Chapter 6
Importance of Structured Diabetes Education

The favorable clinical outcomes in people with diabetes rely on individuals’ self-management of the condition in their daily life. Although in many cases some form of support is provided, people with diabetes do not have any direct supervisor in their daily routines, which emphasizes the importance of education to manage diabetes.

Diabetes education is a critical part of diabetes management and has to be offered to all people with diabetes. Its aim is to equip them with the required knowledge about diabetes, competencies to make stand-alone decision-making, and skills for self-management. Numerous studies have demonstrated that diabetes education could result in improved diabetes care, reduced hospitalizations, and is cost effective in the long-term [1–4].

It is recommended that diabetes education is delivered through standardized and culturally adjusted modules covering different aspects of the living with diabetes. Ideally, such standardization would be done at a national level, based on cultural specifics, available technologies, treatments, lifestyle patterns, and healthcare resources.

Template modules have already been recommended by relevant international authorities and could easily be adopted as a minimum standard for development of country-specific materials [5]. The use of already prepared modules is particularly important in developing countries having limited resources to develop diabetes education modules entirely on their own [5]. Standardized dissemination and evaluation of diabetes knowledge is often labeled as Structured Diabetes Education Program (SDEP).

Structured Diabetes Education Programs should include modules on training-the-trainer, role of diabetes educator and management of diabetes care team, psychosocial and behavioral approaches, and community awareness [5].

There should be modules that cover diagnosis, classification and presentation of diabetes, pathophysiology, self-management, diabetes medication and insulin therapy. Modules should also cover physical activity, nutrition therapy, short-term
complications and emergencies, sick-days, long-term complications, oral and sexual health [5].

Additionally, modules for diabetes in children and adolescents, GDM, pregnancy in pre-existing diabetes, older people, and perioperative management should also be included [5]. The above structure of the SDEP curriculum proposed by IDF should be considered as a minimum and not as a comprehensive list of modules for use by developing countries.

Modules need to be nationally adjusted, culturally and socially tailored, and delivered in the most appropriate format. Digital media and online SDEPs have multiple benefits, especially for lower resource countries where many diabetes specialties are lacking. The internet has been widely available and online platforms have become a viable option for dissemination of SDEPs and evaluation of the diabetes knowledge in people with diabetes.

Duration of SDEPs has to be individualized, as it is not possible to deliver and absorb all the information in a couple of hours. In case of online SDEPs, the recipient could set the dynamics of absorbing information.

Another advantage of online SDEP is that it could be implemented with limited resources, as the accredited materials could be posted online, ending with a diabetes knowledge test. Healthcare providers should direct the person with diabetes towards the online program and will record the test result in the individual EHRs. Diabetes care team would be available for any questions or dilemmas the person might have during the course of SDEP.

Online SDEP becomes essential when people with diabetes are not able to leave their homes, as during the global pandemic with COVID-19. In those situations when people with diabetes are one of the most critical categories for morbidity and mortality, online platforms become the only communication channel for delivering SDEP. Even more, a complete physician’s follow-up visit could be performed via telemedicine with the possibility to access individual EHRs and analyze reports derived from BGMs or CGMs.

It is critical that SDEP is completed not just with evaluation of knowledge and skills acquired by the people with diabetes, but also with their feedback on the content and delivery of SDEP. Only mutual assessment and feedback could lead to acquiring higher levels of education by people with diabetes, and improvement of SDEP content by the diabetes care team.

Furthermore, it is important how often and when to re-introduce SDEP in a particular person with diabetes, as single SDEP in a newly diagnosed, distressed and distracted people, is not expected to equip them with long-term knowledge. According to the ADA, there are four critical times for implementation or reassessment of SDEP: at diagnosis, annually, when complicating factors arise, and when transitions in care occur [1].

It is obvious that SDEP has to be provided at the time of diagnosis, and due to the stress with the new situation, it would be beneficial if the person with diabetes is accompanied by another person from the inner circle, such as a spouse, partner, parent, child or a friend. The closest people to a person with diabetes have to be aware
of all the aspects covered by the SDEP. They should, preferably, accompany the person with diabetes throughout the complete course of SDEP.

