

Original Research Article

Assessing efficacy of diabetes school using diabetes knowledge scale in Turkey

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ABSTRACT

Background: Diabetes education, as an essential component of diabetes management, improves various aspects of diabetes mellitus including lowering Haemoglobin A1c. There is a number of surveys evaluating diabetes knowledge.

Methods: The purpose of this study to measure diabetes knowledge of patients with diabetes mellitus after a structured group education programme named as diabetes school. This study is an observational study and the design is a cohort study. The study took place in 2017-2018. The duration of follow-up is 4 weeks. Fifty-four patients aged over 18 with a previous diagnosis of diabetes mellitus, who attended to the diabetes school education programme, were included to the study. Twenty-three patients participated in the true-false version of the revised Michigan diabetes knowledge questionnaire before and after the programme.

Results: Twenty female and 3 male patients were aged 60.43±9.97 years. The scores improved significantly after the education programme (7.61±4.59 vs 12.39±3.35, p<0.0001). The number of patients correctly identifying more than half of the statements showed a steep increase after the programme (n=6, 26.0% vs n=17, 73.9%). Before education programme 13 had poor knowledge, 9 had moderate, and 1 had good knowledge. After completion 6 had poor knowledge, 11 had moderate, and 5 had good knowledge.

Conclusions: Diabetes school is effective in improving diabetes knowledge in patients with diabetes mellitus. Revised Michigan Diabetes Knowledge Questionnaire can be used to evaluate diabetes knowledge. It may aid to detect the subgroup of patients who are lack knowledge of various aspects of diabetes mellitus.

Keywords: Diabetes mellitus, Education, Knowledge, Michigan, Questionnaire

INTRODUCTION

The prevalence of Diabetes Mellitus (DM) increased dramatically from 7.2% (1998) to 13.7% (2010) in Turkey according to TURDEP studies.^{1,2} It has been reported that annual cost of DM and associated comorbidities and complications reached 10 billion Turkish liras.³ Most of the patients with DM (50-70%) still fall short of target hemoglobin A1C values.^{2,4} Everyday patients with DM face challenges regarding nutrition, physical activity, medications, complications,

and comorbidities and take necessary steps in advance.^{5,6} Diabetes education is an essential component of diabetes management and its importance has been emphasized in various guidelines.^{7,8-10} DM education can decrease hemoglobin A1C by 1% in patients with T2DM.⁸ Beyond its positive effects on A1C lowering, diabetes education improves quality of life and prevents or slows development of complications by improving clinical and behavioral aspects of DM. There is no concrete evidence supporting either type of education is superior than the other (individual or group) in terms of outcomes.⁵ There

are many surveys for evaluating various aspects of diabetes education including those evaluating diabetes knowledge such as Starr County Diabetes Knowledge Questionnaire (DKQ), Michigan brief diabetes knowledge test (DKT), and Kaiser DISTANCE survey.¹¹

Turkish Ministry of Health has been supporting diabetes school, as a model of structured group education, since 2014. The efficacy of this Programme has not been evaluated beyond hemoglobin A1C control. Study aimed to evaluate knowledge of diabetes by applying a questionnaire before and immediately after the school.

METHODS

Study population

The patients, who were registered to diabetes school in September 2017 and January 2018, were evaluated.

Inclusion criteria

- Over age 18
- Diagnosis of DM
- Attending to at least 3 sessions of education programme
- Completion of the survey both before and after the education programme.

Exclusion criteria

- Being ≤ 18 years old
- Not having DM
- Attending to less than 3 sessions of education programme
- Failing to complete the survey either before or after the education programme.

The survey was done before the start of diabetes school and immediately after the last session. Ninety-four patients registered to the school. Only 54 patients attended the programme and 39 patients completed at least 3 sessions of education programme. Among them the data of the 23 patients who participated in the survey both before and after the programme were analyzed. All patients were able to read and write in Turkish.

Diabetes school programme

Diabetes school programme was executed by a multi-disciplinary team (endocrinologists, nephrologist, specialist in sport medicine, ophthalmologist, neurologist, dietitian, diabetes nurses) as 90 minutes sessions a week for 4 consecutive weeks. Information about definition, types, signs and symptoms, pathophysiology, and complications of DM, options of medical therapy, nutrition, exercise, self-blood glucose monitoring, insulin types, insulin injection techniques, and foot care was transferred in an interactive way. The participants, who attended at least 3 sessions, were given certificates.

