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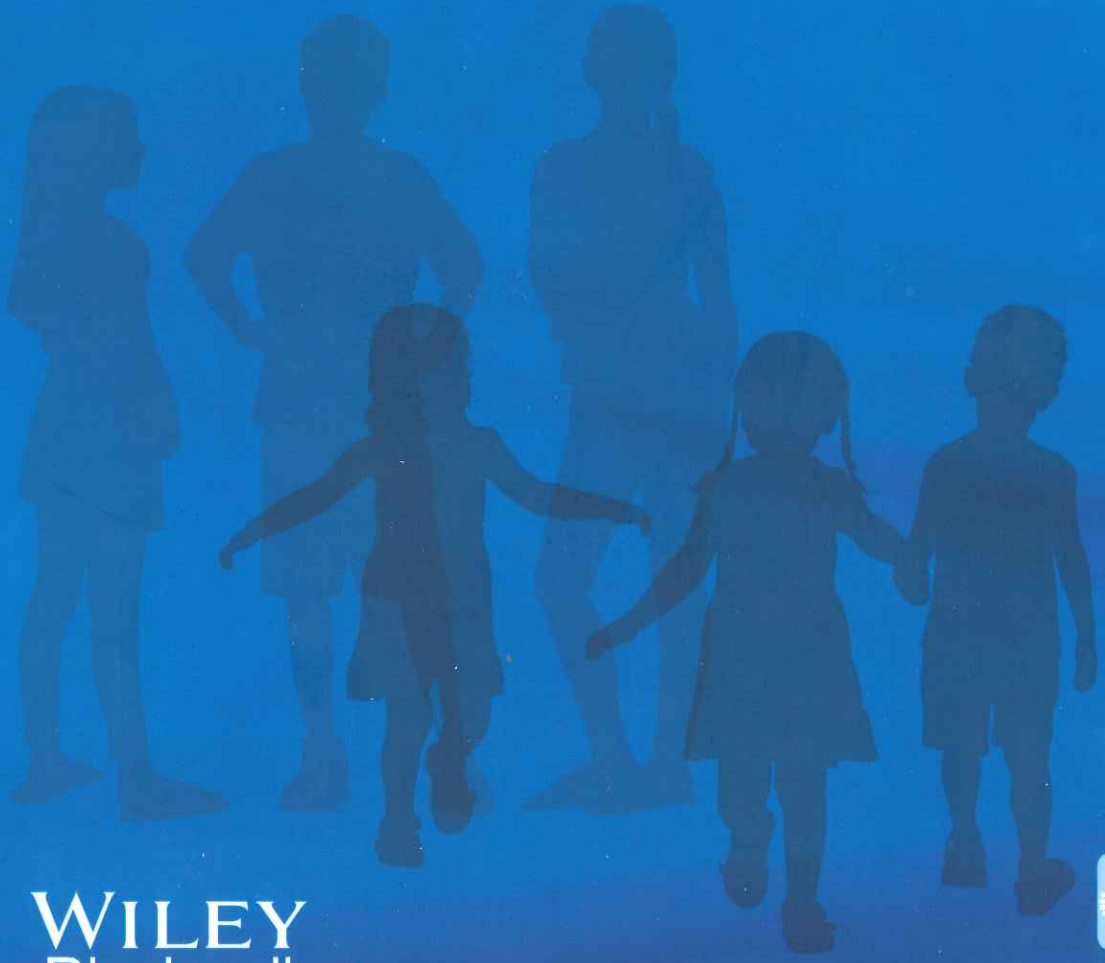

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Conclusions: Our baseline efficacy of diabetes education was less than anticipated. Objective measures are essential to evaluate learning effectiveness and to direct subsequent improvements.

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Evaluation of multiple educational programs on improvement of quality of life and metabolic status (HbA1c) in adult type 1 diabetic patient

BD Saboo[a], PA Talaviya[b,c], SR Joshi[d], HK Chandarana[b], SJ Shah[b], AN Shah[e] & CK Vyas[f]

[a]Dia Care – Diabetes Care and Hormone Clinic, Diabetes, Ahmedabad, India; [b]Dia Care – Diabetes Care and Hormone Clinic, Ahmedabad, India; [c]Pharmacology, Pacific University, Udaipur, India; [d]Joshi Clinic, Mumbai, India; [e]BJ Medical College, Ahmedabad, India; and [f]NHL Medical College, Ahmedabad, India

Aim: The present study was aimed to evaluate the outcome of diabetes educational programs in adult type 1 diabetic patients (T1D).
Methods: Diabetes educational programs were conducted at DiaCare for every 3 months with next 2 years follow up on improvement of quality of life (QOL) and HbA1c in T1D (n = 127, Age 15–20 years, HbA1c >8%). An epidemiological study were conducted on various parameters such as age, gender, duration of diabetes, diet, family history of diabetes, daily glucose monitoring frequency and hypoglycemic events (in past three month). The QOL was assessed by using 15 set diabetes quality of life (DQOL) questionnaire in 96 consecutive patients at Baseline and then at 6, at 12 and at 24 months after education program, decreased in DQOL score noted as improvement in QOL. The average HbA1c level was estimated before and after the programs (At 6, 12 and 24 months).
Results: A total 71.65% (n = 91) patients were responded to study at end of 24 months. The prevalence of T1D was higher in men than in women. The overall DQOL score was significantly ($P < 0.05$) decreased at 6 month from 65.79 ± 3.65 to 52.31 ± 3.51 (20.76% reduction), further more continuous reduction in average DQOL were noted at 12 and 24 months after educational programs. Patients exhibited greater satisfaction and diminished impact of diabetes after the educational programs were noted at 6 months after educational programs and it was maintained up to end of study. The HbA1c level was significantly ($P < 0.001$) decreased at 6 months (8.79 ± 1.88 Vs 7.28 ± 1.1) and at 12 months (8.79 ± 1.88 Vs 6.99 ± 0.46) and further reduction was continued at 24 months (8.79 ± 1.88 Vs 6.71 ± 0.51). The numbers of hypoglycemic events were decreased and frequency of self-monitoring of blood glucose increased after educational programs.
Conclusion: Results of present study revealed that the appropriate counseling and education to diabetic can improve QOL, HbA1c and help to decrease the impact of diabetes in T1D patients.

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Effects of diabetes education on glycemic control in children and adolescents with type 1 diabetes mellitus

C Daramilas[a], M Somali[b], M Papagianni[c], A Chatzi[c], G Mastorakos[d] & Z Mouslech[b]

[a]Faculty of Sciences, Department of Biology, Aristotel University, Thessaloniki, Greece; [b]Department of Endocrinology, National Organization for Health Care (EOPYY), Thessaloniki, Greece; [c]3rd Pediatric Department, Endocrine Unit, Hippokration Hospital, Aristotel University, Thessaloniki, Greece; and [d], Department of Endocrinoloy, Metabolism and Diabetes, Aretaeio Hospital, School of Medicine, National and Kapodistrian University, Athens, Greece

Objectives: The purpose of the study was to assess the impact of a diabetes self-management education program on glycemic control in children and adolescents with type 1diabetes mellitus (T1DM).
Methods: Eight patients aged 7–16 years, 5 on intensive insulin regimen and 3 on continuous subcutaneous insulin infusion, attended the program. Education was delivered by an endocrinologist and a diabetes educator, (biologist- person with T1DM). The program was held over a 12-month period at sequential sessions of 2 weeks. Education included topics such as general knowledge about the disease, insulin therapy and insulin pumps, nutrition, exercise, carbohydrate counting, glycemic index and management of hypoglycaemia. Fasting blood glucose, HbA1c, body weight and hypoglycemia incidents were recorded at baseline and at the end of the program.
Results: There was a significant decrease in the mean high blood glucose level from 302.5 ± 74.4 mg/dL at baseline to 225 ± 46.3 mg/dL 12 months later ($p = 0.011$), especially in patients aged more than 10 years ($p = 0.030$). A significant reduction in hypoglycaemic episodes was also observed from 58.63 ± 33.248 episodes in the preceding 4 month period before enrollment in the education program (baseline) to 27.500 ± 19.464 episodes during the last four months ($p = 0.005$) of the intervention. Mean HbA1c decreased from $7.64 \pm 1.14\%$ at baseline to $7.14 \pm 0.67\%$ at the end of the program ($p = 0.206$).
Conclusions: Even though, due to small sample size, no statistically significant decrease in HbA1c was detected, it is obvious that structured diabetes education improves glycemic control in patients with T1DM as observed by the significant decrease in the number of hypoglycemic incidents. Continuous education could lead to significant clinical outcomes regarding diabetes self-management and play an important role in the treatment of diabetes and growth in children and adolescents.

