseline	7.856	7.868	0.969
	End	8.375	7.408	0.011
	Follow Up	8.400	7.353	0.018
BMI	Baseline	29.069	28.036	0.339
	End	28.181	28.722	0.666
	Follow Up	27.443	27.443	0.289
Systolic BP	Baseline	127.2121	124.9556	0.516
	End	127.7312	122.4545	0.029
	Follow Up	120.9355	121.9778	0.740
Diastolic BP	Baseline	81.2828	82.0778	0.630
	End	78.9462	78.4697	0.777
	Follow Up	79.5161	78.6111	0.542

Discussion

In this study, we evaluated and compared two different educational programs in two different time periods, which is one of the limitations in our study design. But as mentioned in the methodology, there was no intention to develop 2 different educational programs, but to develop and evaluate an effective diabetes educational program. Following the preliminary evaluation of the initial program, negative outcomes were observed from the HbA1c values of the participants. Thus, a modification of the program was essential and therefore a comparison of the 2 diabetes education programs was justified. In addition, as mentioned in the methodology part, the first group who joined the less structured program was randomly recruited and the remaining patients who were not invited to attend the less structured program were invited to attend the structured program. Therefore, there is no evidence of selection bias among the two groups and this is confirmed by the baseline comparisons of both groups, which showed no significant differences in all the clinical measurements. Therefore, both programs were compared to measure the effectiveness of improving the communication skills between the educators and the patients on their clinical outcomes.

This study has shown a significant increase in HbA1c levels in the less structured group. The patient's mean HbA1c level increased from 7.85% (range from 5.6% to 10.0%) at the baseline to 8.37% (range 5.3% to 12.4%) at the end of the program. This increase was not anticipated since it was hypothesized that an educational program should improve the HbA1c level of the patients. An ineffective communication with patients may have played an important role in forcing them not to follow the recommendations of their instructors. The structured group showed different results from the other group. Their HbA1c level at the end of the program was significantly lower than that of the baseline (5.85% reduction). It was reduced from 7.86% (range from 5.3% to 11%) at the baseline to 7.40% (range from 5.1% to 11.8%) at the end of the program. These results were anticipated due to improved communication with the patients, giving them more opportunities to discuss their problems, and offering them the freedom of calling the program instructors at any time to discuss any issue related to their health concerns. Well managed diabetes educational programs would lead to better outcomes in HbA1c values, which were found in many other studies [12],[13],[14],[15].

Obesity is common among patients with diabetes. Weight reduction is associated with many health benefits, including the reduction of BP and glycaemic control [16].

Gregg et al found in 2004, that mortality rate ratios were 23% lower in diabetic patients who tried to reduce their weight than those who did not try to lose weight. It has been found that even patients who failed to lose weight, had lower mortality ratios than those who never tried to lose weight. Patients who tried to lose weight by eating healthier foods and performing physical activities may follow healthier life styles, which are not related to weight loss. They may quit smoking and use seat belts while driving, which has an effect on the mortality rates [17]. Results of this study showed no

significant differences in BMI levels when the two groups were compared. There was a slight reduction in BMI for the less structured group, which reduced from 29.06 kg/m² to 28.18 kg/m² (ranged from 21.9 kg/m² to 41.2 kg/m²), but this was not statistically significant (p=0.388). The structured group showed a slight increase in the mean BMI level between the baseline and the end of the program, 28.03 kg/m² vs 28.72 kg/m² respectively, but it was also not significant (p=0.079).

Obese diabetic patients are generally sedentary. Patients with diabetes complications find it difficult to perform regular exercises. Also, patients taking oral hypoglycaemic agents commonly gain weight due to the medications [18]. Both groups were overweight and obese, with a mean BMI >28 kg/m². Patients were given a whole session on meal planning and another session on exercise. In these classes, the disadvantages of overweightness and the complications associated to it were stressed. Even though it appeared that patients found it difficult to change their meal plans, there should probably be additional sessions to discuss with patients their BMI results and to understand their reasons for not reducing their weight. On the other hand, similar findings were found in an empowerment educational program for diabetic patients which was conducted at seven primary care centers in central Sweden, whereby BMI values showed no significant differences between the intervention and control groups [19].

Hypertension in patients with diabetes was found to be significant in a study which was conducted in Malaysia. It was found that a significant proportion of diabetic patients had hypertension which was not managed according to guidelines [20]. The less structured group showed a significant reduction in systolic BP between the end of the program and the follow up period. When both groups were compared, it was found that there was no significant difference between baseline systolic blood

pressure values, while at the end of the program, it was found that the structured group results were significantly less than those in the less structured group. Similar results were found in the University of North Carolina Enhanced Diabetes Care program which was developed in 3 phases to help diabetic patients in controlling their disease. Twelve months after the intervention, systolic BP reduced significantly by 9mmHg [21]. Moreover, 4872 patients from 647 physicians were enrolled in the disease management program for diabetic patients. The program was structured with regular visits every three months, as well as with the documentation of risks and intervention parameters. The results showed that the systolic BP reduced significantly from 147mmHg to 140 mmHg [22].

Although there was a slight reduction in diastolic BP within each of the 2 groups at the 3 different periods, these reductions were not significant. Also, there was no significant difference between the groups during the whole study period. Therefore, stressing on the importance of controlling blood pressure should be emphasized during the educational programs.

Study limitations

This study faced many limitations such as the difficulty in recruiting patients, the small sample size and financial constraints, which made it difficult for us to recruit a control group due to the expensive cost of the lab tests. Therefore, it would be difficult to generalize these findings on other settings. In addition, it was difficult to do further analyses and comparisons since we are comparing two different groups with two different time periods but as mentioned earlier, it was not intended to develop and compare two different educational programs.

Recommendations

This study provides policy makers a primary data, an insight about the

effectiveness of the diabetes educational program. Future programs are encouraged to focus more on weight reduction, meal planning, and a healthy lifestyle and to practically help patients in controlling their weight and meals.

Conclusion

From the clinical point of view, DSMP was found to be effective. In the structured group, the HbA1c level which is a surrogate indicator for blood glucose level controls, reduced significantly at the end of the program and even after four months of follow up. The importance of the communication between the disease management educators and patients with close monitoring was demonstrated by this study. On the other hand, both groups showed no significant changes in their BMI values. Therefore, emphasizing more on food planning and the importance of weight reduction are very important for the future success of similar programs.

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Conflicts of Interest:

None

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