Salah ALZAWAHREH

IMPROVING SELF-EFFICACY, QUALITY OF LIFE, AND GLYCEMIC CONTROL IN ADOLESCENTS WITH TYPE 1 DIABETES: RANDOMIZED CONTROLLED TRIAL, IN AMMAN, JORDAN

PhD. THESIS

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NEAR EAST UNIVERSITY

INSTITUTE OF GRADUATE STUDIES

DEPARTMENT OF CHILD HEALTH AND DISEASE NURSING

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PhD. THESIS

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Approval

We certify that we have read the thesis submitted by Salah Alzawahreh titled **"IMPROVİNG SELF-EFFICACY, QUALITY OF LIFE, AND GLYCEMIC CONTROL IN ADOLESCENTS WITH TYPE 1 DIABETES: RANDOMIZED CONTROLLED TRIAL IN AMMAN, JORDAN"** and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of PhD in Child Health and Diseases Nursing

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I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Salah Alzawahreh

20 /12/2024

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All praises are for ALLAH Almighty, the most gracious and most Merciful who gave me the strength to complete this task effectively.

"For my parent's; without them I would not be here."

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Salah Alzawahreh

Abstract

Improving Self-Efficacy, Quality of Life, and Glycemic Control in Adolescents With Type 1 Diabetes: Randomized Controlled Trial in Amman, Jordan.

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Background: Poor glycemic management in adolescents with type 1 diabetes mellitus (T1DM) increases complications. Enhanced control is associated with other factors, such as cultural, socioeconomic, and health care system disparities specific to the Middle East, which can greatly influence individuals' ability to get and use health care services as well as their reaction to treatment approaches.

Objective: This study aims to evaluate the impact of the family-centered empowerment model on Jordanian adolescents with type 1 diabetes mellitus, focusing on their glycosylated hemoglobin levels, self-efficacy, and quality of life.

Methods: A randomized controlled trial involved 68 adolescents with type 1 diabetes mellitus, visiting Jordanian Royal Medical Services' clinics. Two sets of participant groups were created: control (n=34) and intervention (n=34). Participants were randomly assigned to either the intervention group, receiving the family-centered empowerment model, or the control group, receiving standard care. Data were collected through face-to-face interviews and medical records.

Results: From April to October 2023, a total of 68 adolescents with type 1 diabetes mellitus, participated in the study at the Jordanian Royal Medical Services. quality of life had significant improvement among 13 (38%) of the 34 participants in the intervention group, and the program significantly improved moderate self-efficacy levels in 12 (35%) patients ($P<.001$). In addition, the average glycosylated hemoglobin levels dropped from 11.25% to 10.23% ($P<.001$).

Recommendations: The study suggests that patients with type 1 diabetes mellitus, should receive continuous care education sessions, including self-care

training, to improve their health. Nurses should also incorporate this training into treatment plans and educational programs for adolescents to enhance their quality of life. Additionally, improvements were seen in stress management, communication, and treatment adherence, with a substantial decrease in treatment obstacles. The intervention was successful in improving both clinical and psychosocial outcomes, as evidenced by the fact that the control group showed no noticeable improvements in these parameters.

Trial Registration: ClinicalTrials.gov NCT06694467;
https://clinicaltrials.gov/study/NCT06694467

Keywords: family-centered empowerment model; glycemic control; quality of life; self-efficacy; type 1 Diabetes Mellitus.

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List of Abbreviations

(A):	Analogue
ADA:	American Diabetes Association
CBT:	Cognitive-Behavioral Therapy
CGM:	Continuous Glucose Monitoring Systems
CI:	Confidence Intervals
CSII:	Continuous Subcutaneous Insulin Infusion
DM:	Diabetes Mellitus
DSEM:	Diabetes Self-Management Measure
GCS:	Generic Core Score
FCEM:	Family Centered Empowerment Model
GSD-Y:	Guided Self-Determination-Young
HbA1c:	Glycosylated Hemoglobin Level
HRQoL:	Health-Related Quality of Life
IFCC:	International Federation of Clinical Chemistry
Kg:	Kilograms
MDI:	Multiple Dose Insulin
NO.	Number
n=	Number
PedsQL:	The Pediatric Quality of Life Inventory
QOL:	Quality Of Life
SEQ:	Self-Efficacy Questionnaire
SMBG:	Self-Monitoring of Blood glucose
T1DM:	Type 1 Diabetes Mellitus
SPSS:	Statistical Package for Social Science
WHO:	World Health Organization
T1-DDS:	Diabetes Distress Scale for Adults with Type 1 Diabetes
SD:	Standard Deviation

CHAPTER I

Introduction

1.1 Statement of the Problem

Diabetes mellitus (DM) is a serious and rapidly spreading disease that has affected world population of different age groups. It is a metabolic disorder characterized by increased blood glucose levels, leading to severe complications such as kidney failure, heart disease, blindness, and even amputations. According to an article by Miolski et al, diabetes mellitus is the world's most common chronic non-infectious disease, and it can affect people of all ages. (2020).

The alarming finding noted in this study is a rising rate of diabetes mellitus in youngsters. This is an alarming trend because the onset of diabetes mellitus is increasingly occurring in younger and younger populations, which could have led to a pandemic phenomenon of the twenty first century mainly due to the increased burden of diabetes on world's health. As reported by Miolski et al. (2020) in their study, the number of children developing diabetes mellitus has increased 3% each year on average, and the trend is expected to persist (Miolski et al., 2020).

According to IDF (International Diabetes Federation), diabetes mellitus is an ailment due to defects in insulin action, insulin secretion or both (IDF, 2017). Type 2 diabetes is the commonest form of the ailment that is triggered by several lifestyle choices, including inadequate exercise, poor dietary regimen, high obesity, and genetics. Type 1DM is caused by autoimmune destruction of the pancreatic β - cells which leads to insulin deficiency, Gestational diabetes is a condition that occurs only during pregnancy and is due to hormones made by the placenta that interferes with the body's normal insulin production and use. Prediabetes is a condition characterized by elevated blood sugar levels that do not reach the threshold for diabetes. Diabetes can lead to several complications like heart disease, stroke, damage to the kidneys, damage to the eyes, damage to the nerves, damage to the feet, etc. Diabetes is treated with a healthy diet, exercise, and weight

control. Medication is also employed to help control blood glucose levels ((DCCT/EDIC, 2016). Diabetes mellitus type 1 (T1DM) develops at any age but usually in young people, for example children and adolescents. Its exact etiology remains outwardly unclear, but genetic predisposition and environmental factors including viral infections or exposure to particular food types are believed to exert a combined effect in the pathogenesis of type 1 diabetes (Mavlyanova UN, 2022). Using insulin therapy for a lifetime and judgment is essential to control blood glucose levels to avoid complications for T1DM patients (Patterson et al, 2019). Insulin delivery, carb counting and blood glucose monitoring form the foundation of managing type 1 diabetes (Patterson et al, 2019). An increasing number of people are attributed to diabetes due to fewer controllable factors like obesity, aged population, and modified lifestyles. Other causes that differentiate developed countries from developing ones include poor attempts at avoiding diseases, lack of access to efficient healthcare services and treatments. (Singla et al., 2022). More funding is needed for public health initiatives that focus on prevention, such as improving diet and increasing physical activity, if we are to reduce this growing burden. To ensure the care of people with diabetes is well managed, access to high-quality care must be improved (Hill-Briggs et al., 2021). Diabetes is a well-known risk factor for stroke and cardiovascular disease, so it is important to promote healthy lifestyle changes such as regular exercise and an appropriate diet. Also, access to proper medical care and monitoring of blood sugar levels are key in preventing complications from worsening, or even developing. More public awareness regarding the importance of treating diabetes properly could help reduce mortality rates related to this disease (Galaviz et al, 2015).