Questionnaire

The 2016 version MDKT includes 23 items. The first 14 items are about general diabetes knowledge while the last 9 items are directed at insulin use.¹¹⁻¹³ The revised MDKT is called Revised Michigan Diabetes Knowledge Questionnaire (rMDKQ) and includes 20 items. Two items are for insulin users and 18 for all patients. The rMDKQ was used. Twenty-item questionnaire were applied to all subjects since information about their medical therapy before onset of the school was not known. The rMDKQ form is depicted in the (Table 1). It was translated into Turkish by the endocrinologists. Due to low sociocultural profile of the patients and in order to overcome the complexity of multiple-choice questions, true/false version was applied.¹⁴

Only the written format was used. The scale included 20 items regarding nutrition, comorbidities, blood glucose control, exercise, medication, and complications. Some of these statements were false and some of them were true. The patients were expected to choose true or false for each statement in the questionnaire. If they had no idea or not sure about an item, they ticked the choice "don't know". Each correctly selected item was scored as 1 point. Each item was scored as zero for incorrect response and "don't know" response. Total scores ranged from 0 to 20. Knowledge score was also categorized into three groups as poor knowledge for scores equal to or less than 9 points, moderate (average) knowledge for scores in the range of 9-14, and good knowledge for scores equal to more than 15 points.

Statistical analysis

IBM SPSS Statistics (IL, Chicago, USA) version 10.0 was used for statistical analysis. The p value below 0.05 was considered statistically significant. All parametric variables showing normal distribution (age and scores before and after diabetes school) were evaluated with Student's t test and shown as mean \pm standard deviation. Other variables not showing normal distribution (duration of DM) were evaluated with Mann Whitney U test and shown as median. For comparison of scores before and after the school programme, paired samples t test was used. Correlation analysis between age, duration of DM, and scores made before and after the programme were done using Spearman correlation analysis. Kruskal Wallis test was used for subgroup analysis.

RESULTS

The demographic characteristics are shown in Table 2. All but one patient did Self-Monitoring of Blood Glucose (SMBG) at home. Thirteen patients did SMBG on daily basis, while 6 did less frequently. Two patients did not mention about the frequency of SMBG.

The scores improved significantly after the education programme (7.61 \pm 4.59 vs 12.39 \pm 3.35, p<0.0001). The

scores made before and after the questionnaire did not show statistical significance according to diabetes duration and age ($p=0.082$ and $p=0.117$, respectively). The scores also did not differ according to marital status.

When the patients were categorized into 2 groups according to their education status (preliminary school vs higher than preliminary school), they did not show statistically difference in age, duration of DM, and scores made before and after education programme. The number of patients correctly identifying more than half of the statements showed a steep increase after the programme ($n=6$, 26.0% vs $n=17$, 73.9%). Scores made before and after education programme, duration of DM, and age did not differ according to SMBG frequency i.e. daily SMBG or less than daily SMBG ($p=0.263$, $p=0.771$, $p=0.587$, and $p=0.483$, respectively).

Before education programme 13 had poor knowledge, 9 had moderate, and 1 had good knowledge. After completion 6 had poor knowledge, 11 had moderate, and 6 had good knowledge. Two patients scored null before the programme and showed significant progress as indicated by 7 and 11 points after completion of it.

The percentage of correctly answered items except number 7 (a can of diet soft drink can be used for treating low blood glucose levels) and 17 (high blood glucose may be caused by too much insulin) improved after diabetes school. The most correctly chosen statements were number 19 and number 20 (for both items: pre-school $n=15$, 65.2%; post-school $n=23$, 100%). These statements were about the importance of regular visits to dietitian, diabetes nurse, and physician to prevent and detect complications.

There was no correlation between age, duration of DM, and scores made before and after the programme.

