

# The Effect of a Single-Session Diabetes Education on the Knowledge, and Attitudes of Patients with Type 2 Diabetes Mellitus Seen at Out-patient Clinics in Chinese General Hospital: A Prospective Cohort Study

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## Abstract

**Introduction:** With the increasing prevalence of diabetes mellitus (DM) in the Philippines, Diabetes Self-Management Education (DSME) remains to play a vital role in diabetes care. It is important in optimizing metabolic control, preventing and managing complications, and maximizing quality of life in a cost-effective manner. This study aimed to determine the effect of diabetes education on the knowledge and attitudes of type 2 DM patients. It also aimed to determine the topics that needed more emphasis during education.

**Methods:** A prospective study, which included 75 patients: 38 patients in the education group and 37 patients in the non-education group, was conducted. A single session diabetes education was given to the patients in the education group. Baseline and follow-up knowledge and attitude scores by using the modified, validated, Filipino versions of American Association of Clinical Endocrinologists (AAACE) Knowledge Evaluation Form and Diabetes Attitude Scale-3 (DAS-3), respectively, were compared between the education and

non-education groups. The changes in weight and body mass index (BMI) for both groups were also compared.

**Results:** Results showed that on follow-up, there was a significant increase in the mean percentage scores for knowledge in the education group. There was no significant increase in mean frequency of correct answers for questions on precautions prior to exercise, monitoring, nutrition and medication adjustment during ill days. Questions on psychosocial impact, and value of tight glucose control showed significant improvement in the education group, while one question on seriousness of diabetes did not improve significantly.

**Conclusion:** Diabetes education generally improved the knowledge and attitudes of patients towards their disease.

**Keywords:** diabetes education, knowledge, attitude, type 2 diabetes mellitus

## Introduction

According to World Health Organization (WHO) in 2014, the global prevalence of type 2 diabetes mellitus (DM) was estimated to be 8.5% among adults.<sup>1</sup> In the Philippines last 2016, the prevalence of diabetes reached 5.8%.<sup>2</sup> WHO also predicted that in 2030 diabetes will be the seventh leading cause of death worldwide.<sup>2</sup>

Diabetes Self-Management Education (DSME) and Diabetes Self-Management Support (DSMS) are vital elements of diabetes care. These help people with diabetes mellitus initiate effective self-management when they are first diagnosed. DSME and DSMS guide patients in optimizing metabolic control, preventing and managing complications, and maximizing quality of life in a cost-effective manner. The American Diabetes Association (ADA) recommends that patients with diabetes should engage in DSME to enhance their knowledge, skills and ability, which are necessary for

diabetes self-care.<sup>3</sup> In a number of studies, DSME is associated with improved diabetes knowledge, self-care behavior, clinical outcomes, such as lower A1C and self-reported weight.<sup>3</sup>

In 2014, Ku, et al. in the Philippines, investigated the effects of implementing a context-adapted DSME and DSMS projects on knowledge, attitudes, self-management practices, adiposity/obesity and glycemia among diabetic patients for one year.<sup>4</sup> They utilized the Diabetes Knowledge Test, Diabetes Knowledge Questionnaire and the Diabetes Attitude Scale-3 (DAS-3) of the University of Michigan Diabetes and Training.

Recently in our institution, the Diabetes and Endocrine Center (DEC) was established to render comprehensive individualized education for diabetic patients. This would help them understand their disease, and reinforce their initiative to maintain a healthy lifestyle and eventually live a life with minimal complications.

The main objective of this study was to determine the effect of diabetes education on the knowledge and attitude of patients with type 2 DM by using the modified,

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pre-validated Filipino translated questionnaires, namely, American Association of Clinical Endocrinologists (AACE) Knowledge Evaluation Form<sup>5</sup>, and the DAS-3<sup>6</sup>, respectively. This study also aimed to compare the frequency of patients who answered correctly for each knowledge question, median scores and the range of scores for each attitude question between education group and non-education group at baseline and on follow-up. This was also designed to determine the change in the weight, and body mass index (BMI) of the patients between education and non-education group from baseline until follow-up.

## Methods

### Study design and subjects

This is a prospective cohort study. Patients who were more than 18 years old, diagnosed with type 2 DM based on the ADA criteria, and seen at outpatient clinics were included in the study. Pregnant, or hospitalized patients and those who had previous diabetes education counseling were excluded. Subjects were recruited by convenience sampling from June to August 2016.

### Questionnaires

A three-part questionnaire was given to patients upon enrollment and on follow-up. It was composed of the Patient information sheet or follow-up form, Knowledge Questionnaire, and Attitude Questionnaire (DAS-3).

Patient information sheet included the following: patient's name, age, sex, address, contact number, duration of diabetes, medications (diet, oral medication, insulin, or both), attending physician, educational attainment, and compliance with medications. This was filled up by the patient upon enrollment in the study. Height, weight and BMI were recorded.

The Knowledge Questionnaire was adapted from the previously translated and validated Filipino version of AACE Knowledge Evaluation Form by Verastigue-Custodio.<sup>5</sup> This included topics on diabetes overview, nutrition, exercise, monitoring and medications. Content validity was performed by four diabetes educators (two nurses and two dietitians) who independently selected 15 out of the 67 questions which they deemed to be most relevant and applicable to the present local setting. (Appendix A and B).

The Filipino version of the DAS-3 that was previously formulated by Yao et al. in 2004<sup>6</sup> was used in this study. After a review of the 33-item questionnaire, content validity was performed by selecting 10 questions. Five subcategories, with two questions for each subcategory were included. Subcategories included the following: need

for special training, seriousness of DM, value of tight control, psychosocial impact, and patient autonomy (Appendix C and D). Initial testing of the final knowledge and attitude questionnaire was done among 10 patients to observe the time needed to complete the questionnaire and to check their understanding on the questions given. A lower score indicated that the patients strongly agreed on the given issues implying a strong impact on their attitude but the reverse scoring was applied to one question on value of tight control (A5).

### Diabetes education

Full module diabetes education offered by the DEC at the Chinese General Hospital (CGH) is a single session counseling which lasts for approximately 90 to 120 minutes. A one-on-one session is offered to private patients, while a group session is rendered to charity patients. Patients were presented with flip charts for each module. It included the following modules: diabetes overview; nutrition and exercise; glucose monitoring and insulin administration; and foot care. At the end of the module, educational kits were given to patients, which included leaflets on diabetes, dietary counseling and their personalized meal plan.

### Data collection

Convenience sampling was done by the researcher during clinic hours. Patients who were seen at the OPD Clinics (private and charity) but not referred to DEC were included in the non-education group. On the other hand, patients who were seen at DEC for full module diabetes education were included in the education group. Referral to DEC was made based on the physician's discretion. Informed consent was secured. Information and other parameters were recorded including height, weight, and BMI.

Patients were then requested to answer the questionnaire with the assistance of the investigator if necessary. Afterwards, the education group proceeded to the full module diabetes education. For the non-education group, they were reminded to follow-up with their physician on their assigned date. On follow-up, patients were instructed to answer the same questionnaire. Due to some unavoidable circumstances of the subjects, their follow-up period differed from three to six months from the enrollment date. Enrollment in the study was not disclosed to the attending physicians to avoid deliberate reiteration of the answers to the questions, which may lead to recall bias.

Recruitment of subjects was done between June to August 2016 for the baseline period and from September to December 2016 for the follow-up of patients.

## Outcome

Primary outcome was the change in the mean percentage scores and frequency of correct answers per item on the knowledge questionnaire and median and range of scores on the attitude questionnaire from baseline and on follow-up (three to six months). Secondary outcomes included comparison in the change in weight, and BMI from baseline and on follow-up.

## Ethics approval

The research protocol was approved by the Research and Ethics Review Board of the CGH. Informed consent, written both in Filipino and English, was explained by the investigator to the patients.