1.2 Purpose of the Study

- To examine the effectiveness of the Family Centered Empowerment Model in improving quality of life, self-efficacy and HbA1c of adolescents with Type 1 Diabetes.

- To recognize the importance of preventive health care, diet, and exercise, while learning how to assess and manage diabetes in their home setting.

1.3 Research Hypotheses

- Adolescents in the intervention group have significantly higher self-efficacy scores than those in the control group.
- Health-related quality of life scores in the intervention are significantly higher than the control adolescents.
- The HbA1c levels in the intervention group of adolescents are significantly lower than those in the control group.
- There will be a significantly negative correlation between the levels of HbA1c, self-efficacy, and quality of life among the intervention group of adolescents, indicating a stronger association as compared to the control group.

1.4 Significance of the Study

The study by Abuali et al. (2023) has produced results that highlight the urgent need for effective strategies for addressing the rising prevalence of diabetes mellitus in Jordan. Promoting healthy lifestyles must be a top priority since it may reduce the risk of glucocorticoids-induced diabetes. Health promotion efforts should focus on educational efforts on dangers of diabetes, importance of exercise and importance of healthy diet. Moreover, it is very important to improve healthcare services to provide quality care for diabetic patients. Early screening and detection should also be instituted to facilitate early intervention and improved management of the disease. This indicates the need for effective public health measures in the country, which could ensure the lowering of prevalence rates of DM and improve the health condition of the country. This study is significant for several key reasons: Delamater, A. M. (2014). Intensive outpatient therapy predict family centered empowerment model clinical benefit improved Quality of Life. This can allow for a lower prevalence of complications and better health states over time (ADA, 2020) Additional studies investigating the impact of this intervention will enable healthcare providers to identify better ways to support adolescents with Type 1 Diabetes and their families.

This study will help shed light into the influences of this Family Centered Empowerment Model on adolescents with Type 1 Diabetes and their families (Delamater, A. M. 2014). This allows for more knowledge and understanding moving forward for both research and clinical purposes and ultimately better experiences for adolescents with Type 1 Diabetes and their families. Better quality of life may result in improved mental health, social engagement, and overall functioning (Bogale et al, 2022). Increased self-efficacy: Increased Self-Regulation: The most critical element of effective diabetic self-care is self-regulation. For example, a Family Centered Empowerment Model may lead to the potential improvement of the self-regulation concept among adolescents in type 1 diabetes; when adolescents feel capable to manage their disease effectively, and their family communication and involvement also is effective, they will more understand what they are doing and what they desire to do. Through exploring how this model operates, the rationale can be appreciated and how it may produce healthier diabetes self-care behaviors. Demographics, behaviors, and psychosocial factors that predict self-care can be used to inform family-centered interventions facilitating self-regulation, resulting in improved diabetes self-care and glycemic control.). This was true even for non- optimal agents who only observed the average action of other agents (Samuelson et al., 2017; Williams et al., 2018). Exploring the effectiveness of the model thus also allows us to pinpoint potential areas of improvement for future interventions. For instance, nothing in the model appears to address the need for concrete plans to heighten self-efficacy. As well as exploring any potential harms of the model, which could put unnecessary stress on adolescents and their families. Such understanding will help in devising interventions that holistically and effectively address the need of adolescents with diabetes. Glycemic Control to reduce HbA1c, adolescents with Type 1 Diabetes should be motivated to follow a healthy diet and exercise, along with medications (American Diabetes Association, 2021). In addition, adolescents need to be informed about the need for routine blood sugar monitoring and the risks that can come from inadequate glycemic control. Moreover, adolescents should be given the tools and resources they need for diabetes management and be supported in their endeavors to make positive lifestyle decisions. However, with appropriate support and guidance, young people can further improve their HbA1c levels and lower their risks for diabetes complications. (Ogle et al, 2022).

Second, in future studies, the outcome could instead be the diabetes-related quality of life or self-efficacy rather than glycemic control. For instance, research can focus on how family involvement in diabetes management can help improve individuals' self-efficacy levels, which is linked to glycemic control (Powers et al., 2015). Moreover, research can be conducted to explore how the presence of family support contribute towards the quality of life someone with diabetes experience, which, in turn has been shown to be related with better glycemic control. By identifying the domains through which family support is linked to control, this research can help shape interventions targeting family support as a way to improve glycemic control.

1.5 Limitation

The short follow-up time is acknowledged as a weakness with the study's research design. Time of follow-up is the complaint of the study given this is a so basic point, for all the research projects, this point must be evaluated by the research. A longer follow-up time is frequently required to make more firm conclusions on the long-term impact and efficacy of treatments in health care research, even if short-term outcomes might still provide valuable information. On the other hand, the reasons for longer follow-up are as follows: first, sustainability of outcomes: the investigation has highlighted learning in $HbA_{1C,}$ self-efficacy, and QOL gains immediately after the intervention, however, longer-term follow-up would judge if these gains are maintained. Diabetes is a chronic illness, and this study involves T1DM; thus, it is important to consider whether the effects of the intervention persist when those with diabetes move to the next phase of their adolescence while they continue to live with the illness. Second, behavioral changes: diabetes requires some extra behaviors that when implemented may not be possible to cultivate within the shortest period. A longer follow-up could help to answer more questions about whether the participants retain the self-management strategies developed during the actual intervention as well as changes to these behaviors over time. Third, adjustment to life changes: the things that the growing adolescent needs may also change as he or she progresses through the different stage of development. Further follow-up would enable scientists to learn whether and how such an intervention influences changes to these emergent challenges and

opportunities to better manage health. Fourth, understanding relapse patterns: a longer follow-up time would be of more importance perhaps to detect any trends in relapse or rather a return to poorer management practices. Understanding why and when these relapses ensue may help fine-tune later interventions and assistance for the varying continued requirements of adolescent individuals and their kin. Fifth, family dynamics: as previously stated, the most significant feature of the approach is to consider the role of family support in regulating T1DM. To give deeper insight into the type of intervention, it would be more appropriate to assess the involvement of the family in supporting the health of the adolescent in the future.

1.6 Definition of Terms:

1.6.1 Weight (Kilograms): Electronic scale was used to measure body weight, checking the weighing equipment is set to zero before weighing, the patient should remove heavy clothing and shoes, and empty the bladder, and the same scale is used for all the patients.

1.6.2 Height (Centimeters): Using a Stadiometer on a horizontal position, standing in upright posture, without shoes and with relaxed shoulders.

1.6.3 Diabetes Duration: The amount of years, as stated in the medical file or as verified by the patient, that have passed from the patient's initial diagnosis of diabetes mellitus.