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Current practice of diabetes education in children and adolescents with type 1 diabetes in Germany and Austria: an analysis based on the German / Austrian DPV database

K Konrad[a], B Bartus[b], K Fink[c], M Fritsch[d], J Herwig[e], K Lange[f], N Nellen-Hellmuth[g], C Vogel[h] & RW Holl[c]

[a]Pediatric Endocrinology and Diabetes, University of Duisburg-Essen, Essen, Germany; [b]Olgahospital Stuttgart, Pediatrics, Stuttgart, Germany; [c]University of Ulm, Institute of Epidemiology and Medical Biometry, Ulm, Germany; [d]Pediatrics, University of Vienna, Vienna, Austria, [e]Childrens Hospital Frankfurt, Pediatrics, Frankfurt, Germany, [f]Pediatric Endocrinology and Diabetes, Hannover Medical School, Hannover, Germany, [g]Diabetes Clinic Bad Mergentheim, Diabetes, Bad Mergentheim, Germany, [h]Pediatric Endocrinology and Diabetes, Childrens Hospital Chemnitz, Chemnitz, Germany

Background: Diabetes education with regularly trainings of patients and their parents are an essential part of diabetes care with effects on diabetes outcome. The objective of our study was to describe current practice of diabetes education in Germany and Austria with regard to training frequency, patient age, diabetes duration, migration background and diabetes therapy in a large cohort of pediatric patients with diabetes mellitus type 1 (T1DM).
Method: We analyzed data from 28.337 patients with T1DM and complete data 2011 in the multicenter DPV registry using SAS 9.3.
Results: In 2011 28.337 patients with T1DM were documented (52.72% male, age: 14.27 [10.48–18.11] years (median [interquartile range]), diabetes duration: 4.98 [1.99–9.58] years, migration background: 16%, multiple daily injections: 65%, insulin-pump therapy: 35%). In total 14.393 diabetes trainings (0.51/patient/year)

Abstract Preview - Step 3/4

- print version -

Category: Diabetes Care, Education, Psychosocial Issues

Title: Effects of diabetes education on glycemic control in children and adolescents with type 1 diabetes mellitus.

Author(s): C. Daramilas[1], M. Somali[2], M. Papagianni[3], A. Chatzi[3], G. Mastorakos[4], Z. Mouslech[2]

Institute(s): [1]Aristotel University, Faculty of Sciences, Department of Biology, Thessaloniki, Greece, [2]National Organization for Health Care (EOPYY), Endocrinology, Thessaloniki, Greece, [3]Aristotel University, 3rd Pediatric Department, Endocrine Unit, Hippokration Hospital, Thessaloniki, Greece, [4]School of Medicine, National and Kapodistrian University, Department of Endocrinoloy, Metabolism and Diabetes, Aretaeio Hospital, Athens, Greece

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Conclusions: Even though, due to small sample size, no statistically significant decrease in HbA1c was detected, it is obvious that structured diabetes education improves glycemic control in patients with T1DM as observed by the significant decrease in the number of hypoglycemic incidents. Continuous education could lead to significant clinical outcomes regarding diabetes self-management and play an important role in the treatment of diabetes and growth in children and adolescents.

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ORIGINAL ARTICLE

Significant effect of group education in patients with diabetes type 1

Zadalla Mouslech[1] · Maria Somali[2] · Livadas Sarantis[3] · Daramilas Christos[2] · Chatzi Alexandra[4] · Papagianni Maria[4] · George Mastorakos[5] · Christos Savopoulos[1] · Apostolos I. Hatzitolios[1]

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Abstract

Objective Type 1 diabetes mellitus (T1DM) constitutes a real challenge in everyday practice for both physicians and patients. Due to the complexity of the disease and its unpredictable nature, structured education and training programs are nowadays implemented that ensure active patient involvement and self-care behaviors to achieve adequate glycemic control, prevent diabetic complications, and improve the quality of life of patients. These programs provide patients with the necessary knowledge and skills to self-monitor and self-manage the disease and its associated metabolic conditions. The aim of the study was to evaluate the effect of a structured 12-month education program that motivated patients to follow a healthy Mediterranean diet and exercise regularly as well as to adjust carbohydrate intake and insulin dose according to their needs.

Design The education group (EG) was comprised of 62 patients (45 males) with type 1 DM, mean age 36 ± 4.2 years and BMI 24.2 ± 3.1 kg/m^2. An age- and BMI-matched control group (CG, $n = 25$, mean age 41 ± 6.4 years, BMI 25.7 ± 4.2 kg/m^2) was composed of patients referred but not enrolled in the project.

Results At the end of this program, HbA1C levels were significantly decreased (8.5 ± 2.1% vs. 7.08 ± 0.79%, $p < 0.0001$) as was also the incidence of hypoglycemic episodes ($p < 0.05$). Regarding daily glucose fluctuations, significant improvement ($p < 0.05$) was observed, as reflected in low, high, and daily median glucose values. On the other hand, the above parameters remained stable in the CG.

Conclusions These results strongly support the need for long-lasting structured education group courses for adult diabetic patients keen to change their habits in order to achieve self-management of the disease.

Keywords Diabetes education program · Type 1 diabetes · Glycemic control · Hypoglycemia · Weight

Introduction

Diabetes mellitus (DM) is today one of the most common chronic diseases. Specifically, in 2013, 382 million people worldwide had diabetes and this number is expected to rise to 592 million by 2035 [1]. With regard to type 1 DM (T1DM), more than 18,000 new cases were diagnosed annually between 2008 and 2009 in individuals older than 20 years of age in the USA (http://www.cdc.gov/diabetes/pubs/statsreport14/national-diabetes-report-web.pdf). In Europe, an increase (0.6–9.3%) in the incidence of T1DM has been recorded in the EURODIAB registry, and T1DM prevalence in individuals < 15 years is predicted to rise significantly (by 70%) by 2020 [2].

DM treatment includes not only the achievement of adequate glycemic control but also the prevention and treatment of diabetic complications, both micro- and macrovascular, as well as improvement in quality of life. Active patient involvement and self-care behaviors, including healthy eating, physical

✉ Livadas Sarantis
sarntis@gmail.com

1 1st Medical Propedeutic Dept. of Internal Medicine, AHEPA University Hospital, Aristotle University of Thessaloniki, 1 Kiriakidi, 54621 Thessaloniki, Greece

2 Endocrinology, Metabolism and Diabetes Unit, Euromedica General Clinic, 11 Marias Kallas & 2 Gravias Streets, 54645 Thessaloniki, Greece

3 Endocrine Unit, Metropolitan Hospital, 9 Ethnarchou Makariou, 18547 Athens, Greece

4 Endocrine Unit, 3rd Pediatric Department, Hippokration Hospital, Aristotle University, 49 Konstantinoupoleos, 54642 Thessaloniki, Greece

5 Department of Endocrinology, Metabolism and Diabetes, Aretaeio Hospital, School of Medicine, National and Kapodistrian University Athens, 76 Vas. Sofias, 11528 Athens, Greece

activity, blood glucose monitoring, good problem-solving and healthy coping skills, compliance with drug therapy, and risk-reduction behaviors (e.g., foot care), have been associated with better glycemic control, fewer diabetic complications, and improved quality of life in patients with DM [3].