## Statistical analysis

A minimum sample size of 68, or 34 per group, was required for this study. This value gives 80% power, a margin of 20% to detect an effect size of 0.282 and 0.05  $\alpha$ -level of significance. The value used for this sample size computation was based on a study by Tuomilehto J.<sup>7</sup> Descriptive statistics was used to summarize the clinical characteristics of the patients. Frequency and proportion were used for nominal variables, median and range for ordinal variables, and mean and standard deviation (SD) for interval/ratio variables.

Independent Sample T-test, Mann-Whitney U and Fisher's Exact/Chi-square test were used to determine the difference of mean, median and frequency between the education and non-education patient groups. Paired sample t-test, Wilcoxon signed rank test and McNemar's test were used to determine the difference of mean, median and frequency between baseline and follow up. Comparison among the different intervals from baseline until follow-up was made between the education and non-education groups by using oneway ANOVA and Kruskal wallis test. Subgroup analysis was made among female and male groups as well as the private and charity clinics by using Mann-whitney U test and independent sample T-test.

All valid data was included in the analysis. Missing variables were neither replaced nor estimated. Null hypotheses were rejected at 0.05  $\alpha$ -level of significance. STATA 12.0 was used for data analysis.

## Results

There were 44 patients initially enrolled in each group. In the education group, five patients were lost to follow-up and one died. While in the non-education group, there were seven patients who were lost to follow-up. At the end of the study, there were 38 patients in the education group, and 37

patients in the non-education group. At baseline, as shown in Table I, there were no differences in the age, marital status, educational attainment, anthropometrics, medications and duration of diabetes between the education and non-education groups. Differences were found in sex composition and clinic attended, where the education group had a higher percentage of females (82% vs. 59%) and charity-attending members (39% vs. 11%) as compared to the non-education group.

Since the subjects had different follow-up periods, namely three, four, five and six months, we compared the characteristics of the patients among the different intervals as shown in Table II. There was no significant difference in their characteristics among patients with different follow-up intervals except for age, gender, marital status and type of clinic attended. For those who had their follow-up at four months, there was significant proportion of older age group in the non-education group and also a greater proportion of married patients in the education group. There was greater proportion of females in the education group who had their follow-up at five months. Among those who had their follow-up at six months, there was greater proportion of private patients in the non-education group.

At baseline, both education and non-education groups were similar in their knowledge scores (Table III). On follow-up, the education group, but not the non-education group, had significant improvements in scores for knowledge (baseline,  $67\% \pm 17\%$ ; follow-up,  $87\% \pm 12\%$ ;  $p < 0.001$ ).

Proportion of correct answers in the knowledge questionnaire increased significantly upon follow-up among education group for all items except five: two pertaining to exercise (K4 and K5), one on monitoring (K7), and medication adjustment during illness (K10), and one about nutrition (K14) (Table IV). On the other hand, significant improvements in scores were demonstrated for only two questions in the non-education group: one on general knowledge (K2) and another on nutrition (K12). When frequency was compared between two groups on follow-up, there was significantly higher frequency in the education group except for one question pertaining to also to exercise (K5), and on medication adjustment (K10) and four questions (K12-K15) on nutrition.

Furthermore, when the scores were compared among patients with different follow-up intervals, namely three, four, five and six months, there was no significant difference observed as shown in Table V.

For the attitude scores, both education and non-education patients were similar in their attitudes towards diabetes at baseline (Table VI). Although there was a decrease in median scores and range of scores in the education group from baseline to follow-up for all

subcategories, which implied that after education more patients had agreed that these issues had an impact on their attitude towards diabetes, this did not show any statistical significance. In the non-education group, the median and range remained relatively the same. On follow-up, there was a significantly lower score for the categories on need for special training and patient autonomy ( $p < 0.001$  and  $p = 0.005$ , respectively) in the education group when compared with the non-education group. Since a reverse scoring was assigned to one of the questions on seriousness of DM, this was not included for the subcategory analysis but was analyzed separately.

Three out of ten attitude items significantly improved in the education group (Table VII). These involved decrease in scores of: items A4 on the seriousness of diabetes and A9 on the psychosocial impact of diabetes. Their scores for item A5 on value of tight glucose control also became more desirable ( $p = 0.036$ ). No comparable changes were seen with the non-education group.

Also, when the change in scores were compared among the groups at different follow-up periods, it showed no significant difference except for the question on the seriousness of diabetes in patients who had their follow-up at three months versus patients who had their follow-up at four months, as shown in Table VIII.

Since there was greater proportion of female and charity patients in the education group, subgroup analysis was done to determine whether these factors may act as effect modifiers or confounders. It showed that there was consistent increase in knowledge scores for all subgroup analysis as presented in Tables IX and X. For the attitude scores, there was significant improvement in scores for the need for special training, psychosocial impact of diabetes and patient autonomy among the private patients and male patients (Tables XI and XII). Among charity patients, there was also significant improvement in the scores for value of tight glucose control, whilst among female patients, there was noted improvement in the scores for the need for special training, and patient autonomy.

We had insufficient evidence to demonstrate significant changes in the weight and BMI of patients who underwent education, but among non-education patients, there was a significant increase in average weight from baseline until follow-up, as shown in Table XIII ( $68.26 \pm 14.71$  and  $69.05 \pm 14.94$ , respectively).

On follow-up, only two percent in the education group and four percent in the non-education group had other source of diabetes education, which included television and radio but this was non-significant between the groups (Table XIV).

## Discussion

In this study, the baseline characteristics did not differ significantly except that in the education group there were greater proportion of females (81% vs 59% in non-education group) and charity patients (39% vs 10% in the non-education group). The disproportion of females in the education group may be due to the fact that they are housewives and it was more feasible for them to attend the teaching modules. There was also greater prevalence of diabetes among women compared with men, 6.1% vs 5.5% respectively.<sup>2</sup> Another possible reason for the increased proportion of women may be due to the increasing awareness that diabetic women were at higher risk of developing cardiovascular disease as well as risk of mortality from coronary heart disease and stroke.<sup>8</sup> While the higher proportion of charity patients in the education group may be attributed to the lower costs of diabetes education offered for these patients. Also, since most of the charity patients were unemployed, it was more feasible for them to attend the diabetes education.

Among the different follow-up intervals, the significant differences in the age, gender, marital status and type of clinic attended may be due to personal factors such as the subjects' availability and their socioeconomic status in complying with the follow-up.

For the knowledge questionnaire, the education group had significantly increased scores on follow-up (86%) compared to the baseline scores (67%). While in the non-education group, the mean percentage of scores at baseline (63%) decreased on follow-up (55%). When scores on follow-up were compared between the two groups, there were significantly higher scores in the education group (86%) than in the non-education group (55%). Several studies showed that diabetes education strategies, in general, had positive effects on the patients' knowledge.<sup>9</sup>

Upon analyzing the effect of diabetes education for each question on diabetes knowledge, we found that there was significantly increased frequency of correct answers on all questions for definition of diabetes, and some questions on need for monitoring, medications and nutrition. While there was an increase in frequency of correct answers on all questions for exercise precaution and some questions on monitoring, adjustment of medication during sick days, and nutrition, this was not significant. In a study by Pereira in 2012, it showed that diabetes education increased the knowledge of the patients in all the topics including general questions, physical activity, diet, foot care, clinical parameters, hypoglycemia, chronic complications, and family support.<sup>10</sup> Our study showed that more emphasis and clarifications should be given for the topics on exercise precautions, monitoring, medications and nutrition during the diabetes education.

When the different follow-up periods were compared between the education and non-education groups, there was no significant difference, which implies that different intervals did not influence the outcomes on the knowledge scores.

For this study, the increase in scores cannot be correlated with any change in their behavior. Also, it is important to understand that although the patient's knowledge is the basis to maintain diabetes self-management, increase in knowledge may not always necessarily mean a change in behavior.