1.6.4 Family Centered Empowerment Model (FCEM): (Appendix A)

Perceived threat, which is comprised of perceived seriousness and perceived vulnerability, is the initial phase. "Perceived severity" refers to an individual's and their family's comprehension of the severity of a condition, as well as their awareness of its dangers and repercussions, and their perception of the disease's likelihood. When a person and their family perceive a danger of sickness, it indicates that they are aware of the circumstances and have a clear understanding of what constitutes good health. In this study, the perceived threat posed by the patients and their family was increased by an increase in perceived severity, the nature of the disease, consequences and hazards, and disease management. The second concept is perceived susceptibility, which gives patients who are vulnerable to complications the ability to ask themselves, "How much am I at risk of disease?" This allows them to

remember potential threats that could result in future health issues for their children and allows for the identification of their level of sensitivity to these issues. Raising awareness and educating patients' family and relatives enhanced their reported severity, and giving the required information and an instruction booklet raised their felt susceptibility. It goes without saying that raising awareness of the illness state and the therapeutic approach increased self-esteem. In order to comprehend the issue using the study samples and to propose and put into practice remedies, the researcher must first foster self-efficacy. At this point, the kids were talking about issues with nutrition, exercise, insulin extraction and injection techniques, glucose testing, and insulin storage conditions. Additionally, self-efficacy and self-esteem are enhanced by this phase. Increasing self-esteem through teaching involvement is the third phase. The first and second levels involved constant teaching engagement. At this point, the patients' family were requested to view the instructional materials, write about any problems they were having with the content they had learned, and receive the right replies. In actuality, the patients received instruction from written materials, which improved their understanding of children and families and helped them use the knowledge to boost their self-esteem. The fourth phase is the assessment procedure, which involves explaining to patients and their families the goals of the research and obtaining written agreement from the children and their families (the mother or father) to participate in it. Patients received assurances that all information would be kept private, that they would be informed of their choice to withdraw from the trial, that participating in educational programs would not result in any financial loss, and that they would get phone programs following the study's completion for the control group.

CHAPTER II

Literature Review

2.1 Theoretical Framework

An electronic search for related literature and studies was performed. Several hosts for databases were accessed including Current Diabetes Reviews, PUBMED, www.thelancet.com and Diabetes & Metabolism Journals. The keywords utilized in the search process were type 1 diabetes mellitus, Family Centered Empowerment Model, The Pediatric Quality of Life Inventory 3.0 Diabetes Model, Self-Efficacy Questionnaire (SEQ) and Glycemic Control Measurement. Supplementary additional search was conducted on Google search engine which to add more relevant data. Studies, information articles and current publications in the English language were criteria for the search. Internationally, youth Type 1 Diabetes Mellitus (TIDM) prevalence is on the rise. Palmer and colleagues estimate that the global prevalence of diabetes will continue to grow; nearly one hundred thirty thousand new cases per year are expected to occur in adolescents and children worldwide (Palmer et al., 2022). This disturbing trend occurring among this demographic in terms of global TIDM prevalence is evident in the report (Palmer et al., 2022). As per estimates from the IDF Diabetes Atlas, in the year 2021, it is expected that 463 million adults aged between 20 and 79 years will have diabetes globally. By 2045 this number is expected to rise to 700 million (IDF, 2021). Moreover, the same said, that 50 per cent of all diabetics do not yet have a diagnosis which stops them from receiving the necessary treatment for their disease. In addition, diabetes is related to various complications, including lower limb amputation, chronic renal disease, cardiovascular disease, diabetic retinopathy, and blindness or poor vision (IDF, 2021). Diabetes is also a huge economic burden on both individuals and societies. Data from 2017-2019 reported in 11th edition of IDF Diabetes Atlas, published in 2019, estimates that globally on healthcare costs related directly or indirectly to diabetes was above 1 trillion dollars (IDF, 2019). These costs include direct medical costs like hospitalizations, medications, and indirect costs such as absenteeism from work and loss of productivity. Considering the high frequency as well as the potential impact of the

event on global public health systems, it is extremely important to make preventive and control measures effective (IDF, 2019). It should focus on early diagnosis which will significantly aid in shortening long term.

In yet another region, Finland shows the highest T1D prevalence in Europe, which reaches about 1.3 per 1000 people (Ogle et al., 2022). This figure which is not comparable with other European countries like Germany and the UK (0.4 and 0.5 per 1000, respectively) (Ogle et al., 2022) is a distinctively high rate. It is not fully understood why there is this difference between countries, but it may be down to some genetic or environmental condition in Finland that does not exist elsewhere. Beyond Europe, data indicate that the incidence of T1D may differ even more from region to region and across populations. Conversely, some Indigenous communities have a disproportionately high burden of T1D that is 4 to 12 times that of other communities in Canada (Zhang et al., 2020). Likewise, one particular study revealed that specific ethnic groups were at a much higher presentation of T1D risk compared to others; From the study performed by Kumar and Kumar (2014), one group within their community was estimated to be four times more likely to develop Type 1 Diabetes in comparison to the other group. (Kumar & Kumar 2014). In summary, these results show that there could be considerable variations in the prevalence of Type 1 Diabetes by geographic region and ethnicity. Researchers are still trying to figure out why the differences are present, but it seems likely that both genetic and environmental factors are essential in determining who will develop this condition globally.

The occurrence of T1D is increasing across the globe, especially in children and adolescents. Hereditary factors and also lifestyle changes, like greater body weight and less physical activity, have been suggested to partly explain this phenomenon (Kahkoska, A. R., & Dabelea, D. (2021). Studies show that the risk of acquiring T1D increases when a family member already has or is at risk for T1D (Genetics Home Reference, 2021). The current T1D therapeutic landscape has been limited but technology has allowed for improved glycemic control through the use of continuous glucose monitoring systems (CGM). CGMs consist of tiny sensors placed just beneath the skin that measure and transmit information to an app on a phone or other device. This enables people with diabetes to track their levels of glucose throughout the day allowing them to better decision-making regarding healthy lifestyle choices, such as the amount food consumed and activity levels.

Moreover, insulin pumps can use CGM data to regulate how much insulin they release into the body (American Diabetes Association, 2021).

2.1.1 Management of Type 1 Diabetes (T1DM)

The cornerstone of T1DM care is the insulin treatment. Insulin may be delivered by a number of different methods such as pumps or injections, depending on the patient's lifestyle and preferences. In addition and together with insulin therapy people with type 1 diabetes should follow a balanced meal plan designed by qualified dietitian taking into consideration patients daily caloric needs and carbohydrates (ADA, 2017). So, you are based on data until October 2023. During these visits, the patients may also get more education about how to deal with their condition, which may help them to know how to perform quality lifestyle changes that should lead to better outcomes in terms of health in the long run (IDF, 2021).
It is also recommended that IDF Individual members with T1DM utilize technology that is available in order to simplify and best facilitate blood glucose monitoring. CGM systems allows patients to monitor their glucose levels in real time without having to draw blood. They can use these to detect patterns within their blood sugar levels and adjust their insulin dosage as required (IDF, 2020).
In addition, T1DM can impact the child or teenager's quality of life, so encouraging engagement and support from parents, healthcare providers and the family unit is also critical to manage the disease. That includes: promoting healthy lifestyle factors, teaching the child/teenager how to adhere to his/her diabetes as effectively as possible, providing emotional support during difficult times, helping them understand the reasons for a certain instruction regarding care, and helping them with problem solving when issues arise in the context of their adherence or decisions regarding medical management (Shapiro et al. 2018). Fostering active participation of the youth in decision-making processes regarding their care has also been identified as just another way to provide empowerment (Bryden et al., 2019). It is also imperative that family members and health professionals recognize the unique challenges of adolescent patients with type 1 diabetes in order to apply appropriate methods (IDF, 2019). A successful management of T1DM people requires one to have access not just to medical professionals but also have access to proper and affordable medical supplies. This includes insulin, syringes, glucose