Structured education and training programs have proven to be helpful in ensuring that DM patients are provided with the necessary knowledge and skills to modify their behavior and self-manage the disease and its associated complications (www.diabeteseducator.org/export/sites/aade/_resources/pdf/research/Guidelines_Final_2_1_11.pdf). In this context, various self-management education programs are available for patients with DM, including the DAFNE (Dose Adjustment For Normal Eating) program, a 5-day course for patients with T1DM with special focus on carbohydrate intake estimation, insulin dose adjustments, and glucose self-monitoring. The DAFNE program was shown to significantly improve glycated hemoglobin (HbA1C) levels and quality of life in T1DM patients ($n = 169$) in a previous randomized controlled trial [4]. More recently, the implementation in the UK of the DAFNE course in a routine clinical setting of T1DM patients ($n = 639$) led to significant reductions in HbA1C levels, episodes of severe hypoglycemia, and psychological distress, as well as improvements in self-reported hypoglycemia awareness and wellbeing 1 year after the education program [5].

Similar positive results have been obtained by a few other studies, but there is a notable lack of robust evidence to support this procedure in everyday practice, especially in adults. Furthermore, the impact of the long duration of these programs (1 year) has not been evaluated. The present study aimed to examine whether an educational program of 12 months' duration that motivated T1DM patients to follow a healthy Mediterranean diet and exercise regularly, as well as to adjust carbohydrate intake and insulin dose accordingly, could lead to better metabolic control among adult patients compared to those who continued standard diabetes care.

Study design and methods

Subjects Eighty-seven (87) patients with T1DM recruited from the association of persons with DM1 entitled "St. George," which is based in Thessaloniki, Greece, attended the diabetes education program and were offered the opportunity to participate in the study. The education group (EG) was comprised of 62 patients (45 males) aged 18 to 62 years (mean age 36 ± 4.2 years and BMI 24.2 ± 3.1 kg/m^2) who had accepted the proposal, while 25 patients (16 males, mean age 41 ± 6.4 years, BMI 25.7 ± 4.2 kg/m^2) who did not participate in the study served as controls (CG). The educational group was comprised mostly of patients on an intensive insulin regimen ($n = 59$), of whom three were on continuous insulin infusion with a pump ($n = 3$). Concerning the control group ($n = 25$, 18 males), all patients also followed an intensive insulin regimen. The basal insulin used was either detemir or glargine, and not NPH. The diabetes regimen remained unchanged throughout the program, with the exception of slight adjustments in insulin dosing (up to 20% of the total insulin dose). None of the patients suffered from severe diabetic complications. All participants completed the 1-year educational course.

The study was approved by the Ethics Committee of the 1st Medical Propedeutic Dept. of Internal Medicine, AHEPA University Hospital, Aristotle University of Thessaloniki, Greece. Informed consent was obtained from the subjects of both groups who participated in the study.

Educational intervention The structured education program was designed according to the National Standards for Diabetes Self-Management Education and Support [6]. The program focused on passing on knowledge and skills concerning DM in a simple and understandable but scientific way and was not restricted to psychological support of the patients. The program included education on such topics as knowledge about DM and insulin, HbA1C, nutrition, and management of hypoglycemia. These topics are listed in detail in Table 1. In accordance with the most up-to-date approach, tutoring was culturally sensitive and adapted to participants' habits [7]. The educational program lasted for 12 months, with 2-h sessions being held every 2 weeks. At the beginning of every session, a long discussion was held as regards the application of knowledge gained during the previous sessions and its effectiveness in problem solving. Sessions took place in groups; each group consisted of the physician in charge (endocrinologist or internist with experience in DM), a diabetes educator, and 6-8 T1DM patients. The educator was a Health Sciences professional with T1DM.

Nutritional guidance and exercise Participants were free to follow their usual dietary habits during this period. However, they were encouraged to adopt a healthy Mediterranean diet and were advised to calculate the amount of carbohydrate of each meal and to adjust their insulin adequately, according to the guidelines. Patients were also motivated to exercise regularly, namely at least three times per week for 1 h, at a moderate pace. Guidance was offered as to carbohydrate intake and insulin dose adjustments according to exercise needs.

Outcomes The primary outcomes included changes in HbA1C levels and the frequency of hypoglycemic episodes at baseline and at the end of the program. Furthermore, a record was kept of mean high and low blood glucose levels every 4 months as well as body weight at baseline and at the end of the program.

Statistics The statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 20 (SPSS, Chicago,

Table 1 Curriculum of the educational program

1	Questionnaire regarding the course of diabetes in each individual and the patient's knowledge of what the disease is
2	What is diabetes? - How is the diagnosis made? - What are the reasons for symptoms? - What is glucose (normal levels and target value)?
3	What is insulin? - How does it act?
4	Nutrition and carbohydrate intake - glycemic index
5	Insulin injections, types, absorption - doses for correction - 1500 and 1800 rule
6	Hypoglycemia (prevention, recognition, management) - rule of 15 - low premeal blood glucose
7	What is HbA1c? - clear targets of control
8	Monitoring - self-management - how important is it to monitor blood glucose and when is it best to do it?
9	What is the benefit of writing down blood glucose level every day? - evaluation
10	What is variability in diabetes?
11	Data for further practice in self-management
12	Management of T1DM before, during and after exercise
13	Microvascular and macrovascular complications and how to prevent them
14	Special occasions and experiences from everyday life of patients with diabetes (sexual activities, driving, alcohol, smoking, drugs)
15	Diabetes, growth and weight control - Is insulin responsible for gaining weight?
16	Myth and reality (Is there an "unexplainable" high or low blood glucose level in diabetes? How to control diabetes if I want to)
17	Diabetes - acceptance - social behavior - Discussion about personal problems
18	What to remember from the previous sessions
19	Individual knowledge evaluation test
20	Evaluation test on feelings and improvement of quality of life through the educational groups
21	What is the difference between using an insulin infusion pump and intensive insulin regimen? How to use an insulin infusion pump if the patient wishes to
22	Technology in diabetes: the future and the present reality

IL, USA). P value < 0.05 was considered statistically significant. Continuous variables were assessed for normal distribution both graphically and by the Kolmogorov-Smirnov test. Variables with asymmetric distribution were analyzed by nonparametric statistical tests (Mann-Whitney test). Differences among continuous variables between the two groups were evaluated using the independent sample, two-tailed t test. Normally distributed variables are presented as mean ± SE.

Results

The two groups were comparable regarding income, education, insurance, and marital status. Pertinent results of the studied subjects are depicted in Table 2. HbA1C values were significantly reduced by 1.5% in the EG group (8.6 ± 2.2% at baseline vs. 7.1 ± 0.8% at the end of the program; $p < 0.001$), whereas no significant difference was observed in CG (7.92 ± 0.2 vs. 7.42 ± 0.13, p: ns). The decrease in HbA1C levels was significant in both male (8.5 ± 2.4% at baseline vs. 6.9 ± 0.7% at the end of the program; $p < 0.001$) and female patients (8.9 ± 1.8% at baseline vs. 7.3 ± 0.9% at the end of the program; $p < 0.001$). With respect to the different age groups, the improvement of HbA1C reached statistical significance in all age groups. Specifically, in patients aged 18–30 years, HbA1C was modified from 8.3 ± 2.4% at baseline to 6.9 ± 0.6% at the end of the program; p: 0.006, as well as for the age group 31–40 years (8.5 ± 1.7% vs. 7.0 ± 0.7%; $p < 0.001$) and those aged older than 41 years (9.8 ± 2.2% vs. 7.6 ± 1.0%; p: 0.024), respectively. Body weight did not change significantly among either group. Concerning glucose fluctuations, as reflected in high, low, and median glucose values, a significant decrease was observed only in the EG group (Table 2, Fig. 1). Finally, the total number of confirmed hypoglycemic episodes in the EG group was significantly reduced from 63 ± 50 at 4 months to 57 ± 37 episodes at 8 months and 30 ± 22 episodes at the end of the program ($p < 0.001$ for all comparisons). However, the incidence of hypoglycemia remained unchanged in CG (Table 2, Fig. 2).