DISCUSSION

Diabetes education is an inevitable component of disease control. In the literature, diabetes education can decrease A1C between 0.6 to 2.5%.^{5,15,16} In a previous study a statistically significant decrease (1.21%) in A1C level after diabetes school education programme was shown.¹⁷ Success of diabetes education assessed by MDKT score showed a negative correlation with hemoglobin A1C level.¹¹

Diabetes education helps informed decision making, problem solving, and behavioral changes regarding self-care. In a study comparing 3 questionnaires (Michigan Brief Diabetes Knowledge Test (MDKT), Starr County Diabetes Knowledge Questionnaire (DKQ), and Kaiser DISTANCE Survey (DISTANCE)) 23-item MDKT was in good correlation in terms of general diet and foot care.¹¹ Arabic version of 14-item MDKT also has high validity.¹³ Because of cultural properties and different populations the researchers sometimes use adapted

versions of the original surveys.¹⁸ The same questionnaire can be applied as true/false type or multiple choice questions. MDKT is a short and quickly administrable test. Its reading level is at the 6th grade.¹²

MDKT knowledge scores are lower in patients with shorter disease duration of diabetes and less self-blood glucose monitoring.¹¹ Level of education is a significant determinant MDKT score.¹¹

In this study, an inverse relationship between scores and age and duration of DM was absent. Frequency of SMBG did not differ according to age, duration of DM or scores made before and after education. So habitual approach may have affected SMBG frequency.

In a study executed in patients with T2DM ($n=95$) in Norway revealed significant improvement of diabetes knowledge which was assessed by using 14-item MDKT before and immediately after group education programme and improvement persisted after 3 months. Despite absence of gender differences in diabetes knowledge scores, those of female participants improved significantly after education programme.¹⁹

In another study of 392 patients with T2DM, 62.5% had an average knowledge of diabetes which denotes to a score of 7-11 over total score of 14.²⁰ There were no significant association between diabetes knowledge scores and demographic features. In the study of Sweileh et al, the majority of participants were highly educated (82.5%) and 80.7% of them scored ≥ 7 out of a total score of 14.²¹

Another study done in 75 diabetic patients, 72% had moderate knowledge (7-11) over a total score of 14.²² A significant relationship between MDKT scores and educational level and marital status was detected. Shams et al used 24 item MDKT and labelled the knowledge level as low (0-40%), medium (41-60%) and high (>60%).²³ They showed that diabetes knowledge was poor in 76 (41.5%), acceptable in 76 (41.5%) and good in 31 (16.9%) out of 183 patients with diabetes (female 76.5%). In Murata's study, 23-item MDKT was used to assess knowledge of diabetes in 180 patients (male 94%) and 64.9 \pm 15.3% were correctly answered.²⁴ A study from Turkey used only 9 items from MDKT in combination with other tests to evaluate diabetes literacy.²⁵

In summary the previous studies yielded 63-65% success in the knowledge questionnaire.²² Conflicting results are present regarding the association between knowledge score and gender. Elderly people had lower knowledge scores.²²

Since most of the patients had a low level of education (82.6% preliminary school), it was unable to reach a definitive conclusion regarding the effect of education on MDKT scores. Although the scores improved after the programme, the rate of patients with moderate or good

knowledge is low which may be attributable to the low level of education. Only 3 male patients attended the programme. Nonetheless, the small number precludes us to reach a conclusion about gender difference.

In a previous study the least correctly answered item was related to food that should not be used when blood glucose was low (25.3%) in accordance with other studies using the same instrument.²² Knowledge about foot care and positive effects of exercise were also good in that study. In another study the least correctly answered items were related to insulin usage although all the subjects involved were already on insulin therapy.²⁴

In this study the success rate was low in items 7 and 17. Patients scored higher in other items related to nutrition. A broader knowledge and reading may aid to recognize carbohydrate containing foods. Since the test was applied in whole without categorizing the patients regarding insulin usage, one can expect lower score in items 17 and 18 which target insulin users. However, the patients had moderate knowledge about insulin use before and good knowledge after the education programme.

The pitfalls of the study are as follows. The number of patients completing the education programme and survey was small. The study group is heterogenous. Two statements regarding insulin therapy were asked to all patients including non-insulin users. Subgroups such as T1DM, T2DM insulin users, and non-insulin users were not analyzed. The reliability and validity of Turkish version of MDKT was not studied.

Despite low number of patients studied, it was shown that knowledge of diabetes improved after group education model executed as diabetes school model. MDKS provides feedback about areas where additional education is needed. Therefore, it can be used along with diabetes school programmes to select the subgroup of patients that need more simplified, interactive, and repetitive sessions. In addition, diabetes education may aid to improve adherence to medical therapy.

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