monitors, test strips, and lancets, as well as other devices used for blood-testing. Understanding carbohydrate counting and familiarization with diabetic meal plans can also help manage this condition appropriately (Holt et al, 2021). Lastly, although exercise is essential for everyone, exercise in patients with T1DM regulates blood sugar levels, reduce stress and promote general wellbeing (Holt et al, 2021). Proper blood sugar maintenance in general is essential in type 1 diabetes, as chronic low blood sugar levels can increase the risk of adverse outcomes. These include macrovascular and microvascular complications that can occur over time, including, for example, diabetic retinopathy, nephropathy, neuropathy, and cardiovascular disease (DiMeglio et al., 2018). In addition to Daily blood glucose monitoring by means of self management or continuous glucose monitors (CGM), HbA1c should be regularly checked by a healthcare provider. An HbA1c level exceeding 7% suggests that the patient's glycemic control may be less than optimal and that further efforts to reduce it are advisable. This could range from more regular monitoring of blood glucose levels to alterations in dietary/exercise patterns to alterations of insulin dosage, if warranted (Sherwani et al., 2016). In addition, regular medical follow up by the patient with T1DM and their treating health care team represents a crucial aspect in the management of T1DM. While the cause of type 1 diabetes is unknown, it is believed to be an autoimmune disease. In T1DM, the immune system attacks and destroys your body's insulin-producing cells in your pancreas. The result is diminished insulin secretion or total cessation of insulin secretion (Roep et al., 2021). People with T1DM should also monitor other health markers besides HbA1c. These encompass blood pressure, body mass index (BMI), renal function tests, cholesterol and triglyceride levels. Lifestyle Modification Dietary and physical activity modification also play a crucial role in the management of this condition, particularly in maintaining values within the recommended range by physicians and adjusting insulins and/or other medications in a timely manner (Mponponsuo et al., 2021). In conclusion, it is essential for individuals diagnosed with T1DM to have regular medical appointments, where changes in glycemic control can be rapidly detected and treated. Individualized management plans are critical for good glycemic control, and regular communication between the patient and healthcare provider can help keep things optimal (Sugandh et al., 2023).

Alongside medical management, psychosocial support strategies may assist adolescents and young people with T1DM. Joining a diabetes support group not only allows a patient to socialize but to also learn more about managing diabetes from other patients dealing with the same condition. Things such as counseling may assist them to cope more efficiently with the illness, process it more completely and be better able to make healthy lifestyle decisions. (Delamater et al 2018) Finally, training in self-management skills, such as stress management skills, physical activity, diet, and resolving problems, could encourage adolescents to manage their health (Chang et al., 2013). Together, these strategies are effective because they allow adolescents and teens with T1DM to be more compliant in following their treatment regimens, while helping to alleviate symptoms of diabetic discomfort (Delamater et al., 2018; Chang et al., 2013). If we get our systems of instruction, counseling, and support right, they will have the tools to help them in short- and long-term success. Its equally important to assist children and families with goal setting, problem-solving, stress management, and self-management strategies (Ispriantari et al., 2023). This prevents them from becoming confident in managing their diabetes independently. Moreover, engaging healthcare providers with experience in managing diabetes would be beneficial, as they can help to correct any medical issues resulting from T1DM (Pulungan et al., 2019). Finally, perhaps most importantly, a safe space for dialogue. Between the child/adolescent and parent or guardian about diabetes. Allowing for an open exchange about feelings surrounding the experience of living with T1DM allows children and adolescents the space to voice their feelings without feeling scolded or chastised by their caregivers (Pulungan et al., 2019). Providing children facing T1DM with supports at a young age can help set them up for success in their continuous management of their disease. Education and self-monitoring are also important for individuals with T1DM to achieve good glycemic control. This fact, along with education regarding disease and its management and life-style changes, helps patients to understand their own disease better. Self-monitoring of glucose levels allows one to titrate insulin doses appropriately (Maimuna, 2022). Nutrition education for individuals with T1DM can also facilitate healthy dietary choices aligning with good diabetes care. Finally, individuals may also want to use psychosocial treatments, such as cognitive behavioral therapy or stress management techniques, to assist manage the psychological effects of manageable diseases such as type 1 diabetes (ADA, 2023).

This can include relaxation techniques or activities focused on thinking positively and problem-solving skills. Together this approach to all aspects of self-care can lead to better long-term health in Type 1 Diabetes Mellitus patients. Another specific function of T1DM self-care is meal planning. Optimal glycemic control in T1DM is achieved through consistent carbohydrate counting with balanced macronutrients and regular meal timings. A registered dietitian or healthcare provider with expertise in diabetes can assist in developing tailored meal plans (Bawazeer, 2022). Someone with type 1 diabetes should take insulin and have blood tests done, but they should also eat a healthy diet. A balanced diet tailored to requirements can sustain ideal levels of glucose and reduce the chances of a diabetic issue (Maimuna, 2022). Exercise is another key aspect of T1DM management. Regular exercise enhances cardiac health, decreases stress, builds strong bones and muscles, and regulates blood sugar. Depending on the individual's age, gender, health status, weight goals etc. (Colbert, 2016), healthcare providers may recommend specific types of and levels of physical activity for individuals living with T1DM. Along with all of these steps, regular visits to healthcare providers are key for them to monitor progress in achieving diabetes management goals. In these visits they will review laboratory results and even lifestyle habits, including diet and exercise level (Maimuna 2022). There are many ways parents and caregivers can support children with T1DM. Parents should monitor their child’s blood sugar, watch their diet and exercise, provide emotional support and encourage self-care habits. Regular monitoring plus having parents, teach their children to follow the same meal plan by either preparing meals at home or making healthy choices when eating out, have been proposed as effective factors (Lu et al, 2020). They should promote physical activity and observe blood sugar levels before and after physical activity; this prevents hypoglycemia with physical activity, as physical activity increases insulin sensitivity during physical activity. Parents should also attend diabetes education sessions along with the child so they can understand T1DM better, what treatments are available for it and how to manage it on a daily basis the best way. As well as provide regular updates to health care professionals when changes are made to medication dose or other changes that help them to optimise glycaemic control. Lastly, it is important for families to create an environment of open communication between all parties about

their feelings regarding managing diabetes in general, but particularly with respect to psychosocial aspects of diabetes management and health status (Zysberg, 2015), as living with chronic illness can be an emotionally draining experience for both parent and child involved.

2.1.2 The role of family support in Type 1 Diabetes mellitus

Multiple treatments are available to help individuals with T1DM to ultimately achieve optimal glycemic control. Insulin therapy employs fast-acting analogs as the first-line drug class, since these provide fast onset of action and short duration of effects (Bogale et al, 2022). It can also be managed with the help of lifestyle changes such as regular exercise, a healthy diet, weight control, and stress management. In addition, research conducted on T1DM patients has shown better outcomes through educating them on self-management techniques (Koppel et al., 2019). Patients are provided guidance regarding the effect of lifestyle on diabetes control and HbA1c, the hematological parameter which is a biological marker of treatment success, which is achieved through therapy (insulin therapy) and lifestyle modification. Thanks to adequately informed about them having T1DM and under the supervision of health professionals, people live with T1DM can learn how to control this disease. (Abuali et al, 2023). Family dynamics may influence a child's attitude and approach to diabetes care, with consequent effects on glycemic control. Positive family support is critical in training the child with T1DM to follow treatment, diet and exercise (McCarthy et al., 2017; Zysberg, L., & Lang, T. (2015). Financial resources may also have an effect on glycemic control as these can limit access to expensive medical products such as continuous glucose monitoring or insulin pumps (Grunberger et al., 2018). Factors such as peers, the school environment and others within the social context can also influence a child with diabetes management. These environments should encourage knowledge about T1DM to ensure that the child is included in social situations and encouraged to participate freely (Garfield et al., 2020). Lastly, aspects of culture can impact a person's perspective on diabetes management; the culturally dependent practices of sick individuals can assist in determining values concerning diet or exercise, both of which are important aspects of glycemic control (Thapa & Gupta, 2021). Abuali et al (2023) This could involve adherence to specified