Discussion

In the present study, 62 patients (45 males) with T1DM with a mean age of 36 ± 4.2 years and BMI 24.2 ± 3.1 kg/m^2 attended a structured education program on diabetes self-monitoring and management. This program consisted of 2-h

Table 2 Results of comparison between groups

		Education group ($n = 62$)			Control group ($n = 25$)		
		Before	Post	p	Before	Post	p
Weight (kg)		77.2 ± 3.4	76 ± 4.5	ns	73 ± 2.3	75 ± 2.3	ns
BMI (kg/m^2)		24.2 ± 3.1	23.3 ± 5.4	ns	25.7 ± 4.2	26.1 ± 6.5	ns
HbA1c (%) (IFCC mmol/mol)		8.54 ± 0.26 (69.8 ± 2.1)	7.08 ± 0.1 (53.9 ± 1.2)	< 0.001	7.92 ± 0.2 (63.1 ± 2)	7.42 ± 0.13 (57.6 ± 1.6)	ns
Glucose values (mmol/L)	*High*	18.02 ± 0.6	12.39 ± 0.4	< 0.001	11.35 ± 0.5	12.77 ± 0.6	ns
	Low	8.59 ± 0.6	6.66 ± 0.3	< 0.001	8.15 ± 0.4	7.43 ± 0.3	ns
	Median	13.49 ± 0.5	172 ± 0.3	< 0.001	10.84 ± 1,26	11.07 ± 0.7	ns
Median number of hypoglycemic episodes per week (min-max)		3.3 (0.8–4.1)	1.6 (0.9–2.1)	< 0.001	2.6 (1.1–3.2)	2.3 (0.9–2.8)	ns

Data are presented as median and SE values and the paired t test was used for the analysis

sessions carried out every 14 days and lasted for 1 year. Participants were motivated to follow a healthy Mediterranean diet and to exercise regularly as well as to adjust carbohydrate intake and insulin dose accordingly. T1DM pathophysiology and therapy as well as prevention and treatment of diabetic complications were also discussed extensively. Furthermore, the program focused on the prevention, recognition, and management of hypoglycemic episodes, as hypoglycemia may significantly affect not only T1DM treatment but also patients' quality of life. At the end of this program, HbA1C levels were significantly reduced in both genders and all age groups, followed by reduction of glucose fluctuations and incidence of hypoglycemia. Of note, no significant change in HbA1C levels, glycemic controls, or the rate of hypoglycemias was observed in the control group (Table 2).

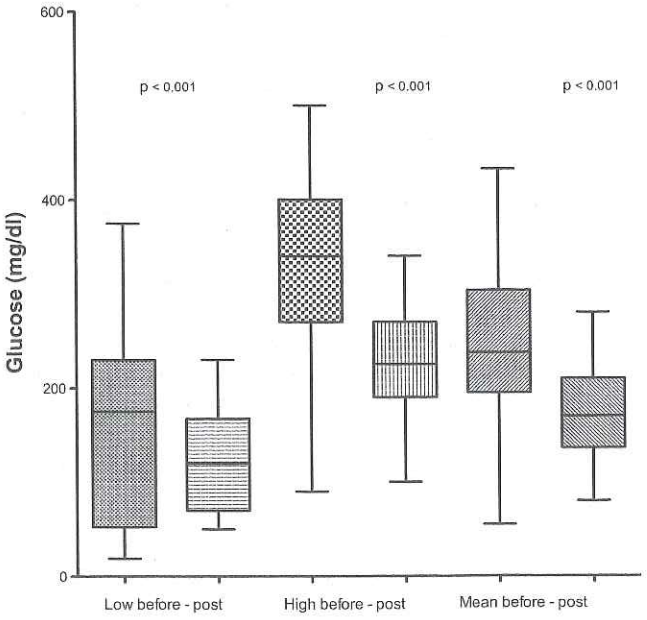

Fig. 1 High, low, and median glucose values

The amelioration of HbA1C values through educational intervention is in agreement with available literature data. As can be seen in Table 3 summarizing the current literature evidence, in three out of five studies, a positive impact on HbA1C levels is anticipated through this intervention [8–13]. In brief, Abolfotouh et al. evaluated in a total of 503 T1DM adolescents (experimental vs. control group) the effect of four educational courses during a 4-month period and found an improvement in quality of life and a slight decrease in HbA1c values [8]. Furthermore, Mannucci et al. described a significant reduction in HbA1C levels, from 7.5 ± 1.8 to 6.8 ± 1.4%, only in those patients who followed a similar structured approach and were keen to participate [9]. In another study, weekly psycho-educational sessions ($n = 7$) with 60 T1DM patients were also reported as having achieved reduction in HbA1c by 0.3% at 6 months, whereas no changes were recorded in the control group [10]. Finally, in a previous study of 25 uncontrolled T1DM adolescents, a 3-month psycho-educational program (including a session for the parents and three sessions for the patients) significantly decreased HbA1c levels by 0.65% by the end of the 9-month follow-up [11]. However, not all educational programs succeed in improving glycemic control. In this context, the Child and Adolescent Structured Competencies Approach to Diabetes Education (CASCADE) was delivered to 362 T1DM patients and their families without significantly beneficially affecting HbA1c levels during follow-up [12]. Furthermore, according to the available evidence from interventions targeting African American diabetic patients, a reduction of HbA1C by only 0.8% is anticipated [13]. Nevertheless, a recent meta-analysis found no significant improvement achieved via behavioral programs for T1DM, but, as the authors pointed out, all the studies included in the analysis had a medium or high risk of bias [14].

Conversely, in the present study, the data, as compared to those cited above, demonstrated a higher reduction of HbA1C values (1.5%) (Table 1). This disparity could be attributed to the longer duration of the educational program (1 year) and

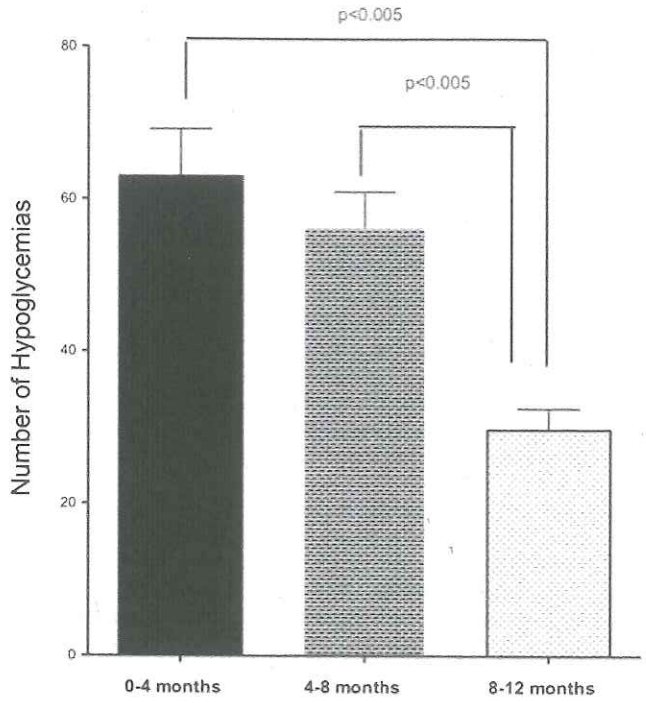

Fig. 2 The incidence of hypoglycemia

the fact that the present program was adapted to Greek dietary and cultural habits, an approach that improves patients' adherence to the program [7]. Another aspect that might conduce to better subject compliance was the method of delivering diabetes education techniques. Indeed, it has been ascertained that the group setting, as in the present study, is more effective than the individual setting [15]. Other factors contributing to significant improvement in HbA1C could be the older age of the patients and the fact that this was not a randomized study but included only patients who were willing to participate. It has been shown that patients keen to improve their glycemic control and who are concerned about their disease, adopt and adhere more readily to new therapeutic strategies [16]. Taken as a whole, it seems clear that the above parameters, namely cultural adjustment, long duration, participation of adults, group setting, and the self-motivation of patients, contribute to higher compliance and improved HbA1C levels.