One example of the need to have an accompanying person during SDEP is when a spouse or a partner is more often preparing the meals, and has to be aware of the nutritional characteristics of various foods that might affect glycaemia. Another example is the need to educate the people from inner circle on the signs and symptoms of hypoglycemia, a common acute diabetes complication in people with diabetes. Unfortunately, according to the IDF estimates, less than 50% of people with diabetes and 25% of family members of people with diabetes have access to diabetes education programs (Fig. 6.1) [6].

Continuous, documented SDEP has to be performed at least on an annual basis with recording of individuals’ success to acquire the necessary knowledge, skills and competencies. The capturing of individuals’ achievements after SDEP completion would enable continuous monitoring of a person's knowledge, similar to monitoring of parameters for metabolic control. When complicating factors or transition in care occurs, the SDEP needs to be re-introduced, regardless of the time elapsed since the previous diabetes education [1].

It is crucial for the healthcare system in developing countries to understand and acknowledge the importance of the SDEP. In many cases the SDEP has not been implemented as recommended, although the other components of diabetes management (staff, medication, glucose monitoring) have been available. Structured

![Fig. 6.1 Percentage of people with diabetes and their family members with access to diabetes education programs, data adapted from Ref. [6]](image-url)
diabetes education should be focused on the needs, clinical outcomes, overall health and well-being of the person with diabetes, and should be considered at every physician’s visit.

The way SDEP is offered may be different: could be in individual settings, group settings, or combined—certain modules could be covered individually, and others in groups. It is preferred that education programs involve the members of the whole diabetes care team. It would be beneficial if peer-to-peer dissemination of information is also included as part of the SDEP, conveyed by other people with diabetes, particularly for people with type 1 diabetes. The importance of such peer-to-peer communication is often exceeding the one delivered through the standardized modules of SDEP. It is crucial that such communication is provided in a controlled and approved manner.

In the era of digital technologies, it is impossible to prevent people from encountering numerous unverified and often harmful diabetes related information, especially through the social media. Misleading information in many cases offers magical solutions, frequently resulting in devastating consequences in the form of acute diabetes complications. It is difficult to assess the long-term deleterious effects such spread of false information might have on the development of chronic diabetes complications.

People with diabetes from developing, less regulated countries, are more prone to be exposed to non-medical schemes for diabetes management. Providing them with knowledge how to identify the risk and to immediately discuss it with their diabetes healthcare providers becomes mandatory in contemporary circumstances, when they are surrounded by unlimited sources of information.

When the importance of SDEP in diabetes management is recognized within the healthcare system, it has to be appropriately valued; otherwise the sustainability of SDEP as a continuous process would be jeopardized. Healthcare systems in developing countries have to allocate dedicated resources for SDEP, similar to the resources allocated for glucose monitoring, diabetes medication, screening and treatment of diabetes complications.

Reports from studies conducted in developing countries confirm the value of the SDEP. It has been demonstrated that glycaemic control parameters (HbA1c, FPG, PPG), lipid profile (total cholesterol and triglycerides), and BMI were significantly improved in people who were part of the intervention group with SDEP, compared to the control group without SDEP [7]. Reported outcomes (medication adherence, self-management behavior, knowledge, self-efficacy, health belief and QoL) were significantly improved by the SDEP [7]. By improving metabolic parameters, SDEP could result in reducing the risk of developing diabetes complications [7].

In another review of SDEPs in high- and low-mortality developing countries, interventions were generally effective on behavior change and persons’ glycaemic control in the short term (≤9 months) [8]. While 57% of the studies mentioned cultural tailoring of interventions, only 17% reported on training of providers, and 39% were designed to be accessible for people with low literacy [8]. The limited studies available suggest that SDEPs in developing countries are effective in the short term, but must be tailored to conform to the cultural aspects of the target population [8].
Studies of SDEPs in developing countries from Sub-Saharan Africa also confirmed the importance of education in people with diabetes. Combination of weekly group educational sessions on nutritional aspects with monthly follow up sessions significantly reduced the intake of energy and starchy food [9]. Another study with weekly contacts over a period of four months significantly improved the healthy eating habits of people with diabetes [10].

Group education programs about self-care behaviors in developing countries improved the foot care of participants [11, 12]. In addition, four one-hour group education sessions on nutritional aspects significantly increased the level of adherence [11, 12].