medication and nutrient recommendations, how blood glucose is monitored and administered, and how insulin dose responses rigorously fit into individual metabolic regimes. Mansour et al.'s findings suggest as doctors, we have to plan and advocate to address these challenges to improve glycemic control (2022). These advantages could include better patient education regarding diabetes management, improved medication regimen compliance, regular blood glucose monitoring and individualized insulin dosing strategies. Moreover, nutrition support services should be accessible for people with diabetes (Mansour et al., 2022). Having self-control is also important in terms of your diabetes as it helps in sticking to the treatment plan. Over the long term, a people with T1DM experience can to better achieve control or even prevention of hypoglycemia, hyperglycemia, and needle prick through self-management like goal setting, problem saving, and time management. Besides that, self-discipline and a better lifestyle have a significant role in controlling diabetes, which involves a healthy diet and regular exercise (Shrivastava et al, 2013). Understanding T1DM is paramount for effective self-management. Being aware of which symptoms might mean that your blood sugar are high or low can help a person identify when they require medical intervention or additional insulin doses. Having a knowledge of how food intake influences the glucose level, even allows people to modify the dosages of the insulin beforehand of meals and consequently prevents large fluctuations in blood sugar level all through the day (Shrivastava et al, 2013). In addition, considering more about complication could make them personally approach preventive measures before any problems arise, management modification through lifestyle changes should be awaited to develop immediately eg: exercise, composition of diet with sufficient fiber intake foods e.g., fruits, and vegetable (Viswanathan V.,2015). The ADA suggests that you and other caregivers start learning about T1DM as soon as you and your child receive the diagnosis. Such education may range from attending diabetes education classes and learning how to give insulin and interpret blood glucose levels, to recognizing signs of hypoglycemia or hyperglycemia, recognizing and treating ketoacidosis, carbohydrate counting for meal planning and so on … (ADA 2020). It is also important for families to communicate with a healthcare team regularly to ensure that they have up-to-date information about treatments. According to the ADA, they recommend at least every 3–6 months regular doctor check-up to review time in managing T1DM

(ADA 2020). While health professionals will provide the medical care their children need, family members should also be involved in emotional support for children living with T1DM. Become a supportive environment through positive reinforcement and encouragement (Holtz et al, 2023). Educating parents and children on T1DM, its management and potential long-term complications is important as well. Regular checkups with a doctor are necessary to assess diabetes control and to make changes in a treatment plan, if appropriate. Rewarding good behavior is necessary to regulate blood glucose levels and avoid unpleasant conditions on the way (Keklik et al, 2020). In terms of emotional support, family members need to establish a safe space where adolescents can share their feelings freely, free of ridicule or criticism. Open lines of communication between family members promote trust and understanding when significant decisions must be made about T1DM management. We need good parents who understand how challenging it is to live the life you were born into but love themselves enough to show us how to live an example of a healthy life, even on a horrible day when it hurts to do so. (Pate et al, 2015). There are many ways that healthcare professionals can engage with the family of a T1DM patient. First, health care providers need to educate families on the disease and its management, including diet and exercise. Furthermore, they need to promote the family's engagement in diabetes management by explaining different treatment regimens and medication types tailored to the unique needs of their child (Keklik et al, 2020). Both healthcare providers and families should also be aware of common warning signs they may encounter when caring for diabetes, such as hypoglycemia or hyperglycemia, so they're ready and able to respond to them if they are encountered. Finally, healthcare professionals can provide resources on mental health support services that both patients and families may require due to living with T1DM (Kalra et al., 2018). As well, psychosocial support for families and children with type 1 diabetes is crucial. These include educating about the disease, addressing psychological barriers to diabetes management and adherence, discussing feelings of stigma surrounding the disease, and providing emotional support (Mponponsuo et al., 2021). In addition, a collaborative approach with a multidisciplinary team of health care providers, including endocrinologist, dietitian, social workers can better ensure that all aspects of T1DM management are attended to in a systematic manner (Palmer et al., 2022). Moreover, insulin

injections, carbohydrate counting and physical activity are also common self-management methods to achieve glycemic control in children with T1DM. Moreover, the involvement and support of parents or other caregivers contribute significantly to improved glycemic control outcomes in children with T1DM. Hence, it is critical for the health service providers to educate and guide the children, parents, and caregivers regarding the self-care techniques of T1DM management and to give them assistance to ensure compliance with these strategies. (Palmer et al., 2022). Parents need to be educated about their child's condition and the corresponding lifestyle and treatment changes that need to be made. Health care providers need to provide clear, up-to-date information about how to manage a child's diabetes, and how to recognize and respond to symptoms of hypo- and hyperglycemia. (Jayachandran MR, 2022). Moreover, parents need to understand watching for their child's development and growth, as well as the potential serious long-term effects of diabetes. In addition to caring for a child with diabetes, parents must establish a diabetes management plan. This includes a balanced diet, regular exercise, the administration of insulin and regular blood glucose measurements. Additionally parents should be encouraged to ask help from parents of children with diabetes, as well as express any concerns or challenges to the healthcare team (Sousa et al., 2023). Family-centered care also serve to reduce health disparities in populations. There is less chance of misunderstanding which would lead to sub-optimal results when family focused care is provided as all family members are made a part of the care process. Moreover, family-centered care can alleviate financial burdens and anxiety in regard to hospitalizations and other healthcare costs, which are particularly heavy for families of lower socioeconomic status (Qian et al., 2021). Additionally, family-centered care can promote communication between health care teams and families. Conclusion: Family-Centered Care in the Pediatric setting has number of benefits both to child and to the family overall. By addressing the emotional needs of parents and including them in the care of their child, healthcare providers can improve the experience of caregiving for the child and family and encourage stronger outcomes across the board. Family often acts as a source of psychologic and emotional support for T1DM patients. They may also be able to offer understanding, reassurance, and emotional support as the diagnosed individual copes with adjustments to their diagnosis and with the everyday realities of living

with the condition. Finally, family members can offer practical help, such as assisting with meal preparation, driving to medical appointments, or helping with other activities of daily living. (Nasrabadi et al,2021). Parents may also worry about complications and the long-term effects of type 1 diabetes. The burden of managing their child's diabetes may also feel heavy for them and they may even suffer from guilt if they fail to provide their child with the best possible care (Feeley et al., 2019). Furthermore, psychosocial issues such as peer acceptance and self-esteem can concern parents regarding the social and emotional consequences of T1DM on their child. They might be concerned with how their child will deal with the social and emotional demands of having to navigate their diabetes in a world that is not always accommodating (Feeley et al., 2019). This may include helping develop a diabetes management regimen, emphasising the importance of a balanced diet and physical activity, as well as offering assistance and recommendations for reporting and managing blood glucose levels. Health care providers should also discuss coping strategies for the emotional aspects of type 1 diabetes and provide emotional support to parents, siblings and other family members. Health care providers also must understand type 1 diabetes' financial implications and offer families strategies and options to assist maladaptive coping strategies by parents of T1DM children include overprotection, denial, and poor communication. "Overprotectiveness" is an example of too much when it refers to a parent placing close attention on the child's food intake, activity, and blood glucose readings, or when they become too fused with the child's diabetes management. (Jayachandran MR, 2022). Examples include avoiding the gravity of the situation, downplaying their child's illness and avoiding useful interventions (Cheraghi et al, 2015). For example, ineffective communication could be the parent not informing the healthcare providers about the child, or not seeking assistance for themselves when required, or sending inadequate or conflicting information to the individual about the diabetes. In this regard, healthcare providers should emphasize family-centered care to foster adaptive coping and maintain quality of life both for parents and for T1DM children throughout daily life (Kuo et al, 2012). This may be provided by offering families detailed education about T1DM and/or support groups for peers, or by granting access to healthcare professionals (Kuo et al, 2012) Healthcare professionals can advocate for the families to have these conversations surrounding diabetes management in a safe and trusting environment.