We also observed the effect on the attitude since both knowledge and attitude would affect the behavior of the patients towards their disease. When analyzed per subcategory, diabetes education had a positive effect on their attitude as reflected by the decrease in the median of scores and range, although these differences from baseline to follow-up were not significant (Table VI). However, on follow-up, there were greater number of patients in the education group compared with the non-education that strongly agreed on the need for special training and patient autonomy. While for the seriousness of diabetes and psychosocial impact on follow-up, most of the patients only somewhat agreed that these attitudes had an impact towards their disease.

When the answers for each of the attitude questionnaire on follow-up were analyzed, there were significantly more number of patients who strongly agreed on all questions pertaining to the need for special training, psychosocial impact, patient autonomy, and value of tight control. Question comparing the seriousness of type 1 and type 2 DM had no significant difference at baseline and on follow-up for both groups. This may be due to the lack of knowledge and misconceptions regarding type 1 diabetes. While for the question on the seriousness of DM, there was significant difference on baseline and on follow-up for the education group. Their perception on the seriousness of DM may be affected by several factors. In a study by Yao, et al., educational attainment and family history were identified as factors that have effects on attitude of patients especially pertaining to value of tight glucose control and seriousness of diabetes, respectively.<sup>6</sup> The seriousness of DM may also have different impact on the patients. In a study by Daly, they showed that participants who indicated that type 2 DM is a very serious disease were more likely to have higher HbA1c11. This is in contrast with the study of Nuaimi<sup>12</sup>, which showed that there was no significant association between the patient's attitude and glycemic control. Hence, this issue must be addressed based on the patient's perception of their disease and their corresponding behavior.

When the attitude scores were compared at different follow-up periods, there was no significant difference except

for the question on the seriousness of diabetes, with the education having more impact at four months than at three months. This observation may be due to other several factors such as personal experiences and family history as discussed previously.

Subgroup analysis was done for the knowledge and attitude scores among the female and male groups and private and charity patients. There was a consistent increase in the knowledge scores, which may imply that the type of session given did not influence the outcome. However, the attitude scores varied among the different groups. In a study by Shakibasadeh in 2011, five main barriers that influence diabetes self-care were enumerated, namely physical, psychological, education, social and care system barriers. They also enumerated motivators such as perceived responsibility for family, religious beliefs and the view of significant others.<sup>13</sup> These results suggested that gender and type of clinic may be confounders to the outcomes in attitude scores but there was insufficient evidence to conclude this observation.

The change in the weight and BMI were compared between the education and non-education groups to determine if the education had an effect on these parameters since the importance of weight loss was also part of the module. This study showed that in the education group, the weight and BMI slightly decreased but they were not significant. The weight in the non-education group increased but BMI remained relatively the same. However, other factors such as exercise, diet, medications and other comorbidities may affect these parameters and should also be taken into consideration during further analysis.

This study compared the effect of diabetes education on the knowledge and attitude from baseline and on follow-up in both the education and non-education groups. It also utilized the previously validated Filipino version of the questionnaires best suited for our Filipino patients. Topics on knowledge and attitude that should be given more emphasis during education were identified. Comparison of outcomes between the groups at different follow-up periods was done which showed different intervals did not affect the outcome. Subgroup analysis showed that gender and type of clinic attended did not influence outcomes on knowledge scores.

In this study, selection of subjects was not randomized. Also, ideally follow-up should be done after three months, but due to unavoidable circumstances, patients were able to follow-up at different periods, ranging from three to six months.

## Recommendations

Comparing the outcomes at short and long-term intervals may be conducted. Follow-up study can be done at

long term intervals such as at one year to determine which information has been retained. If results showed significantly decreasing scores, then a refresher course may be offered to the patients. Also, comparison of the outcomes between the group session and the one-on-one session may be considered. Other metabolic parameters, such as fasting blood sugar, blood pressure, HbA1c, lipid profile may be included as outcomes to establish the effect of education on glucose control. The effect of education on the behavior or practices of diabetic patients may also be assessed.

## Conclusion

Diabetes education still plays a vital role in the self-management of patients with type 2 DM. Among Filipino patients, diabetes education improved their knowledge and attitude towards their disease. Certain topics such as precautions during exercise, monitoring, medication adjustment during ill days and nutrition should be given more emphasis during education. Also, their attitudes towards seriousness of diabetes differ which may be attributable to other factors such as educational attainment. Further study on the effect of diabetes education on the behavior and glucose control would be valuable.

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## Tables

**Table I.** Baseline characteristics of type 2 diabetic patients (n=75)

	Education Patients (n=38)	Non-Education Patients (n=37)	p-value
	Mean $\pm$ SD; Frequency (%)		
<b>Age (years)</b>	53.79 $\pm$ 10.11	58.35 $\pm$ 10.86	
18–30	1 (2.63)	1 (2.7)	0.064 <sup>‡</sup>
31–60	27 (71.05)	18 (48.65)	0.087 <sup>§</sup>
Older than 60	10 (26.32)	18 (48.65)	
<b>Sex</b>			
Male	7 (18.42)	15 (40.54)	0.035 <sup>†</sup>
Female	31 (81.58)	22 (59.46)	
<b>Marital status</b>			
Single	1 (2.63)	3 (8.11)	0.501 <sup>§</sup>
Married	32 (84.21)	28 (75.68)	
Separated or widowed	5 (13.16)	6 (16.22)	
<b>Educational attainment</b>			
Elementary	3 (7.89)	5 (13.51)	0.740 <sup>§</sup>
High school	9 (23.68)	10 (27.03)	
College	22 (57.89)	20 (54.05)	
None	4 (10.53)	2 (5.41)	
<b>Weight (kg)</b>	66.5 $\pm$ 16.09	68.26 $\pm$ 14.71	0.623 <sup>‡</sup>
<b>Height (cm)</b>	155.84 $\pm$ 9.48	158.2 $\pm$ 9.76	0.291 <sup>‡</sup>
<b>BMI (kg/m<sup>2</sup>)</b>	27.98 $\pm$ 5.92	27.26 $\pm$ 3.75	
Normal	6 (15.79)	3 (8.11)	0.536 <sup>‡</sup>
Overweight	6 (15.79)	10 (27.03)	0.338 <sup>§</sup>
Obese	26 (68.42)	24 (64.86)	
<b>Waist circumference (cm)</b>	95.34 $\pm$ 10.64	95.77 $\pm$ 12.87	0.891 <sup>‡</sup>
<b>Hip circumference (cm)</b>	100.62 $\pm$ 11.12	101.89 $\pm$ 10.37	0.610 <sup>‡</sup>
<b>Waist-hip ratio</b>	0.96 (0.81–1.1)	0.94 (0.76–1.2)	0.147 <sup>†</sup>
<b>Therapeutic regimen</b>			
Diet only	0	0	
Oral antihyperglycemic agents	21 (55.26)	27 (72.97)	0.269 <sup>§</sup>
Insulin	5 (13.16)	3 (8.11)	
Both	12 (31.58)	7 (18.92)	
<b>Duration of diabetes</b>			
< 1 year	7 (18.42)	2 (5.41)	0.153 <sup>§</sup>
> 1 year	31 (82.58)	35 (94.59)	
<b>Type of clinic attended</b>			
Private	23 (60.53)	33 (89.19)	0.004 <sup>†</sup>
Charity	15 (39.47)	4 (10.81)	

Statistical methods: <sup>†</sup>Mann-Whitney U test; <sup>‡</sup>independent sample T test; <sup>§</sup>Fisher's exact test; <sup>¶</sup>chi square test.