In a similar manner, glycemic control as reflected in low, high, and mean values were significantly improved in patients of the educational group compared to control subjects (Fig. 1). This observation is of considerable importance, showing that the educational program improves daily glucose fluctuations, which is directly related to better quality of life and survival [17, 18]. In effect, the majority of subjects participating in the study reported that they were more self-assured and capable of managing everyday challenges of the disease, a fact which accounts for the present positive study findings.

As regards the incidence of hypoglycemic episodes, a significant reduction (by almost 50%) was observed from the fourth month until the end of the study (Fig. 2). This finding is noteworthy and is of great importance for everyday practice given that hypoglycemia remains a critical clinical issue in the treatment of T1DM patients [19, 20]. Furthermore, it should be emphasized that the fear of hypoglycemia may further hamper patient compliance and glycemic control in T1DM and has also been associated with cognitive dysfunction in T1DM children [21, 22].

With respect to body weight, no significant modification was found in either group (Table 2), although improved glycemic control has been linked to weight gain in T1DM due to insulin use [23]. Therefore, educational courses including recommendations relating to healthy dietary habits, physical activity, and adjustments of insulin dose based on carbohydrate intake are useful in order to prevent weight increases following achievement of better glycemic control in such patients. Of note, long-action insulin detemir was reported to significantly decrease weight compared to NPH insulin in T1DM patients, thus representing an attractive therapeutic option [24]. However, in the current study, all patients were on treatment with insulin glargine or detemir and NPH was not used.

Since the implementation of such group-based approaches poses certain difficulties in relation to scheduling and costs,

Table 3 Synopsis of available clinical trials and present study findings

	Patients (*n*)	Age	Duration (months)	Frequency of educational sessions	HbA1C (%)		Net A1C modification (%)
					Baseline	Post intervention	
Manucci E et al., 2005	46	Adults	12	Every 15 days	7.5 ± 1.8	6.8 ± 1.4	0.7
Abolfotouh MA et al., 2011	503	Adolescents	4	Monthly	10.62 ± 1.89	10.44 ± 1.44	0.18
Forlani G et al., 2013	60	40 ± 12 years	6	Weekly	8.2 ± 1.6	7.9 ± 1.6	0.3
Verbeek S et al., 2011	25	Adolescents	3	Monthly	10.0 ± 0.7	9.4.0 ± 0.7	0.6
Sawtell M et al., 2015	362	8–16 years	1	2 educational courses	≥ 8.5	No impact	ns
Present study	87	Adults	12	Every 15 days	8.54 ± 0.26	7.08 ± 0.1	1.5

alternatives have been proposed to improve the impact of such educational programs, including internet-based courses [25–27]. Applications for smartphones and smartwatches have also been developed containing data on physical exercise, diet, insulin treatment, and self-monitoring [28]. A recent meta-analysis corroborates the significance of educational interventions in conjunction with technological courses in improving hypoglycemia awareness and glycemic control in T1DM patients [29]. Interactive computer-based training courses may be more useful than conventional ones in educating diabetic patients in the prevention and management of hypoglycemia [30]. This finding further supports the clinical significance of educational programs in preventing hypoglycemic episodes in T1DM.

The major limitation of this study is that it is not a randomized study. This may have impacted on the results, as the intervention group was comprised of patients who had actively chosen to participate rather than being assigned to a group following the standard randomization process. Accordingly, one may suggest that these subjects were more motivated than their peers to improve their glycemic control and this parameter may explain the difference found among groups. On the other hand, since this study reflects real world data, we anticipate that active involvement of patients will be reflected in their DM status and therefore, our role as clinicians is to reinforce and instruct them to follow these structured programs.

In conclusion, the present study clearly demonstrated significant improvements in glycemic control and hypoglycemia prevalence in T1DM patients attending an educational DM program. These results validate the need for structured education and training courses on self-monitoring and self-management in T1DM patients. Data on the pathophysiology and treatment of both DM and diabetic complications should also be discussed with the patients to increase their awareness of the nature of the disease. The main aim of such a project is to motivate them to be actively involved in the prevention and management of both the disease and its complications. The success of this type of approach seems to be dependent on the long duration of the program, the group-based approach, the older age of participants, their willingness to be actively involved in attaining glycemic control, and the adaptation of the program to national and ethnic variations. The findings of the present study confirm Doctor Joslin's famous quote, that "The person with diabetes who knows the most lives the longest" [31].

Compliance with ethical standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The ethics committee of the AHEPA Hospital approved the study and written informed consent was obtained from all participants.

Conflict of interest The authors declare that they have no conflict of interest.

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HORMONES

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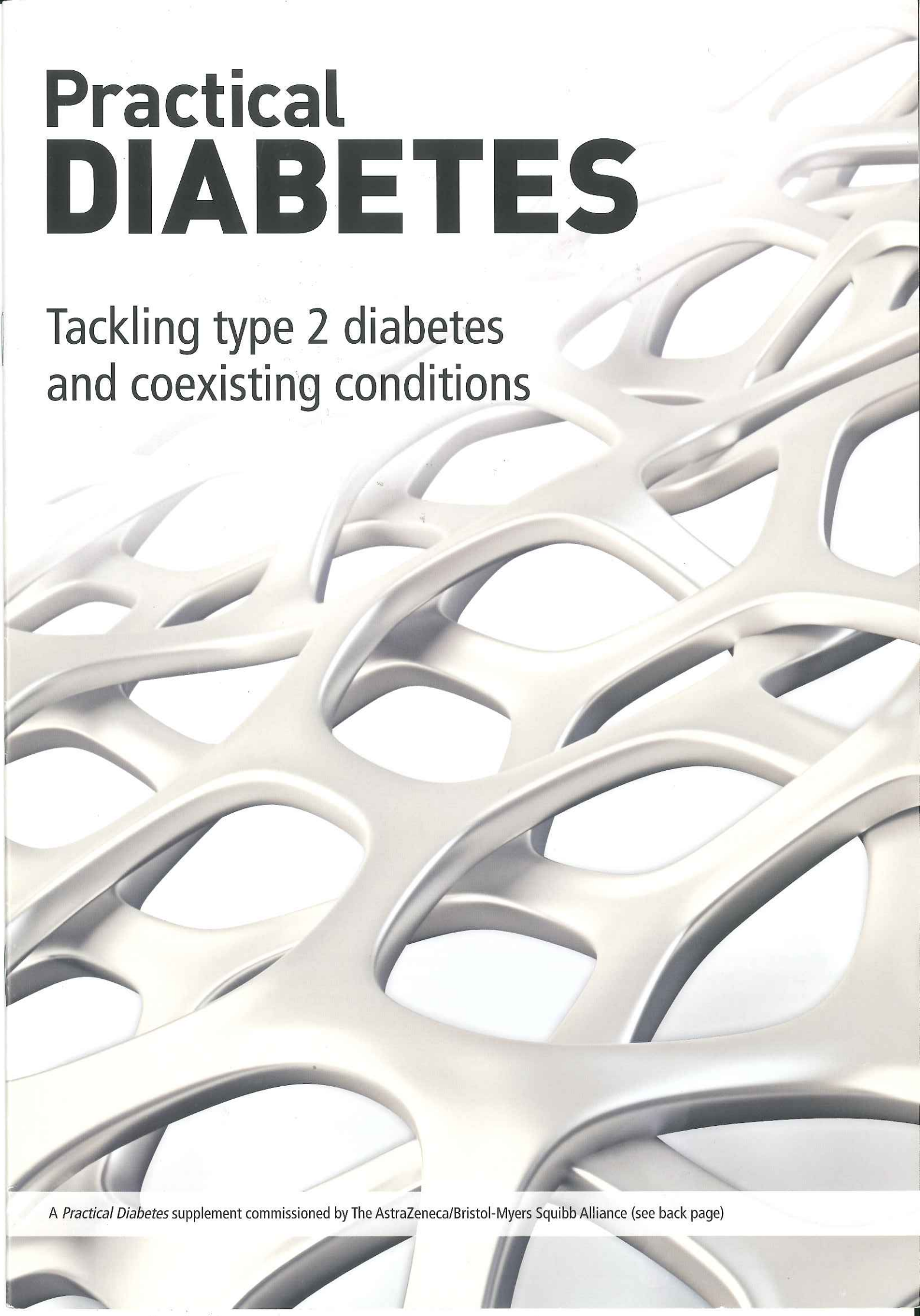
Practical DIABETES