Education levels are lower in most of the developing countries and the channels of communication are limited. It is a challenge to convey the information to people with diabetes in low-income countries if there is a limited access to healthcare, education, mass media or online platforms.

Despite the studies above, SDEPs in most developing countries are limited in scope, content and consistency, and it is largely unknown how people from developing countries utilize the SDEP for managing their diabetes [13, 14].

Structured Diabetes Education Programs should become a mandatory part of the National Diabetes Care guidelines in developing countries. It needs to be stipulated in the guidelines that every person with diabetes has to be offered SDEP, followed by testing of acquired diabetes knowledge, skills and competencies [15]. In addition, National Diabetes Care guidelines in developing countries should potentiate that people with diabetes need to be informed about the importance of SDEP as an integral part of their diabetes management [15].

Although numerous diabetes care initiatives running in developing countries were acknowledged by relevant international authorities, it was also recognized that many SDEP recommendations were not fully implemented, and significant number of people with both type 1 and type 2 diabetes were not offered SDEPs, neither at the time of diagnosis nor later during the course of the disease [16].

Despite the need for improved education of people with diabetes, there is also a need for improved education of the physicians treating diabetes, as reported from a study conducted in developing countries [17]. Physicians need to be aware of the current guidelines in order to provide proper diabetes care. Many physicians noted adequate glycaemic control despite non availability of HbA1c measurements, whereas others overestimated the proportions of people at goal [17]. In addition, the clinical inertia of delayed intensification of therapy was reported among physicians [17].

The IDF estimates that currently 20% of healthcare professionals do not receive any postgraduate training in diabetes [6]. It once again stresses the need of education not only towards the people with diabetes and their family members, but also towards the healthcare professionals.

It is critical who is delivering the diabetes education for healthcare providers, as it is very important that those sources are unbiased and financed with unrestricted grants. One of the most important channels of exerting influence on prescribing patterns of physicians is through medical education. Many of those medical education
events or resources in developing countries are not evidence based and balanced, and are favoring particular treatment sponsored by certain pharmaceutical company. This could significantly drive the costs of diabetes treatment higher, as explained in the previous chapters.

Furthermore, SDEPs in developing countries are mainly available in diabetes care facilities in larger cities, and a lack of resources was recognized as a reason for the paucity in diabetes education in developing countries [17]. It was mentioned that diabetes prevalence has been higher in rural compared to urban areas in the Republic of North Macedonia [18].

One of the possible explanations for this surprising finding could be the limited access to adequate SDEP in rural areas due to the lack of Diabetes Centers [18]. Diabetes Centers are not only providing care for people diagnosed with diabetes, but are also managing people with prediabetes. It was therefore recognized that lack of those centers in rural areas could be a reason for the higher diabetes prevalence in rural compared to urban population [18].

There have been no studies so far comparing the effect of SDEP on the level of diabetes knowledge and metabolic control in insulin-treated people, if SDEP is provided at the time of diagnosis or later during the course of diabetes [19].

Such study comparing the diabetes knowledge between insulin-treated people with diabetes offered SDEP at the time of diagnosis with those offered unstructured education, and evaluating the effects of the SDEP on their diabetes knowledge immediately after, and 1 year after completion, has been reported from the Republic of North Macedonia [19]. In addition, glycaemic control was compared in both groups at baseline, and one year after SDEP [19].

Insulin treated people with diabetes demonstrated inadequate diabetes knowledge and there was no difference in the previously acquired knowledge between the groups, regardless if people were offered SDEP or unstructured education at the time of diagnosis [19]. Such findings at baseline demonstrate the need to implement the National Diabetes Care guidelines’ recommendations and offer SDEP at least annually with test of the acquired diabetes knowledge [15]. Despite SDEP being delivered at the time of diagnosis, if it is not repeated at least annually, the benefits are lost when compared to unstructured education.

As anticipated, diabetes knowledge was significantly improved in both groups after 5 days of SDEP, and both groups passed the predefined threshold of knowledge test with no between-group differences in the test results [19].

When the same diabetes knowledge test was taken after 1 year, lower results were observed in both groups, if compared to the results obtained after the completion of SDEP [19]. Nonetheless, these results were significantly higher than those obtained before the SDEP, indicating sustainable effect of SDEP after 1 year [19]. Both groups demonstrated adequate diabetes knowledge 1 year after SDEP by passing the predefined threshold [19].