**Table II.** Comparison of the baseline characteristics between the education and non-education groups at different follow-up periods (n=75)

	Education Patients (n=38)	Non-education Patients (n=37)	p-value
	Mean $\pm$ SD; Frequency (%); Median (Range)		
<b>Age (years)</b>			
At 3 months follow-up (n = 10)	53.63 $\pm$ 11.33	51.5 $\pm$ 0.71	.897 <sup>‡</sup>
At 4 months follow-up (n = 14)	49.11 $\pm$ 4.65	61.8 $\pm$ 8.67	0.004 <sup>‡</sup>
At 5 months follow-up (n = 19)	55.5 $\pm$ 8.82	59.22 $\pm$ 9.87	0.397 <sup>‡</sup>
At 6 months follow-up (n = 32)	56.91 $\pm$ 12.91	57.81 $\pm$ 12.25	0.848 <sup>‡</sup>

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	Education Patients (n=38)	Non-education Patients (n=37)	p-value
	Mean ± SD; Frequency (%); Median (Range)		
Sex			
At 3 months follow-up	[n=8]	[n=2]	.133 <sup>§</sup>
Male	2 (25)	2 (100)	
Female	6 (75)	0	
At 4 months follow-up	[n=9]	[n=5]	.258 <sup>§</sup>
Male	3 (33.3)	0	
Female	6 (66.7)	5 (100)	
At 5 months follow-up	[n=10]	[n=9]	.033 <sup>§</sup>
Male	0	4 (44.4)	
Female	10 (100)	5 (55.6)	
At 6 months follow-up	[n=11]	[n=21]	.248 <sup>§</sup>
Male	2 (18.2)	9 (42.9)	
Female	9 (81.8)	12 (57.1)	
Marital status			
At 3 months follow-up	[n=8]	[n=2]	1.000 <sup>§</sup>
Single	0	0	
Married	7 (87.5)	2 (100)	
Separated or widowed	1 (12.5)	0	
At 4 months follow-up	[n=9]	[n=5]	.027 <sup>§</sup>
Single	0	2 (40)	
Married	9 (100)	2 (40)	
Separated or widowed	0	1 (20)	
At 5 months follow-up	[n=10]	[n=9]	.334 <sup>§</sup>
Single	1 (10)	0	
Married	7 (70)	9 (100)	
Separated or widowed	2 (20)	0	
At 6 months follow-up	[n=11]	[n=21]	1.000 <sup>§</sup>
Single	0	1 (4.8)	
Married	9 (81.8)	15 (71.4)	
Separated or widowed	2 (18.2)	5 (23.8)	
Educational attainment			
At 3 months follow-up	[n=8]	[n=2]	.289 <sup>§</sup>
Elementary	0	0	
High school	2 (25)	2 (100)	
College	4 (50)	0	
None	2 (25)	0	
At 4 months follow-up	[n=9]	[n=5]	1.000 <sup>§</sup>
Elementary	0	0	
High school	2 (22.2)	2 (40)	
College	6 (66.7)	3 (60)	
None	1 (11.1)	0	
At 5 months follow-up	[n=10]	[n=9]	.902 <sup>§</sup>
Elementary	2 (20)	2 (22.2)	
High school	1 (10)	2 (22.2)	
College	6 (60)	4 (44.4)	
None	1 (10)	1 (11.1)	
At 6 months follow-up	[n=11]	[n=21]	.711 <sup>§</sup>
Elementary	1 (9.09)	3 (14.3)	
High school	4 (36.4)	4 (19.0)	
College	6 (54.6)	13 (61.9)	
None	0	1 (4.8)	
BMI (kg/m <sup>2</sup> )			
At 3 months follow-up	30.25 ± 7.04	28.35 ± 2.05	.726 <sup>†</sup>
At 4 months follow-up	28.92 ± 6.5	26.94 ± 3.59	.545 <sup>†</sup>
At 5 months follow-up	27.76 ± 6.0	28.57 ± 4.82	.752 <sup>†</sup>
At 6 months follow-up	25.75 ± 4.26	26.68 ± 3.46	.510 <sup>†</sup>
Waist circumference (cm)			
At 3 months follow-up	96.88 ± 8.22	111.0 ± 12.73	.080 <sup>†</sup>
At 4 months follow-up	99.56 ± 13.21	102.8 ± 14.65	.679 <sup>†</sup>
At 5 months follow-up	94.1 ± 11.30	94.56 ± 13.36	.937 <sup>†</sup>
At 6 months follow-up	92.09 ± 9.29	93.17 ± 11.51	.791 <sup>†</sup>



**Table II.** Comparison of the baseline characteristics between the education and non-education groups at different follow-up periods (n=75)

	Education Patients (n=38)	Non-education Patients (n=37)	p-value
	Mean ± SD; Frequency (%); Median (Range)		
Hip circumference (cm)			
At 3 months follow-up	101.56 ± 8.3	113 ± 4.24	.105 <sup>‡</sup>
At 4 months follow-up	103.11 ± 13.36	102.4 ± 12.6	.924 <sup>‡</sup>
At 5 months follow-up	99.5 ± 13.78	101 ± 13.20	.812 <sup>‡</sup>
At 6 months follow-up	98.91 ± 9.22	101.10 ± 8.82	.517 <sup>‡</sup>
Waist-hip ratio			
At 3 months follow-up	0.96 ± 0.03	0.98 ± 0.07	.445 <sup>‡</sup>
At 4 months follow-up	0.97 ± 0.06	1.002 ± 0.12	.549 <sup>‡</sup>
At 5 months follow-up	0.95 ± 0.08	0.94 ± 0.05	.626 <sup>‡</sup>
At 6 months follow-up	0.93 ± 0.07	0.92 ± 0.06	.552 <sup>‡</sup>
Therapeutic regimen			
At 3 months follow-up	[n=8]	[n=2]	.600 <sup>§</sup>
Oral antihyperglycemic agents	4 (50)	2 (100)	
Insulin	3 (37.5)	0	
Both	1 (12.5)	0	
At 4 months follow-up	[n=9]	[n=5]	.670 <sup>§</sup>
Oral antihyperglycemic agents	6 (66.7)	5 (100)	
Insulin	1 (11.1)	0	
Both	2 (22.2)	0	
At 5 months follow-up	[n=10]	[n=9]	1.000 <sup>§</sup>
Oral antihyperglycemic agents	4 (40)	4 (44.4)	
Insulin	1 (10)	1 (11.1)	
Both	5 (50)	4 (44.4)	
At 6 months follow-up	[n=11]	[n=21]	.353 <sup>§</sup>
Oral antihyperglycemic agents	7 (63.6)	16 (76.2)	
Insulin	0	2 (9.5)	
Both	4 (36.4)	3 (14.3)	
Duration of diabetes			
At 3 months follow-up	[n=8]	[n=2]	1.000 <sup>§</sup>
< 1 year	1 (12.5)	0	
> 1 year	7 (87.5)	2 (100)	
At 4 months follow-up	[n=9]	[n=5]	.221 <sup>§</sup>
< 1 year	4 (44.4)	0	
> 1 year	5 (55.6)	5 (100)	
At 5 months follow-up	[n=10]	[n=9]	1.000 <sup>§</sup>
< 1 year	1 (10)	1 (11.1)	
> 1 year	9 (90)	8 (88.9)	
At 6 months follow-up	[n=11]	[n=21]	1.000 <sup>§</sup>
< 1 year	1 (9.1)	1 (4.8)	
> 1 year	10 (90.9)	20 (95.2)	
Type of clinic attended			
At 3 months follow-up	[n=8]	[n=2]	1.000 <sup>§</sup>
Private	5 (62.5)	1 (50)	
Charity	3 (37.5)	1 (50)	
At 4 months follow-up	[n=9]	[n=5]	1.000 <sup>§</sup>
Private	6 (66.7)	4 (80)	
Charity	3 (33.3)	1 (20)	
At 5 months follow-up	[n=10]	[n=9]	.303 <sup>§</sup>
Private	6 (60)	8 (88.9)	
Charity	4 (40)	1 (11.1)	
At 6 months follow-up	[n=11]	[n=21]	.011 <sup>§</sup>
Private	6 (54.6)	20 (95.2)	
Charity	5 (45.4)	1 (4.8)	

Statistical methods: <sup>‡</sup>independent sample T test; <sup>§</sup>Fisher's exact test;

**Table III.** Comparison of mean percentage scores in knowledge of patients in the education and non-education groups (n=75).