Tackling type 2 diabetes and coexisting conditions



A *Practical Diabetes* supplement commissioned by The AstraZeneca/Bristol-Myers Squibb Alliance (see back page)

Attendees

Dr Gillian Hood, North East London Diabetes Research Network Manager, co-editor of *European Diabetes Nursing.* Foundation of European Nurses in Diabetes (FEND)
Professor Doctor Johan Wens, Professor of General Practice, University of Antwerp and Chair, Primary Care Diabetes Europe (PCDE), Belgium
Professor Josep Redon, Professor of Internal Medicine, University of Valencia, and President of the European Society of Hypertension, Spain
Katie Gallagher, Policy Officer, International Diabetes Federation Europe (IDF EUROPE)
Richard Lane, OBE, President, Diabetes UK
Mercedes Maderuelo, Spanish Federation of Diabetics (FEDE)
Christos Daramilas, The Panhellenic Federation of Associations of People with Diabetes (POSSASDIA), Greece
Anna Śliwińska, Polish Diabetes Association (PDA)

Additional contribution was provided by Professor Lilienfeld-Toal, Board member, Deutscher Diabetiker Bund (DDB)
Editorial support was provided by Steve Chaplin, medical writer

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Tackling type 2 diabetes and coexisting conditions

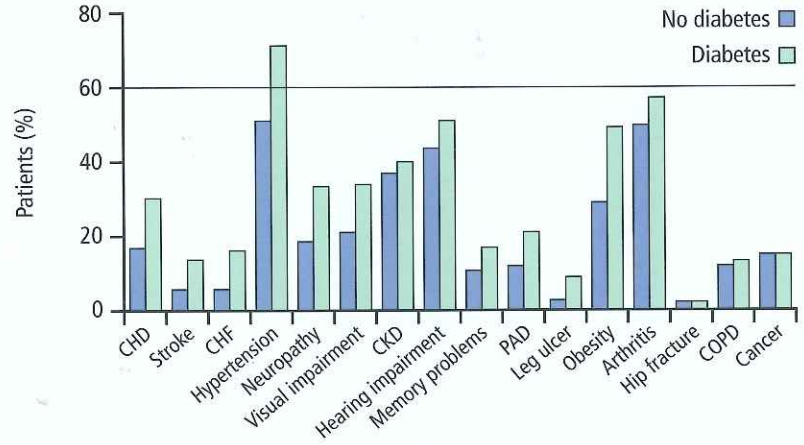
Type 2 diabetes is a chronic condition characterised by worsening glucose tolerance due to diminishing insulin secretion and/or insulin resistance, said **Professor Josep Redon**, University of Valencia. However, glycaemic control is not the only challenge facing people with type 2 diabetes. Coexisting conditions – that is, conditions that cause, are caused by or are otherwise related to another condition – are more common in people with diabetes than the general population and include hypertension, obesity and dyslipidaemia (Figure 1).[1]

Coexisting conditions are not confined to physical disorders – 41% of people with diabetes have poor psychological well-being.[2] Type 2 diabetes is associated with memory problems,[1] cognitive dysfunction[3] and anxiety.[4] Depression is more common than in people without diabetes (Figure 2).[5] It can impair quality of life (Figure 3)[6] and is associated with an increased risk of microvascular and macrovascular complications[7] and death.[8] Cognitive dysfunction and depression can therefore be considered to be 'key unmet coexisting conditions in diabetes'.

Coexisting conditions can negatively affect how patients prioritise their diabetes management,[9] reducing the likelihood of treatment intensification,[10] increasing resource use in primary and secondary care,[10] and impairing quality of life (Figure 3).[11] The impact of depression on people with diabetes is so great that it is second only to diabetic foot in terms of primary care physician workload.[10]

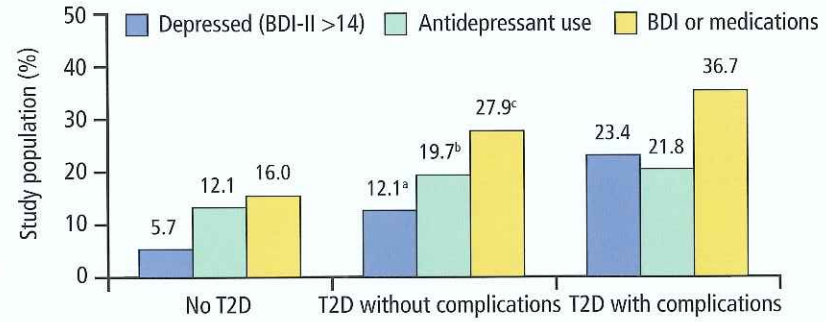
Participation in a disease management programme improves quality of life in people with diabetes, especially in those with more than one coexisting condition.[11] In primary care, management requires a positive outlook and an holistic approach, taking into account the total impact of diabetes and coexisting conditions on individuals and healthcare systems.

A glucocentric approach is not enough to deliver good diabetes care, Professor Redon concluded.



CHD, coronary heart disease; CHF, congestive heart failure; CKD, chronic kidney disease; PAD, peripheral artery disease; COPD, chronic obstructive pulmonary disease

Figure 1. Prevalence (% patients) of coexisting conditions in people with diabetes >60 years old.[1]



T2D, type 2 diabetes; BDI-II, Beck Depression Inventory II score. Depression disorder was defined as a BDI score of >14 and/or use of antidepressant medication.
[a]p=0.0016 vs non-T2D controls; [b]p=0.0053 vs non-T2D controls; [c]p=0.0001 vs non-T2D controls.

Figure 2. Prevalence of depression in people with type 2 diabetes, with and without complications compared with people without diabetes[5]

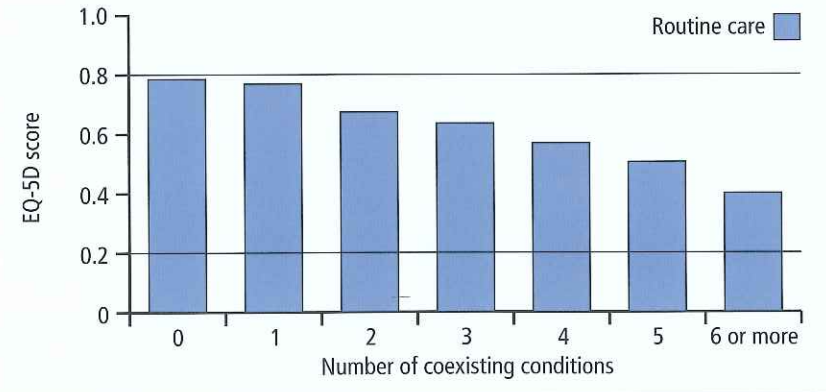


Figure 3. Effect of increasing numbers of coexisting conditions on health-related quality of life (EQ-5D score)[11]

Healthcare professional and patient perspectives on coexisting conditions in type 2 diabetes

A GP's perspective

Professor Doctor Johan Wens

By the time type 2 diabetes is diagnosed, many patients in primary care have already developed coexisting conditions (Table 1)[12] and they need a comprehensive management programme of monitoring, data collection and multiple drug therapy. With consultations averaging only 11 minutes in Europe,[13] primary care physicians lack the time necessary to deliver this.

In this setting, primary care physicians find it difficult to educate patients about their diabetes[14] and they do not achieve treatment targets for coexisting conditions in many patients.[15] Management guidelines may be unhelpful because they are mainly based on randomised and controlled clinical trials, which often exclude patients with complex coexisting conditions. Consequently, there are no guidelines specifically on the management of coexisting conditions in people with diabetes, Professor Wens commented.

The solution is for patients and primary care physicians to agree their priorities for diabetes care. What are their goals for diabetes control relative to the management of coexisting conditions? And how can healthcare systems be redesigned to enable primary care physicians to have greater efficiency in complex care management?