Finally, health care workers should follow up on the family's adjustment and give needed interventions including referrals to mental health providers as needed. (Aldubayee et al. 2020). Family centered care has the ability to also lower the cost of health care for the provider and the family. Engaging family members in decision making can lead to better communication between health care providers and families and more appropriate and less expensive treatment. Additionally, as family driven care promotes increased collaboration between caregivers and families, it may improve outcomes for the patients as well (Qian et al, 2021). Family-centered care is a key healthcare approach that can be helpful not only to providers but also to families as highlighted throughout this site. This can result in better communication, collaboration and decision making and leads to shorter hospital stays and lower healthcare costs. Overall, however, it results in a better, healthier experience for families and their children. Other studies suggest that treatment for children with type 1 diabetes is greatly tied to the involvement of their parents. Because parents are well-acquainted with their child's needs, the involvement of parents can assist medical professionals in developing tailored care and treatment plans (Stefanowicz et al, 2018). Finally, education of families can facilitate a better understanding of their children’s disease process as well as skills needed to enhance successful management of diabetes. Most importantly, parental engagement can increase therapy adherence and significantly improve glycemic control and quality of life for children with T1DM. Overall, Ispriantari et al. (2023), emphasized the impact of family support in the effective management of T1DM children. Knowing the importance of quality care and improved patient outcomes, parent/guardian/caregiver involvement and support can be encouraged by healthcare providers. Family-centered interventions include approaches that aim at equipping families with the information and skills required for comprehensive management of the health of their children. In order to achieve this, you need to explain the family on changes should be made and the intervention of the therapy provided (ADA, 2020). Family-centered interventions can also improve family relationships, decrease family stress, and foster adaptive coping strategies (Park et al, 2018). These treatments will also allow families to gain a deeper understanding on how Type 1 Diabetes impacts their own and their children's life, which will lead to better management of the disease (ADA, 2020). In summary, family-based

interventions are an important strategy within the healthcare system and provide significant advantages for both families and clinicians. By providing families with the information and skills needed to manage their children's health and encouraging positive coping mechanisms, these treatments can help improve health outcomes and overall satisfaction (Stefanowicz et al, 2018). Family-centric approaches help adapt interventions that not only directly target the individuals suffering from the ailment but also their families along with resulting in a numerous of advantages including maximized adherence rates (Elsbach & Knippenberg, 2020). They can also reduce parental anxiety, and improve the interaction between the family and the healthcare team. Furthermore, it has been shown that they reduce the costs associated with Type 1 Diabetes and improve the quality of life of the child and the family as a whole (Elsbach & Knippenberg, 2020). Furthermore, family-centered interventions can represent an opportunity for the family to develop positive self-care practices and skills, which can be helpful in the long-term management of T1DM (Ispriantari et al., 2023). Interventions may involve educating caregivers and providing support, offering opportunities for family members to learn about diabetes management and skills practice, and encouraging family involvement in decision making (Busebaia et al, 2023). Interventions can also provide support to empower the patient and family to devise self-management strategies, including problem-solving skills training and the ability of parents to comprehend and respond to changes in their child's diabetes control. Widely, it has been found that family-centered therapies aid in promoting better quality of life and improved diabetes management for parents and children with type 1 diabetes. Such interventions may help reduce caregiver strain and promote family communication, as well as improve patient quality of life and physical health (Vasilopoulou et al, 2022). Participation of the family in health care system is essential for the effective management of type 1 diabetes. Family-centered care improves diabetes control and adherence to treatment plans according to research (Ansah, 2022). Ensuring families are educated of their significance in their child's care, healthcare providers should keep an open and effective means of communication with families. That means giving them the information and supports to give someone explaining about the illness and how to address it. In addition, health care providers should be encouraged to develop a trusting and good working relationship with family members that makes them feel supported to provide care (Kwame et al, 2021).

In brief, families have an important role in the healthcare system of children with chronic diseases, such as T1DM, which must be acknowledged and supported by healthcare professionals. “Mothers of children with diabetic disorders type 1 have to cope with not only changing to the new type of family, but also the way they treat child and educate into insulin use, and also how to administer it to a child have significant impact on their psychological, emotional, economic and social well-being. They can facilitate the adjustment of families to T1DM, provide psychosocial and emotional support, and assist parents and families in the development of skills necessary to manage T1DM.” This is where nurses play an important role as they can provide families with access to diabetic support groups, diabetes education material and information on the different services available to help manage the illness and improve the quality of the child's life (Hemmati Maslakpak et al., 2020). In addition, nurses can educate and support families on how to best manage the condition and guide them on how to communicate with their child regarding the condition. In short, nurses can do many things and address the most common concerns among the patients of T1DM; educating the patients, providing the other resources they need and providing emotional support as well. Nurses play a critical role in promoting self-care and chronic disease management for patients and their families (Hemmati Maslakpak et al., 2020) to increase their understanding of and ability to manage the condition. For healthcare professionals to be able to work collaboratively and reciprocally with families, they should have an understanding of family dynamics and culture. One of the most important things healthcare professionals can do to manage the ethics of difficult conversations is to create a space for those conversations that is open and based on mutual respect and understanding (Michaelson et al, 2021). Healthcare providers should hear family feedback, and incorporate it into care plans so everyone gets the service that best fits their individual family’s needs. Also, they should take into account any cultural beliefs or practices that might affect the family’s approach to healthcare. If families feel heard and that their needs are considered, they are more likely to participate actively in their child’s care. Lastly, healthcare workers should have high-quality information available for families regarding the most current information and therapies on T1DM. Families also need to be provided with available resources that can help them better understand their child’s condition, including information regarding diet, exercise, and medications.

This action can ensure that families have the power to determine the care of their child, healthcare providers. Providers in the healthcare field and families can work together and reciprocal in a way to maintain a good quality of life for their children having type 1 diabetes (Punaglom et al, 2022). Collaboration amongst clinicians and families can happen in the clinic, home, and community. In a clinical setting, clinicians and families can collaborate to evaluate child needs, discuss the treatment plan, and track progress. The family can give support, guidance and education in management of T1DM in the home. Families and healthcare professionals can work together to raise awareness about T1DM, identify resources and support groups, and share information about the condition in the community. (Kwame et all, 2021). Professionalization is the collaboration, between healthcare professionals and families, that ensures the establishment of mutual respect and understanding and creating a collaborative environment that is reciprocal. Such collaboration promotes open communication, builds trust and respect, and embraces problem solving. (Kwame et al, 2021). Also, it aids in sharing experiences and perspectives between families, thus helping you to develop a custom contact strategy that meets the exact needs of the child and the family. Finally, families must work with healthcare professionals to help find a balance that promotes quality of life for children with T1DM. (Sun et al, 2017). Encouraged patients to ask questions and give feedback on their understanding of their conditions and the strategies being discussed Doing so may also help develop a trusting dynamic between the patient and nurse (Babaii et al., 2021). Hands-on demonstrations can instruct patients and their families in how to check blood sugar levels, inject insulin, and manage diet and exercise. T1DM is complex and needs to be well managed, which can be conveyed through diagrams and charts. Nurses also utilize technology to educate their patients, using videos and online resources. These educational materials offered to patients allow for self-learning through literature regarding T1DM management. (Sun et al, 2017). Several key areas in which nurses have provided contributions in the management of diabetes have been recognized. First and foremost, nurses are advocates for their patients. They work with other members of the health care team to make sure that their patients are getting integrated, best-evidence care. They also work to identify and address any social, economic or emotional barriers that may impede a patient's capacity to manage their diabetes. Advocacy encompasses ensuring that patients have access to appropriate resources to support their health and well-being (Msekandiana et al, 2020). Thirdly, they act as coaches, providing employees the ongoing support and