	Education Patients (n=38)	Non-Education Patients (n=37)	p-value
	Mean ± SD		
Knowledge score* (%)			
Baseline	67.02 ± 16.98	63.6 ± 18.5	0.408 <sup>§</sup>
Follow-up	86.67 ± 12.01	55.68 ± 18.07	<0.001 <sup>§</sup>
P-value (baseline < follow up)	<0.001 <sup>‡</sup>	0.973 <sup>‡</sup>	

Statistical tests used: <sup>§</sup>Independent sample T-test; <sup>‡</sup>Paired sample T-test  
\* covers 15 items in all

**Table IV.** Itemized comparison of correct answers for the knowledge questionnaire between the education and non-education groups (n=75)

	Education Patients (n=38)	Non-Education Patients (n=37)	p-value
	Frequency (%)		
<b>What is Diabetes</b>			
K1 - In type 2 diabetes, the body cannot use insulin well.			
Baseline	23 (60.53)	20 (54.05)	<0.001 <sup>‡</sup>
Follow-up	35 (92.11)	11 (29.73)	0.044 <sup>‡</sup>
P value	0.003	0.0495	
K2 - Insulin helps the body turn sugar into energy.			
Baseline	17 (44.74)	9 (24.32)	0.063 <sup>‡</sup>
Follow-up	28 (73.68)	14 (37.84)	0.002 <sup>‡</sup>
P value	0.005	0.166	
K3 - Weakness, sweating, and shakiness are symptoms of hypoglycemia.			
Baseline	20 (52.63)	18 (48.65)	0.730 <sup>‡</sup>
Follow-up	33 (86.84)	11 (29.73)	<0.001 <sup>‡</sup>
P value	0.0003	0.090	
<b>Exercise</b>			
K4 - Patients who need insulin should inject it into the thigh muscle before running.			
Baseline	28 (73.68)	20 (54.05)	0.077 <sup>‡</sup>
Follow-up	31 (81.58)	22 (59.46)	0.035 <sup>‡</sup>
P value	0.366	0.617	
K5 - If blood glucose is more than 300 mg/dL, insulin should be adjusted or exercise should be delayed.			
Baseline	27 (71.05)	23 (62.16)	0.414 <sup>‡</sup>
Follow-up	25 (65.79)	20 (54.05)	0.300 <sup>‡</sup>
P value	0.617	0.467	
<b>Blood glucose monitoring</b>			
K6 - Self-monitoring of blood glucose is (...)*			
Baseline	17 (44.74)	19 (51.35)	0.566 <sup>‡</sup>
Follow-up	30 (78.95)	10 (27.03)	<0.001 <sup>‡</sup>
P value <sup>†</sup>	0.003	0.039	
K7 - Monitoring should be done more often (...)**			
Baseline	22 (57.89)	22 (59.46)	0.891 <sup>‡</sup>
Follow-up	29 (76.32)	12 (32.43)	<0.001 <sup>‡</sup>
P value <sup>†</sup>	0.090	0.033	
<b>Medications</b>			
K8 - The preferred site for an insulin injection is the abdomen.			
Baseline	28 (73.68)	19 (51.35)	0.046 <sup>‡</sup>
Follow-up	37 (97.37)	20 (54.05)	<0.001 <sup>‡</sup>
P value <sup>†</sup>	0.003	0.763	
K9 - Insulin should not always be injected in the same site.			
Baseline	26 (68.42)	28 (75.68)	0.484 <sup>‡</sup>
Follow-up	36 (94.74)	22 (59.46)	<0.001 <sup>‡</sup>
P value <sup>†</sup>	0.008	0.058	

**Table IV.** Itemized comparison of correct answers for the knowledge questionnaire between the education and non-education groups (n=75)

	Education Patients (n=38)	Non-Education Patients (n=37)	p-value
	Frequency (%)		
K10 - During illness, you should not stop taking your medications. Baseline Follow-up P value <sup>†</sup>	33 (86.84) 34 (89.47) 0.739	35 (94.59) 28 (75.68) 0.035	0.430 <sup>§</sup> 0.115 <sup>‡</sup>
<b>Nutrition</b>			
K11 - In overweight patients with diabetes, losing weight may (...) <sup>***</sup> Baseline Follow-up P value <sup>†</sup>	20 (52.63) 30 (78.95) 0.008	17 (45.95) 10 (27.03) 0.071	0.563 <sup>‡</sup> <0.001 <sup>‡</sup>
K12 - Cheddar cheese is high in fat. Baseline Follow-up P value <sup>†</sup>	31 (81.58) 38 (100) 0.008	30 (81.08) 34 (91.89) 0.103	0.956 <sup>‡</sup> 0.115 <sup>§</sup>
K13 - Cholesterol is the fatty substance in food linked to heart disease. Baseline Follow-up P value <sup>†</sup>	34 (89.47) 38 (100) 0.046	33 (89.19) 34 (91.89) 0.655	1.000 <sup>§</sup> 0.115 <sup>§</sup>
K14 - To decrease dietary fat and cholesterol, broiled chicken without skin is the best choice. Baseline Follow-up P value <sup>†</sup>	32 (84.21) 35 (92.11) 0.317	33 (89.19) 33 (89.19) 1.000	0.736 <sup>§</sup> 0.711 <sup>§</sup>
K15 - Soluble fiber may help lower blood glucose. Baseline Follow-up P value <sup>†</sup>	24 (63.16) 35 (92.11) 0.002	27 (72.97) 28 (75.68) 0.763	0.362 <sup>‡</sup> 0.052 <sup>‡</sup>
Statistical methods: <sup>†</sup> McNemar's test; <sup>‡</sup> Chi square test; <sup>§</sup> Fisher's exact test. All were correct statements: *essential for intensive therapy, the key to determining the right amount of medication, and useful even if diabetes is controlled with diet and exercise; **on sick days, when traveling, and when meal or exercise plans change; ***help the body use insulin better, lower blood glucose, and decrease the risk of heart disease.			

**Table V.** Comparison of knowledge scores between the education and non-education group at different follow-up intervals (n=75)

	3 months follow-up (n=10)	4 months follow-up (n=14)	5 months follow-up (n=19)	6 months follow-up (n=32)	p-value
	Mean ± SD; Median (Range)				
Knowledge score* (%)					
Education					
Pre-test	78.3 ± 15.8	57.8 ± 17.0	70.7 ± 13.8	63.03 ± 16.7	0.056 <sup>§</sup>
Post-test	85 ± 16.6	84.45 ± 11.1	86.7 ± 11.8	89.7 ± 10.1	0.777 <sup>§</sup>
Non-Education					
Pre-test	83.3 ± 4.7	52 ± 20.2	57.04 ± 17.4	67.3 ± 17.5	0.096 <sup>§</sup>
Post-test	66.67 ± 18.6	45.3 ± 11.1	60.7 ± 17.5	54.9 ± 18.2	0.386 <sup>§</sup>
Statistical methods: <sup>§</sup> Oneway ANOVA; <sup>†</sup> Kruskal wallis test *Covers 15 items in all					

**Table VI.** Comparison of the median scores and range of scores of attitude between the education and non-education groups at baseline and on follow-up (n=75).

	Education Patients (n=38)	Non-education (n=37)	p-value
	Median (Range)		
Attitude Category			
Need for special training			
Baseline	1.5 (1 to 4)	2 (1 to 3)	0.412 <sup>‡</sup>
Follow-up	1 (1 to 2)	2 (1 to 3)	<0.001 <sup>‡</sup>
P-value	0.169 <sup>†</sup>	0.481 <sup>†</sup>	

**Table VI.** Comparison of the median scores and range of scores of attitude between the education and non-education groups at baseline and on follow-up (n=75).