Complications	% patients (Belgium)
Hypertension	49.5
Ischaemic cardiomyopathy	14.5
Peripheral vascular disease	7.3
Skin mycosis	7.1
Cerebrovascular accident	6.4
Neuropathy	3.1
Foot lesions	1.8
Retinopathy	1.2

Table 1. Prevalence (% patients) of coexisting conditions and complications at the time of diagnosis of type 2 diabetes in primary care (Belgium)[12]

A nurse perspective

Dr Gillian Hood (PhD)

The role of nurses in diabetes care varies widely in Europe. However, in those countries with a strong primary care oriented health service, they have a prominent role in daily management. In the UK, type 2 diabetes is almost exclusively managed in primary care. Management is defined by evidence-based guidelines and primary care physicians are incentivised by performance payments to achieve a range of treatment targets. Nurses manage many coexisting conditions (Box 1) and much of the day-to-day care. Monitoring and referral is delivered by practice nurses in nurse-led clinics, who are able to screen for coexisting conditions, including obesity. Diabetes specialist nurses provide support to those patients whose diabetes is more difficult to manage. These interventions require detailed educational programmes that are commissioned by primary care trusts and are usually delivered by nurses.

- Obesity – some nurse/dietitian-led clinics
- Cardiovascular disease – some nurse-led clinics
- Hypertension – some nurse-led clinics
- Nephropathy – nurse surveillance/referral
- Retinopathy – nurse surveillance/referral
- Foot disease – nurse surveillance/referral
- Depression – nurse screening for the future

Box 1. Conditions seen by the diabetes nurse in the UK primary care setting

Everyone with diabetes has problems with management at times, but the current economic climate makes it difficult for some people to adopt a healthy lifestyle. Nurses can help to overcome this by delivering different options through structured patient education to all patients (Box 2). There should be a change in approach from overall disease management to tailoring care to different groups of patients with type 2 diabetes. A glucocentric clinical approach alone is not enough in the face of the diabetes epidemic – there is a need to raise the visibility of diabetes, change society's perceptions and do more research to improve prevention. Nurses can work effectively with schools and communities to educate children early about healthy lifestyles and to overcome cultural barriers to education among ethnic minorities.

Providing basic information about different and important areas for managing diabetes and preventing complications:

1. Healthy eating
2. Being active
3. Monitoring
4. Reducing risks
5. Taking medication
6. Problem solving
7. Healthy coping

Box 2. Patient structured education: a nurse-led intervention to reduce complications

A patient perspective

Katie Gallagher

There are many coexisting conditions associated with type 2 diabetes: drug-induced conditions, endocrine disorders, obesity, hypertension, cardiovascular disease, sleep apnoea and depression to name only a few. The impact on the day-to-day lives of people living with diabetes is significant and includes psychological

stress of a long-term disability, metabolic derangement and high behavioural demands of the treatment. Any coexisting conditions can only enhance such burdens.

Among the many coexisting conditions associated with diabetes, depression is a huge burden for people with diabetes and their carers. Depression is twice as common among people with diabetes than in control populations.[16] It significantly impairs all aspects of quality of life,[17] reduces adherence to treatment,[18] diminishes self-care behaviour and, in those using insulin, adversely affects glycaemic control.[19] This matters to patients. If adherence to treatment is reduced, patients are more likely to develop complications and this, in turn, means a shorter life expectancy.

Stigma is an important societal barrier for people living with diabetes. Depression as a coexisting condition associated with diabetes also carries a stigma and inhibits appropriate recognition and is a barrier to adequate care. Optimal management of depression in diabetes requires equal emphasis on both physical and mental disorders, so involving psychiatrists who are sensitive to these needs is essential. Patient education is also a necessity and key to good self-management and care.

The management of diabetes and coexisting conditions such as depression requires a holistic, multidisciplinary approach using a patient-centred integrated care model that puts an equal emphasis on all aspects of living with diabetes and coexisting conditions.

Ms Gallagher acknowledged Professor Richard IG Holt, Professor in Diabetes and Endocrinology, University of Southampton.

Discussion and outcomes from the meeting

The participants divided into work groups to consider three important questions relating to the coexisting conditions associated with type 2 diabetes:

- What more could be done to educate patients about the coexisting conditions of type 2 diabetes?
- How can patients be supported to improve communication with their primary care physician about their type 2 diabetes and coexisting conditions?
- Do primary care physicians and policy makers understand the impact of coexisting conditions in type 2 diabetes?

Group participants brought different perspectives to the debate – patient advocacy, primary care, nursing and research (summarised in Box 3). Their views are represented below.

What more could be done to educate patients about the coexisting conditions of type 2 diabetes?

It is important to detect coexisting conditions early because prompt intervention can reduce the risk of complications. However, efforts to act quickly are hampered by a lack of awareness among people with type 2 diabetes. Many are not well informed about glucose control, and at times they do not understand their management targets and lack awareness of the conditions associated with type 2 diabetes. This has proved hard to change because, despite increasing public awareness of diabetes, the stigma surrounding the condition stops people from talking about it and learning to manage their condition effectively.

Education can overcome this problem provided it is delivered effectively. The group emphasised the distinction between information (what is this condition and how is it treated?) and patient education (motivating the patient to look after their diabetes). Patients need information about diabetes and coexisting conditions at the time of diagnosis because this will help them understand the value of ongoing education to support their self-management. In the case of many coexisting conditions, there are separate educational sessions available (distinct from patients' diabetes management programmes). For example, to assist patients with their obesity or hypertension, educational programmes can help patients reach specific

Communication

- Patients and clinicians need to understand and trust each others' expertise
- Patients should be encouraged to be open about their diabetes management and not deceive healthcare professionals
- Patients should feel in control of their diabetes management
- Patient choice must be based on informed decision-making
- Patients should be given tools (eg a diary or a diabetes passport) to help them discuss the management of their diabetes with clinicians
- Healthcare professionals should avoid negativity about treatment targets and adopt a positive approach when discussing management with patients
- Healthcare professionals should be trained to use motivational interviewing techniques

Education

- Information comes before education: healthcare professionals should provide patients with information about type 2 diabetes and coexisting conditions at the time of diagnosis
- Psychological support for patients should be available at the time of diagnosis to help them cope with the diagnosis
- Healthcare professionals should be trained to deliver education using a range of approaches, both traditional (such as local meetings) and digital (such as websites and e-tools)
- Healthcare professionals should help patients understand the need for education about their diabetes
- Healthcare professionals should emphasise to patients the benefits of good self-management
- Patients should have access to peer-to-peer groups for support and information about diabetes
- Education initiatives should take into account that the main information resource for young people is the internet and that it is difficult to control the quality of information on the internet
- Healthcare professionals should be informed about and use best practice in educating patients about diabetes

Policy and politics

- Communications between healthcare professionals, politicians and policy makers should be improved
- The cost effectiveness of diabetes prevention programmes should be demonstrated
- Policy makers should be made aware of the impact of diabetes on spending and resource use
- Politicians and policy makers should focus on the benefits of long-term investment in effective diabetes management, not short-term gains from commissioning care at the lowest cost
- Public understanding of type 2 diabetes should be raised by including characters with type 2 diabetes in television programmes for example
- Healthcare professionals and patients should collaborate with the media to build a story about type 2 diabetes that can be used to raise public awareness

Box 3. Key recommendations for raising awareness of coexisting conditions in type 2 diabetes

blood pressure or weight management goals. It should be acknowledged, however, that there is a lack of evidence to show what constitutes best practice in education about coexisting conditions. It is important not to alarm patients who may already be struggling to cope with their diagnosis. Psychological support at this time is essential.

Diabetes care varies widely, even within a single country;[12,13] therefore, starting points will be different depending on local service provision. It cannot be assumed that patients receive education about coexisting conditions, and where education is provided it does not always meet quality standards. Education should be embedded in local reimbursement mechanisms to ensure that healthcare professionals include it in the overall care package. At the same time, patients need to be motivated to participate in programmes by fully understanding their value. There are well-structured education programmes in Europe, but little evidence about their impact. Therefore, it is a challenge to obtain funding for programmes, even though they are inexpensive.