In addition, lower HbA1c values were measured in both groups after 1 year, with no between-group difference in HbA1c reduction. The improved glycaemic control could be attributed to the increase in diabetes knowledge after 1 year; however, even the reduced values of HbA1c were well above the recommended targets [1, 15, 19].
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The inadequate glycaemic control achieved 1 year after SDEP supports the recommendations from the National Diabetes Care guidelines to repeat the education and testing of diabetes knowledge at least annually [15, 19]. Improvement of glycaemic control after SDEP and the positive effects of SDEP on diabetes knowledge have been reported from similar studies in developed countries [20–24].

It would be of interest to further evaluate the sustainable effects of SDEP on diabetes knowledge and metabolic control for a period longer than 1 year, and to establish the optimal frequency and content of SDEP for each person.

Structured diabetes education should be appropriate in terms of cultural, linguistic needs or level of literacy. Adequate resources need to be secured for the diabetes educators, who should be qualified, competent and adequately trained. As part of the patient-centric healthcare system, people should also be encouraged to take an active role in the creation and implementation of SDEPs.

Healthcare providers need to be cautious when educating people with diabetes how to use and interpret results from the BGMs. It should be considered that many people in developing countries are of advanced age, have a lower level of education, and are not familiar with English, the standard language of messages and alerts on the BGM display. The education on SMBG has to be adjusted to the level of education of the people who would use it. Situations are common when people with diabetes are looking at the display upside down reading 14 mmol/L (252 mg/dL) instead of ‘hi’, a dangerous situation of hyperglycemia that may result in DKA or HHS (Fig. 6.2) [25].

Another example of misreading the BGM display by an older person not familiar with English is when ‘lo’ (low) was read as 10 mmol/L (180 mg/dL), and hypoglycemia requiring treatment was misinterpreted (Fig. 6.2) [25]. People with diabetes should be evaluated for obtaining an acceptable level of knowledge and skills before using the BGMs on their own.

Fig. 6.2 Pitfalls in reading the display of BGMs [25]. BGMs Blood Glucose Meters
According to the IDF, one of the challenges developing countries face is addressing the lack of time and shortages of personnel to offer diabetes education [16]. Diet counseling in people with type 2 diabetes is generally provided by diabetes nurses concentrated in urban areas and limited to people on insulin. Dietitians are not involved in diabetes treatment in most of the developing countries. Physicians’ education in developing countries includes very little practical instruction on the role of nutrition in disease prevention or treatment. Furthermore, there is a shortage of registered nurses with training in diabetes [16].

Majority of population with diabetes in developing countries is lacking access to healthcare providers involved in SDEP. Offering continuous and high-quality SDEP has been a challenge even for the developed countries, which only suggests the magnitude of the problem for the developing countries.

Novel digital technologies have to be used to enforce SDEP and such initiatives might be of particular interest for developing countries. It has been acknowledged that mobile technologies, such as mobile banking, are penetrating fast even in the less developed countries. As internet and mobile technologies become widely available, online or m-Health based SDEP modules could be a cost-effective solution.

The essence of SDEP is re-education and re-evaluation. Platforms with records of scores the person achieves after SDEP would be valuable information for the healthcare provider. Additionally, it would be of great benefit if such scores are captured in the individual EHRs, together with the other diabetes related information that need to be continuously monitored.

Continuous SDEP results in a sustainable increase of diabetes knowledge attained by people with diabetes, and could ultimately lead to improved glycaemic control and reduced risk of diabetes complications.

What needs to be done for implementation of structured diabetes education programs in developing countries?

Each developing country should…

• …include SDEP as a key activity of diabetes management in the National Diabetes Care guidelines,
• …offer SDEP through standardized, culturally adjusted modules, covering different aspects of the living with diabetes;
• …offer SDEP to people with diabetes minimum at the four critical times: at diagnosis, annually, when complicating factors arise, and when transitions in care occur;
• … ensure test scores after completion of SDEP are recorded in individual EHRs as part of the NeHS;
• … allocate resources for SDEP to ensure its sustainability,
• … consider online SDEP and m-Health solutions in a setting of limited resources.
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