	Education Patients (n=38)	Non-education (n=37)	p-value
	Median (Range)		
Seriousness of DM			
Baseline	2.5 (1 to 5)	3 (1 to 4)	0.167 <sup>‡</sup>
Follow-up	2 (1 to 4)	3 (1 to 4)	0.271 <sup>‡</sup>
P-value	0.076 <sup>†</sup>	0.327 <sup>†</sup>	
Psychosocial impact of DM			
Baseline	2 (1 to 4)	2 (1 to 4)	0.299 <sup>‡</sup>
Follow-up	2 (1 to 3)	2 (1 to 4)	0.086 <sup>‡</sup>
P-value	0.678 <sup>†</sup>	0.815 <sup>†</sup>	
Patient autonomy			
Baseline	1 (1 to 3)	2 (1 to 3)	0.127 <sup>‡</sup>
Follow-up	1 (1 to 2)	2 (1 to 3)	0.005 <sup>‡</sup>
P-value	1.000 <sup>†</sup>	0.238 <sup>†</sup>	

Statistical methods: <sup>‡</sup>Mann-Whitney U test; <sup>†</sup>Wilcoxon Signed rank test

**Table VII.** Itemized comparison of answers for the attitude questionnaire between the education and non-education groups (n=75)

	Education Patients (n=38)	Non-Education Patients (n=37)	p-value
	Median (Range)		
Need for special training			
A1 - Health care professionals who treat people with diabetes should be trained to communicate well with their patients.			
Baseline	1 (1-4)	1 (1-3)	0.226*
Follow-up	1 (1-2)	2 (1-3)	0.003*
P value <sup>†</sup>	0.481	0.648	
A2 - Health care professionals should be taught how daily diabetes care affects patients' lives.			
Baseline	1 (1-4)	2 (1-4)	0.257*
Follow-up	1 (1-2)	2 (1-4)	<0.001*
P value <sup>†</sup>	0.210	0.664	
Seriousness of Type 2 diabetes			
A3 - Type 2 is as serious as Type 1 diabetes.			
Baseline	2 (1-5)	3 (1-5)	0.037*
Follow-up	2 (1-4)	2 (1-5)	0.205*
P value <sup>†</sup>	0.424	0.122	
A4 - Type 2 diabetes is a very serious disease.			
Baseline	2 (1-5)	2 (1-4)	0.955*
Follow-up	2 (1-4)	2 (1-4)	0.114*
P value <sup>†</sup>	0.019	1.000	
Value of tight glucose control			
A5 - There is not much use in trying to have good blood sugar control because the complications of diabetes will happen anyway.			
Baseline	4 (1-5)	3 (1-5)	0.726*
Follow-up	4 (1-5)	3 (1-5)	0.001*
P value <sup>†</sup>	0.036	0.690	
A8 - Almost everyone with diabetes should do whatever it takes to keep their blood sugar close to normal.			
Baseline	1 (1-4)	2 (1-5)	0.096*
Follow-up	1 (1-2)	2 (1-3)	0.001*
P value <sup>†</sup>	0.481	0.503	
Psychosocial impact of diabetes			
A6 - Diabetes affects almost every part of a diabetic person's life.			
Baseline	1 (1-4)	2 (1-4)	0.073*
Follow-up	2 (1-4)	2 (1-4)	0.027*
P value <sup>†</sup>	0.832	0.481	

**Table VII.** Itemized comparison of answers for the attitude questionnaire between the education and non-education groups (n=75)

	Education Patients (n=38)	Non-Education Patients (n=37)	p-value
	Median (Range)		
A9 - Having diabetes changes a person's outlook on life. Baseline Follow-up P value <sup>†</sup>	2 (1-4) 1 (1-4) 0.043	2 (1-5) 2 (1-5) 0.167	0.248* 0.022*
Patient autonomy			
A7 - The important decisions regarding daily diabetes care should be made by the person with diabetes. Baseline Follow-up P value <sup>†</sup>	1 (1-3) 1 (1-2) 1.000	2 (1-5) 2 (1-3) 0.332	0.150* 0.013*
A10. - To do a good job, diabetes educators should learn a lot about being teacher. Baseline Follow-up P value <sup>†</sup>	1 (1-2) 1 (1-2) 0.180	2 (1-5) 2 (1-3) 0.815	0.073* 0.001*

Statistical methods: \*Mann-Whitney U test; <sup>†</sup>Wilcoxon Signed rank test.  
Scoring for attitude subscales (except item A5 with reverse scoring): 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; 5, strongly agree.

**Table VIII.** Comparison of scores in attitude between the education and non-education groups at different follow-up intervals (n=75)

	3 months follow-up (n=10)	4 months follow-up (n=14)	5 months follow-up (n=19)	6 months follow-up (n=32)	p-value
	Mean ± SD; Median (Range)				
Attitude score** (average per subscale)					
Need for special training (A1-2)					
Education					
Pre-test	1.25 (1-3)	1.5 (1-3.5)	1.5 (1-2)	1 (1-2)	0.665 <sup>†</sup>
Post-test	1.25 (1-2)	1 (1-2)	1 (1-2)	1 (1-2)	0.245 <sup>†</sup>
Non-Education					
Pre-test	1.25 (1-1.5)	2 (1.5-2)	1 (1-2)	2 (1-3)	0.144 <sup>†</sup>
Post-test	1.25 (1-1.5)	1.5 (1-2)	2 (1-2.5)	2 (1-2.5)	0.329 <sup>†</sup>
Seriousness of Type 2 diabetes (A3-4)					
Education					
Pre-test	2.5 (2-4)	2 (1-3.5)	2 (1.5-5)	2.5 (1-4)	0.787 <sup>†</sup>
Post-test	3 (2-4)	1 (1-2.5)	1.25 (1-4)	2 (1-4)	0.030 <sup>†</sup>
Non-Education					
Pre-test	2 (1-3)	3 (1-3)	2 (1-3.5)	3 (1-4)	0.247 <sup>†</sup>
Post-test	1.5 (1-2)	3 (2-3.5)	3 (2-4)	2.5 (1-4)	0.097 <sup>†</sup>
Value of tight glucose control (A5, 8)					
Education					
Pre-test	2.75 (2-3)	2 (1-3)	2.5 (1-3)	2 (1-3)	0.120 <sup>†</sup>
Post-test	2.5 (1.5-3)	2.5 (1-3)	3 (2.5-3.5)	2.5 (2-3)	0.367 <sup>†</sup>
Non-Education					
Pre-test	2 (1.5-2.5)	2 (1.5-3)	2.5 (1-3)	3 (1.5-5)	0.211 <sup>†</sup>
Post-test	2	3 (1-3)	3 (1.5-3)	2.5 (1.5-3)	0.408 <sup>†</sup>
Psychosocial impact of diabetes (A6, 9)					
Education					
Pre-test	2 (1-3)	2 (1-2.5)	2 (1-3.5)	1.5 (1-2.5)	0.350 <sup>†</sup>
Post-test	2 (1-3)	1.5 (1-2.5)	1.5 (1-2.5)	1.5 (1-3)	0.224 <sup>†</sup>
Non-Education					
Pre-test	1.25 (1-1.5)	2 (2-3)	2 (1-3.5)	2 (1-3)	0.123 <sup>†</sup>
Post-test	1.75 (1.5-2)	2 (1-3)	2 (1-3)	2 (1-3.5)	0.668 <sup>†</sup>
Patient autonomy (A7, 10)					
Education					
Pre-test	1.5 (1-2)	1.5 (1-2)	1 (1-2.5)	1 (1-2)	0.395 <sup>†</sup>
Post-test	1.25 (1-2)	1 (1-2)	1 (1-1.5)	1 (1-2)	0.409 <sup>†</sup>
Non-Education					
Pre-test	1.5 (1-2)	2 (1-2)	2 (1-3)	2 (1-3)	0.994 <sup>†</sup>
Post-test	1.75 (1.5-2)	1 (1-2.5)	1.5 (1-2)	2 (1-2.5)	0.662 <sup>†</sup>

**Table VIII.** Comparison of scores in attitude between the education and non-education groups at different follow-up intervals (n=75)

	3 months follow-up (n=10)	4 months follow-up (n=14)	5 months follow-up (n=19)	6 months follow-up (n=32)	p-value
	Mean ± SD; Median (Range)				
Statistical methods: §Oneway ANOVA; †Kruskal wallis test					
**Covers 10 items. Scoring for attitude subscales (except for item A5 with reverse scoring): 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; 5, strongly agree.					