motivation they need. They can track progress, offer encouragement and highlight areas that need improvement. However, by motivating their patients to alter their lifestyle, nurses can help ensure healthier outcomes as well as longevity of health (Msekandiana et al, 2020). In summary, nurses play a crucial role in the management of diabetes. This allows them to educate, advocate, and support patients, enabling them to actively participate in their own care and ensure they create the choices that are in the patients best interest. This is critical in supporting those with T1DM to maintain good health and well-being. Nurses also educate patients and their families on T1DM and its management. They teach you how to give insulin the right way, monitor blood sugar, and recognize symptoms of hypoglycemia and hyperglycemia. They also provide nutrition guidance and lifestyle changes (e.g. exercise and stress management) to patients so they can manage their diabetes well (Ansah, 2022).

2.1.3 Self-efficacy of type 1 Diabetes mellitus and quality of life (QOL)

Self-efficacy is also essential to help youth with chronic diseases develop and maintain good mental health. Adolescents with an increased level of self-efficacy have greater resilience, improved self-confidence, and better self-esteem. As a result, they are less prone to depression and other mental health problems because they are better at managing their emotions and dealing with stress (Ebrahimi Belil et al, 2018). Finally, high self-efficacy can result in higher levels of self-motivation, and self-direction, which can lead to teenagers with chronic conditions remaining occupied with things they enjoy doing and forming meaningful relationships. One of core determinants of quality of life (QOL) is physical health among the people with diabetes. This includes managing the ability to engage in the activities of daily living, like walking and eating, and controlling symptoms like fatigue, pain, and dizziness. Additionally, the right medications and treatments also play a big role in diabetes management, as they help prevent complications and long-term effects (Aljawarneh, 2018). Emotional well-being is an important QOL factor for people with diabetes. That is managing one's stress and anxiety as well as how to develop positive coping strategies. Family and friends can play an important role by learning about how diabetes works and by providing you support in coping with the emotional component of the disease. The quality of life of an individual is greatly influenced by social connections. A good social network of family, friends and health professionals is also a comforting part of quality-of-life. Participating in meaningful and joyful activities can also enhance overall satisfaction (Kalra et al., 2018). Quality of life with diabetes was affected by many factors. Diabetes is mentioned as a health condition, and it creates both a biological and an emotional burden, but the condition also is a catalyst for lifestyle and diet improvement, and creation of knowledge and capabilities (Rasoul et al., 2019). Moreover, changes in the surrounding environment lead to more social support for patients with diabetes, higher healthcare accessibility, and greater awareness of the disease. Additionally, research indicates that individuals diagnosed with diabetes may be more likely to engage in healthy behaviors such as exercise and self-monitoring (Aljawarneh, 2018). Individuals with diabetes generally have a lower quality of life than people without chronic diseases, delight rating decreased quality of life. Healthcare practitioners, on the other hand, can gain an in-depth understanding of how diabetes is affecting a person's quality of life by considering the different aspects of quality of life. Moreover, improved access to treatment, increased social support, and increased understanding of their disease might all

benefit individuals with diabetes (Aljawarneh, 2018). Appropriate care of diabetes can delay or prevent the onset of problems. Good blood glucose control can reduce the risk of long-term complications like retinopathy, kidney disease, CVD, and stroke in people with diabetes. And it might reduce their risk of experiencing acute side effects such as hypoglycemia, or low blood sugar, which can be dangerous and require hospitalization. Good glycemic control is not only associated with an improvement in quality of life but also a decrease in healthcare costs due to diabetes (Shafiee et al, 2012). People with well-controlled diabetes require less hospitalizations and expensive treatment leading to lower medical costs. Further, with tight glycemic control the risk of developing long-term complications from insulin is also reduced thereby resulting in potentially lower costs of health-care in coming years. (Singla, 2022). Now you are a diabetes self-management support program you been designed using evidence based methods to help others manage diabetes. They typically incorporate an individualized approach to diabetes self-management that includes education about diabetes, goal-setting, problem-solving techniques and methods for working through challenging emotions. Additionally, such courses often include aspects of cognitive-behavioral therapy (CBT), which seeks to help individuals understand and manage how they think and behave. They may have better overall quality of life, self-efficacy, and glucose control if they enroll in a diabetic self-management program (Brink et al., 2019). Beyond diabetes self-management programs, there are an expanding field of technology-assisted interventions that support the best way to manage diabetes. These include online tools, mobile apps, and wearable devices designed to help people self-monitor their blood glucose levels, plan meals, and make lifestyle changes. These technologies can empower people to have better insights into their diabetes to make better decisions in real time about how best to care for themselves. In addition, these technologies can also offer emotional support and assist individuals in managing the stress of living with diabetes (Nguyen et al., 2020). Diabetes self management as a whole is crucial for optimized glycemic control and quality of life. Articles on self-management programs and technology interventions, this will enable them to help manage diabetes in a better way and enjoy an enhanced quality of life. (Someia et al, 2020).

2.2 Related Research:

Fiallo-Scharer et al. g (2019) study aimed at examining the effectiveness of an intervention that provided families with personalized self-management tools based on their individual self-management challenges for children managed for type 1 diabetes. The trial involved 214 children with type 1 diabetes, aged 8–16, and their participating parent(s). Children were randomly assigned to the intervention group or control group. While the control group received standard treatment, the intervention group was provided with materials to specifically stimulate self-management. Results of the study showed that after combining data from both sites and both age groups, there was no significant overall intervention effect on HbA1c or quality of life. But when the data were parsed by place and age group, several significant findings emerged. At first site, teenagers in the intervention group had faster decreases in post-intervention HbA1c levels than those in the usual care group. This was particularly evident among adolescents with high baseline HbA1c levels (>8.5 and >10) whose A1c decreased significantly. Overcoming challenges due to motivation to manage self-care was associated with improvements in HbA1c. This implies that we should provide more support and resources that guide motivated teens to take more initiative in control of their blood glucose. Additionally, parents of intervention group children co-located with usual care group children reported a significantly greater increase in QOL during the intervention than did parents of usual care group children. This reflects the fact that if you offer extra support and resources, the benefits are not limited to the children, but extend to the quality of life of their parents. In the study, investigators noted the importance of tailoring treatments to specific populations and addressing barriers to self-management at the individual level, even if there was no net significant effect of the intervention on A1c or quality of life overall. Stanger et al. (2018) conducted a study to evaluate the feasibility and efficacy of a multi-component web-based intervention for adolescents with poorly controlled type 1 diabetes. The intervention consisted of working memory training for the teens; education for parents regarding contingency contracts; motivational and cognitive-behavioral therapy; and incentives for both parents and teens. There were 114 teenagers included in the research with poorly managed type 1 diabetes, who were then randomised to either normal treatment (31 participants) or an online intervention (30 participants). The intervention was 25 weeks long and comprised 15 sessions delivered via a web platform. The results showed just how effective the