Fundamentally, patients need to understand why education is important. This is equally true for healthcare professionals and, before useful patient education can begin, they should be trained to deliver it effectively.

Funding from the European Union (EU) is available for innovative education strategies that meet its requirements for promoting regional development. In Greece, for example, proposals to develop education for healthcare professionals have been incorporated into a National Strategic Reference Framework. This document, which identifies potential funding streams and matches local initiatives to them, forms the national strategy for negotiating and delivering funding from the EU.

Education materials should always be positive in tone, providing clear achievable objectives and directions that will encourage patients to take personal control at an early stage. Negative messages emphasising the danger of long-term complications without proactive management can deter patients from engaging with efforts to improve management. The objectives of education often focus on glycaemic control when this is not always what matters most to patients. Education is worthwhile if it improves quality of life, even if it does not lower HbA1c. It can be difficult to develop educational materials focusing on coexisting conditions alone. However, it is equally true that over-emphasising glycaemic control can demoralise individuals who do not achieve HbA1c targets. While it is important to aim for good glycaemic control, targets need to be attainable for the individual, and educational messages must be carefully structured. It is important that educators get the right messages across, something that can be achieved by using expert patients.

Ideally, structured education programmes should be standardised across Europe so that appropriate messages can be delivered across a range of formats and in different settings in individual countries. A lay panel for education in Europe would help to ensure that these programmes were user-focused. It is also important to be active in the delivery of education programmes rather than passively make them available. Education programmes must be adequately funded – both the EU and the pharmaceutical industry have a role to play here. It is important healthcare professionals, the funding institutions and patients agree that the educational programmes are necessary and up to date – the programmes should be evaluated every two years.

Education is a long-term process and, for maximum retention, programmes should be packaged in sessions to be delivered over an extended period of time. People with type 2 diabetes are a heterogeneous group and a range of user-focused strategies is needed to deliver education, using as many channels of communication as possible. Websites and e-tools are promising formats, but we should not rely solely on digital media because availability varies between countries and these technologies are accessed by some age groups and not others (although the group agreed that people in their 50s and 60s are becoming increasingly confident users of the internet). Other ways of working include peer-to-peer groups – experience shows these are well received and trusted by patient groups and therefore have a high impact. Diabetes UK, for example, maintains about 400 local voluntary support groups (see www.diabetes.org.uk/How_we_help/Local_support_groups). Traditional approaches, such as local evening meetings with quizzes, free health magazines and cookery classes still have a role as a way of reaching older people in small communities, for example.

Nevertheless, digital media are proving increasingly useful for selected groups. It is difficult to persuade young people to become involved in patient advocacy organisations because their preferred means of communication is primarily online social network sites. This is something that has been neglected by healthcare professionals, but there is concern about the current quality of information available online and the tendency for uncritical acceptance of information from websites. Strategies for education should therefore include structured but informal internet-based approaches. Virtual communities hosted by Diabetes UK (www.diabetes.org.uk) have proved popular (Diabetes UK also has a Facebook page and its president has a blog). In Belgium, a website for patients has been validated by healthcare professionals; it is closely monitored and, although it does not allow input from the public, users can put questions to healthcare professionals (www.dieponline.be).

There is still much to be done to address the stigma associated with diabetes. One way to tackle this is by including characters with diabetes in television programmes (like soap operas) to demonstrate that diabetes is part of everyday life. Public role models are needed, such as celebrities and sports

personalities with diabetes, who can increase awareness and who could encourage those living with diabetes to talk about their condition more openly. IDF Europe has hosted World Diabetes Day on a number of occasions together with high level athletes living with diabetes.

How can patients be supported to improve communication with their primary care doctor?

In reality, both the primary care physician and the patient need support for effective communication. They need more time, something that may be constrained by resources but can be optimised through careful planning and making the consultation process more efficient (eg by using electronic records). Patients should be motivated to complete their educational programme, which healthcare professionals should follow up by introducing a disease management programme.

The consultation process should be about negotiating shared goals. Patients and healthcare professionals should not make assumptions about each other. They may want different things from diabetes management and both parties need to be open about this to achieve the best possible outcomes. If healthcare professionals explain the reasoning behind their goals, taking care not to patronise their patients, patients are more likely to understand and therefore respect them. Healthcare professionals sometimes do not acknowledge the patients' expertise in how management fits into their lives, but they should recognise that they only see patients for 5–10 minutes at a time, whereas patients live with their diabetes 24 hours a day.

On the other hand, patients are not always accurate when describing their self-management. At times, their desire to please or pacify the healthcare professional by misrepresenting their blood glucose data shows that care is not fully patient-centred: they should understand that 'good' glucose levels are for their benefit. Patients should therefore be encouraged to understand the healthcare professional's perspective and the importance of accurate glucose monitoring. Both should be prepared to provide feedback and learn from each other. This would facilitate the collaborative approach necessary for effective management.

Year of Care (Diabetes UK)

The Year of Care programme showed how to deliver personalised care in routine practice for people with diabetes. Care planning with non-traditional providers (voluntary organisations, community groups, social enterprises) can help to make routine consultations between clinicians and people with long-term conditions truly collaborative. A guide can be downloaded from: www.diabetes.org.uk/ Professionals/Service-improvement/Year-of-Care.

At the time of diagnosis, the task of communication rests with the healthcare professional. The initial information is usually given by the person who makes the diagnosis , but doctors do not always make the best educators and they should be prepared to hand over responsibility for education to someone with the appropriate skills if needed. It is important that the patient feels in control, the 'captain of their own ship' and empowered to make informed choices. With this power comes responsibility – patients should feel accountable for the decisions they take about the management of their coexisting conditions. To help patients achieve these objectives, healthcare professionals should consider training in motivational interviewing. Negativity about coexisting conditions creates a feeling of powerlessness among patients. Healthcare professionals should be more positive in their support for patients struggling to reach treatment targets.

Practical steps that clinicians can take to facilitate effective communication include suggesting the patient sets the agenda for their consultation and asking them to complete a pre-appointment questionnaire about their health and concerns (perhaps using a computer in the waiting room). Additionally, patients can be offered tools such as a checklist detailing the care they can expect to receive, a diabetes passport to document treatment and a diary to record routine monitoring results. Visual aids should also be used to facilitate communication and education when appropriate. The patient's progress through the education pathway can be recorded using electronic records and there is hope in the future that electronic self-management systems will offer a way to deliver daily snippets of timely advice to patients.

Do primary care doctors and policy makers understand the impact of coexisting conditions in type 2 diabetes?

There has been encouraging progress in policy making focused on diabetes in recent years. Initiatives such as World Diabetes Day show that policy makers are building knowledge and awareness and it is to be hoped that this momentum can be sustained. The task is now to create key messages about diabetes that policy makers will act on, and to utilise a range of media to deliver them.

There is no shortage of statistics showing how people with diabetes are affected by coexisting conditions, but they are not being translated into action. There is clearly a need to present these data in a more accessible way that will encourage the rational allocation of budgets, such as comparisons of the burden of type 2 diabetes with that of other long-term conditions. Although policy makers are probably aware of these issues, politicians tend to prioritise short-term financial concerns.

It must be acknowledged that there is little evidence to show that prevention programmes are cost effective. As a result, implementation is based on a narrow analysis of the impact of coexisting conditions with a focus on cost and designed to achieve short-term savings. In Poland, for example, the cost of glucose testing strips has been increased, even though this will threaten the quality of glucose control and therefore increase the

risk of complications in the years to come. Furthermore, policy makers do not take sufficient account of the indirect costs of diabetes, such as lost productivity. There is a need to convince politicians and policy makers to adopt a long-term view of management so they will invest to save. Communication between patients, policy makers and politicians should be improved – a European user group could help to achieve this.

Overall, many of the issues discussed here would be resolved if politicians, policy makers and primary care physicians adopted an holistic approach to delivering cost-effective management of coexisting conditions, so avoiding the future costs of higher morbidity and mortality. Core messages should be formed into a cohesive story that, working closely with the media, could be communicated to everyone concerned in diabetes care to build the momentum of a long-term campaign.

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