**Table IX.** Comparison of knowledge scores between the private and charity patients (n=75)

	PRIVATE			CHARITY		
	Education Patients (n=23)	Non-Education Patients (n=33)	P-value	Education Patients (n=15)	Non-Education Patients (n=4)	p-value
	Mean ± SD; Median (Range)			Mean ± SD; Median (Range)		
Knowledge score* (%)						
Pre-test	67.54 ± 18.2	65.05 ± 17.88	0.614§	66.22 ± 15.42	51.67 ± 22.03	0.142§
Post-test	88.41 ± 12.59	55.56 ± 19.12	<0.0001§	84.0 ± 10.92	56.67 ± 3.85	0.0002§
Statistical methods †Mann-Whitney U test; §independent sample T test						
*Covers 15 items in all.						

**Table X.** Comparison of knowledge scores between male and female patients (n=75)

	MALE			FEMALE		
	Education Patients (n=7)	Non-Education Patients (n=15)	P-value	Education Patients (n=31)	Non-Education Patients (n=22)	p-value
	Mean ± SD; Median (Range)			Mean ± SD; Median (Range)		
Knowledge score* (%)						
Pre-test	66.7 ± 16.3	69.33 ± 14.8	0.708§	67.1 ± 17.4	59.7 ± 20.0	0.157§
Post-test	89.5 ± 19.6	52.0 ± 15.4	<0.0001§	86.0 ± 9.9	58.2 ± 19.6	<0.0001§
Statistical methods: †Mann-Whitney U test; §independent sample T test						
*Covers 15 items in all.						

**Table XI.** Comparison of attitude scores between the private and charity patients (n=75)

	PRIVATE			CHARITY		
	Education Patients (n=23)	Non-Education Patients (n=33)	P-value	Education Patients (n=15)	Non-Education Patients (n=4)	p-value
	Mean ± SD; Median (Range)			Mean ± SD; Median (Range)		
Attitude score** (average per subscale)						
Need for special training (A1–2)						
Pre-test	1 (1-3.5)	2 (1-2.5)	0.108†	1.5 (1-3)	1.25 (1-3)	0.958†
Post-test	1 (1-2)	1.5 (1-2)	0.001†	1 (1-2)	2 (1-2.5)	0.074†
Seriousness of Type 2 diabetes (A3–4)						
Pre-test	2 (1-5)	3 (1-4)	0.072†	2.5 (1-4)	2 (1-3.5)	0.611†
Post-test	2 (1-4)	2.5 (1-4)	0.152†	2.5 (1-4)	3 (1-3)	0.331†
Value of tight glucose control (A5, 8)						
Pre-test	2.5 (1-3)	2.5 (1-5)	0.438†	2.5 (1-3)	1.75 (1.5-2.5)	0.353†
Post-test	2.5 (2-3)	2.5 (2-3)	0.264†	2.5 (1-3.5)	1.5 (1-2)	0.014†
Psychosocial impact of diabetes (A6, 9)						
Pre-test	1.5 (1-3.5)	2 (1-3)	0.077†	2 (1-3)	2.25 (1-3.5)	0.508†
Post-test	1.5 (1-3)	2 (1-3.5)	0.014†	1.5 (1-3)	1.5 (1-3)	0.754†
Patient autonomy (A7, 10)						
Pre-test	1 (1-5)	2 (1-3)	0.212†	1 (1-2)	1.25 (1-3)	0.486†
Post-test	1 (1-2)	2 (1-2.5)	0.001†	1 (1-2)	1 (1-1.5)	0.394†
Statistical methods: †Mann-Whitney U test; §independent sample T test						
*Covers 15 items in all.						
**Covers 10 items. Scoring for attitude subscales (except for item A5 with reverse scoring): 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; 5, strongly agree.						

**Table XII.** Comparison of attitude scores between male and female diabetic patients (n=56)

	MALE			FEMALE		
	Education Patients (n=7)	Non-Education Patients (n=33)	p-value	Education Patients(n=31)	Non-Education Patients (n=22)	p-value
	Mean ± SD; Median (Range)			Mean ± SD; Median (Range)		
Attitude score** (average per subscale)						
Need for special training (A1–2)						
Pre-test	1 (1-2)	1 (1-2.5)	0.830 <sup>‡</sup>	1.5 (1-3.5)	2 (1-3)	0.022 <sup>‡</sup>
Post-test	1 (1-1.5)	2 (1-2)	0.003 <sup>‡</sup>	1 (1-2)	2 (1-2.5)	0.005 <sup>‡</sup>
Seriousness of Type 2 diabetes (A3–4)						
Pre-test	2 (1-3)	2.5 (1-3.5)	0.188 <sup>‡</sup>	2.5 (1-5)	3 (1-4)	0.162 <sup>‡</sup>
Post-test	1 (1-3.5)	2 (1-4)	0.116 <sup>‡</sup>	2 (1-4)	2.5 (1-4)	0.217 <sup>‡</sup>
Value of tight glucose control (A5, 8)						
Pre-test	2 (1-3)	2.5 (1-3.5)	0.587 <sup>‡</sup>	2.5 (1-3)	2.5 (1.5-5)	0.508 <sup>‡</sup>
Post-test	2.5 (2-3)	2 (2-3)	0.069 <sup>‡</sup>	2.5 (1-3.5)	2.5 (1-3)	0.433 <sup>‡</sup>
Psychosocial impact of diabetes (A6, 9)						
Pre-test	1.5 (1-2)	1.5 (1-3)	0.575 <sup>‡</sup>	2 (1-3.5)	2 (1-3.5)	0.028 <sup>‡</sup>
Post-test	1.5 (1-2)	2 (1-3.5)	0.016 <sup>‡</sup>	1.5 (1-3)	2 (1-3)	0.089 <sup>‡</sup>
Patient autonomy (A7, 10)						
Pre-test	1 (1-2)	1 (1-2)	0.903 <sup>‡</sup>	1 (1-2.5)	2 (1-3)	0.013 <sup>‡</sup>
Post-test	1 (1-2)	2 (1-2.5)	0.022 <sup>‡</sup>	1 (1-2)	1.5 (1-2.5)	0.037 <sup>‡</sup>

Statistical methods <sup>‡</sup>Mann-Whitney U test; <sup>§</sup>independent sample T test  
 \*\*Covers 10 items. Scoring for attitude subscales (except for item A5 with reverse scoring): 1, strongly disagree; 2, disagree; 3, neutral; 4, agree; 5, strongly agree.

## APPENDICES

## Appendix A. Knowledge Questionnaire: Modified, Validated AACE Knowledge Evaluation Form (Filipino Version)

- Sa Type 2 diabetes, ang katawan ng tao ay:
  - Hindi nakakagamit ng insulin ng mabuti
  - walang anumang insulin na ginagawa
  - nire-reject ang insulin
  - winawasak ang insulin
- Tinutulungan ng insulin ang katawan ng tao upang:
  - gawing enerhiya ang asukal
  - alisin ang asukal
  - panatilihin ang asukal sa dugo
  - gumawa ng red blood cell
- Alin sa mga sumusunod ang sintomas ng hypoglycemia?
  - Panghihina
  - Pagpapawis
  - Panginginig
  - lahat ng nakasaad sa itaas
- Ang mga pasyenteng kailangan ng insulin ay dapat na iniksyonan sa hita bago sila tumakbo.
  - Tama
  - Mali
- Kung ang blood glucose ay higit sa 300 mg/dL, kailangang i-adjust ang insulin o iliban ang pag-eehersisyo
  - Tama
  - Mali
- Ang pansariling pagmonitor ng blood glucose ay:
  - napakahalaga para sa masidhing/ intensibong panggagamot.
  - susi upang malaman ang tamang dami ng gamot
  - magagamit kahit na ang diabetes ay nakokontrol ng dyeta o ehersisyo
  - lahat ng nakasaad sa itaas
- Ang pagmomonitor ay dapat gawin nang mas madalas:
  - sa mga araw na may sakit
  - kung nagbibyahe
  - kung nagbago ng plano sa pagkain at ehersisyo
  - sa lahat ng nakasaad sa itaas
- Ang pinakamainam na bahagi ng katawan para sa iniksyon ng insulin ay ang:
  - Tiyan
  - Balakang
  - Pigi
  - lahat ng nakasaad sa itaas
- Ang insulin ay dapat na iniiniksyon sa iisang lugar lamang:
  - Tama
  - Mali
- Habang may sakit, dapat itigil ang paggamit ng gamot.
  - Tama
  - Mali
- Sa mga pasyente ng diabetes na sobra sa timbang, ang magpapayat ay:
  - makatutulong upang gumanang mabuti ang insulin sa katawan
  - makakapagpapaba ng blood glucose
  - makakabawas sa peligro na sakit sa puso
  - nagbubunga ng lahat ng nakasaad sa itaas
- Alin sa mga sumusunod na pagkain ang mataas sa taba?
  - Mansanas
  - Letsugas
  - kesong cheddar
  - oatmeal
- Ang mga pagkaing mayaman sa taba na nauugnay sa sakit sa puso ay:
  - mga karbohydreyt
  - protina
  - kolesterol
  - fiber/hibla

14. Upang mabawasan ang mga taba at kolesterol, aling pagkain ang pinakamainam piliin?
- Bistik
  - pritong itlog
  - inihaw na manok na walang balat
  - tinapay na may palamang keso at ham
15. Alin sa mga sumusunod ang nakakatulong makapagpapaba ng blood glucose?
- taba/fat
  - protina
  - soluble fiber
  - lahat ng nakasaad sa itaas

#### Appendix B Knowledge Questionnaire: Modified, Validated AACE Knowledge Evaluation Form (English Version)

Encircle the correct answer:

- In type 2 diabetes, the body :
  - Cannot use insulin well
  - Makes no insulin at all
  - Reject insulin
  - Destroys insulin
- Insulin helps the body
  - turn sugar into energy
  - get rid of sugar
  - store sugar in the blood
  - make red blood cells
- Which of the following is a symptom of hypoglycemia?
  - weakness
  - sweating
  - shakiness
  - all of the above
- Patients who need insulin should inject it into the thigh muscle before running.
  - true
  - false
- If blood glucose is more than 300 mg/dL, insulin should be adjusted or exercise should be delayed.
  - true
  - false
- Self-monitoring of blood glucose is
  - essential for intensive therapy
  - the key to determining the right amount of medication
  - useful even if diabetes is controlled with diet and exercise
  - all of the above
- Monitoring should be done more often
  - on sick days
  - when traveling
  - when meal or exercise plans change
  - at all of the above times
- The preferred site for an insulin injection is
  - the abdomen
  - the hips
  - the buttocks
  - all of the above
- Insulin should always be injected in the same site.
  - true
  - false
- During illness, you should stop taking your medications.
  - true
  - false
- In overweight patients with diabetes, losing weight may
  - help the body use insulin better
  - lower blood glucose
  - decrease the risk of heart disease
  - do all of the above
- Which of the following foods is high in fat?
  - apples
  - lettuce
  - cheddar cheese
  - oatmeal
- The fatty substance in food linked to heart disease is
  - carbohydrates
  - protein
  - cholesterol
  - fiber
- To decrease dietary fat and cholesterol, which food is the best choice?
  - steak
  - fried eggs
  - broiled chicken without skin
  - ham and cheese sandwich
- Which of the following may help lower blood glucose?
  - fat
  - protein
  - soluble fiber
  - all of the above

#### Appendix C: Attitude Questionnaire: Modified, Validated Translated Diabetes Attitude Scale 3 (DAS-3) (Filipino Version)

Piliin lamang sa pamamagitan ng pagbiolog ang mga kasagutang sa tingin ninyo ay pinakamalapit sa inyong pananaw tungkol sa bawat pangungusap. Wala pong tama o malig kasagutan. Mahalagang sagutin ang lahat ng katanungan

Sa pangkalahatan, ako ay naniniwala na:	Lubos na sumasang-ayon	Sumasang-ayon	Walang kinikiligan	Hindi sumasang-ayon	Lubos na hindi sumasang-ayon
1...ang mga doktor, nurses at dietitian ay kailangan maturuan ng wastong/tamang pamamaraan ng pakikipagusap sa pasyente					
2...kailangang maturuan ang mga doktor, nurses at dietitian kung paano nakakaapekto sa buhay ng isang may diabetes ang pang-araw-araw na pangangalaga sa sarili					



Sa pangkalahatan, ako ay naniniwala na:	Lubos na sumasang-ayon	Sumasang-ayon	Walang kinikilingan	Hindi sumasang-ayon	Lubos na hindi sumasang-ayon
3... magkasinglubha ang type 1 diabetes at type 2 diabetes					
4...isang napakalubhang sakit ang type 2 Diabetes					
5...wala ring silbi kung pagsikapan ang mabuting pagkontrol ng asukal sa dugo (blood sugar) dahil mangyayari din hamang mga komplikasyong dulot ng diabetes					
6...nakakaapekto ang diabetes sa halos lahat ng bahagi ng buhay ng isang pasyente					
7...kailangang pagpasiyahan ng may diabetes ang mahahalagang desisyon ukol sa pangaraw-araw na pangangalaga sa sarili					
8...kailangang gawin ng isang may diabetes ang lahat upang mapanatiling normal ang kanyang asukal sa dugo (blood sugar)					
9...nakakapagpabago ng pananaw ng buhay ng isang tao ang pagkakaroon ng diabetes					
10...kailangang matutunan ng isang may diabetes ang lahat ng nauukol sa saki upang lubos na mapangalagaan ang kanyang sarili					

#### Appendix D: Attitude Questionnaire: Modified, Validated Translated Diabetes Attitude Scale 3 (DAS-3) (English Version)

Below are some statements about diabetes. Each numbered statement finishes the sentence "In general, I believe that..." You may believe that a statement is true for one person but not for another person or may be true one time but not be true another time. Mark the answer that you believe is true most of the time or is true for most people. Place a check mark in the box below the word or phrase that is closest to your opinion about each statement. It is important that you answer every statement. Note: The term "health care professionals" in this survey refers to doctors, nurses, and dietitians.

In general, I believe that:	1	2	3	4	5
1. ...health care professionals who treat people with diabetes should be trained to communicate well with their patients.					
2. ... health care professionals should be taught how daily diabetes care affects patients' lives.					
3. Type 2 is as serious as Type 1 diabetes.					
4. Type 2 diabetes is a very serious disease.					
5. there is not much use in trying to have good blood sugar control because the complications of diabetes will happen anyway.					
6. diabetes affects almost every part of a diabetic person's life.					
7. the important decisions regarding daily diabetes care should be made by the person with diabetes.					
8. almost everyone with diabetes should do whatever it takes to keep their blood sugar close to normal.					
9. having diabetes changes a person's outlook on life.					
10. to do a good job, diabetes educators should learn a lot about being teachers					

Scale Name	Scale Equation	Special Instruction
Need for Special Training	1,2	
Seriousness of DM	3,4	
Value of Tight Control	5,8	Reverse scores for Q5
Psychosocial Impact of DM	6,9	
Patient Autonomy	7,10	

SCORING: Strongly agree = 5, Agree = 4, Neutral = 3, Disagree = 2, Strongly Disagree = 1

MEAN SCORES: total scores/number of items answered