web-based intervention was at improving glycemic control in poorly-controlled teens with type 1 diabetes. The intervention group also had significantly lower HbA1c values than the usual care group. Furthermore, the intervention group had higher improvements compared with the standard care group on scores of working memory, parent facilitating diabetes care, and self-blood glucose monitoring. Overall, Stanger et al. (2018) showed that a web-based multi-component intervention can be an effective and acceptable approach to helping adolescents with poor controlled type 1 diabetes achieve better glycemic control. Type 1 diabetes (T1D) has become a growing concern worldwide, especially in children (under five). Unfortunately, fewer than one in six children and adolescents reaches optimal levels of glycated hemoglobin (HbA1c). To address this issue, Christie et al. (2016) conducted a practical, cluster-randomized controlled trial to assess a structured educational group based in a clinic integrating psychological techniques to improve long term glycemic control, quality of life, and psychosocial well-being among children and adolescents with type 1 diabetes. In this trial, 362 children with HbA1c values of 8.5% or more who were enrolled at 28 pediatric diabetes programs were randomly assigned either to normal treatment or to the intervention. The children ranged in age from eight to sixteen. Outcomes measured included HbA1c at 12 and 24 months, hypoglycemia, admissions, self-management, interventional compliance, emotional and behavioral adjustment and quality of life. A process study was also conducted to determine the feasibility of implementing the intervention. In children and adolescents with poor control, the study showed that structured education intervention delivered by diabetic nurses and dietitians who used psychological techniques to increase engagement and behavior change had no effect on HbA1c. Due to the fact that the intervention was implemented within routine clinical care, there were a number of key challenges. Mean HbA1c was obtained in 82.3% of patients at 12 months and 78.5% of patients at 24 months. The rest of the findings were largely the same, and the total number of modules completed did not affect the result. There were no significant differences in hypoglycemia or admissions between the groups. At 12 months, the intervention group reported significantly higher self-management skills ($p<0.001$), emotional and behavioral adjustment ($p=0.02$), and quality of life ($p=0.04$) than the control group; this was not the case at 24 months. The compliance with the intervention was high and 76% of patients attended all six sessions. A clinic-based structured educational group with psychological techniques can help children and adolescents with T1D achieve the long-term benefits of glycemic control as well as self-management abilities, emotional and behavioral adjustment and better quality

of life. The intervention was feasible for delivery in routine clinical practice. Hakim (2017) conducted an experimental study to measure the effect of a family-centered empowerment approach on increasing awareness of moms who had diabetic children. The study selected one hundred parents of six to twelve-year-old children with diabetes, randomly assigning them to either an intervention group or to a control group. The data-gathering tool was a questionnaire that was created. The authors of the present study explored post- intervention features of the intervention group versus those in the group pre- intervention, statistically assessing relations in food ($p<0.001$), symptoms, activity level, disease control test results ($p<0.0001$). However, the control group did not show these significant differences. These findings suggest that by implementing the empowerment model, moms grow more conscious of the needs of their diabetic children." Hence, this model is suggested to use for educating and enhancing maternal knowledge in similar settings. The current study provides meaningful insights into the potential benefits of practicing a family-centered empowerment paradigm that will enhance the mothers' awareness and understanding of how to care for their children with DM. As per the Alonso Martin research et al. The aim of this study (2016) was to explore the ways in which kids and teenagers who have been diagnosed with the disease (T1DM) manage their blood sugar readouts given their understanding of the disease. To assess caregivers′ knowledge, a survey was developed, and adapted based on treatment modality (continuous subcutaneous insulin infusion (CSII) or multiple dose insulin (MDI)). Mean values of HbA1c were used as a metabolic control measure for the previous year. As CSII requires a higher degree of expertise than MDI, they found that patients on CSII had poorer outcomes. Academic parent: Jayachandran, M. R. (2022) utilized a descriptive study design to investigate the socio-economic status and perceived levels of social support among parents of their children diagnosed with type 1 diabetes. This suggests that healthcare providers should consider developing programs and resources that could potentially improve the socioeconomic status of parents of children with type 1 diabetes mellitus. This could mean helping support insurance coverage related to diabetes, as well as financial assistance, housing options and services aimed at reducing the financial burden of managing care. Finally, health care providers must ensure that a family has teaching materials to use as a reference for proper diabetic management and control. This means advising on healthy diet, exercise and also the administration of medication as well as recognising the early signs and symptoms of both hypo- and hyperglycemia. Parents may use this information to provide their child with the best possible outcomes in terms of health and well-

being, while also doing a better job of managing their child's diabetes. The transitional stage of emerging adulthood is a period of great importance for the control of type 1 diabetes (T1D) patients. These years are marked by important lifestyle transitions, such as moving out of home, going to college or entering into a career. Hence, it is important to understand how elements of family functioning such as family conflict and diabetes management responsibilities are affected by the transition out of high school. Hilliard et al. (2019) examined how the diabetes-related family conflict and accountability changed from pre to post-high school graduation and how that relates to glycemic control over the following year. In three successive pavilion visits, starting the spring of high school senior year, seventy-nine emerging adults with T1D and their parents self-reported on diabetes-specific family conflict and family responsibility. Hemoglobin A1c (HbA1c), an indicator of glucose concentration over a three- month period, was extracted from the clinical records. Family conflict around diabetes was low to begin with, the study found, and didn't change much over time. There was a significant decrease in parent responsibility for diabetes care tasks over time. It was clear especially in the families that they were taking less responsibility for things like offering the emerging adult food choices, administering insulin shots, reminding them to check their blood glucose levels, etc. Conversely, over the years, responsibility for tasks such as the sourcing of food and diabetic supplies became increasingly intertwined. The research further found a positive association between glycemic control and the degree to which parents were responsible for diabetes responsibilities. More specifically, glycemic control in the emerging adult was better with greater parental accountability as part of diabetes management responsibilities. Yet, diabetes-specific family conflict was not positively associated with glycemic control. These results have important implications for health care practitioners and families of children at risk for developing T1D. First, the emergence of young adults shifting towards their own independence should serve as a marker for parents to slowly transfer responsibility for diabetes management tasks over to their children. But it becomes essential to prepare this emerging adult to do this work, and to understand the need to keep glycemic control. Second, encourage family empowerment and coordination with diabetes management among family members, because healthcare providers can only provide necessary training treatment. This might include allocating resources to aid families as they transition to a greater independence and teaching families on how to understand the benefits of sharing the burden of diabetes control chores. The findings may inform healthcare providers and families in supporting emerging. That T1DM is a complex

and demanding disease and requires frequent self-management. While biological therapies are critical component of effective diabetes management, psychological factors also play a pivotal role in driving patients' experiences and outcomes. To gain insight into the daily experience of children with type 1 diabetes living in Kenya, Palmer et al. (2022) will focus on psychosocial factors that may impact their diabetes-self- management. The study employed more qualitative techniques to collect data, including focus groups, semi-structured interviews, and picture diaries. The subjects of the study were fifteen children with T1DM and fourteen of their guardians. Thematic analysis of the data produced four overarching themes: the pursuit of normalcy; economic marginalization; knowledge and awareness; and the value of social support. They emphasise the need for educational and awareness- raising initiatives to enable children and their caregivers to get a better understanding of the condition. The knowledge and understanding of T1DM was found to be insufficient, there being a gap existing that affected the self-management of diabetes in many children and caregivers in the study. Education and awareness-raising initiatives have been shown to be critical interventions to improve diabetes self-management in Kenyan children with type 1 diabetes. The economic exclusion showed that financial hardship is one of the greatest barriers to successful diabetes self-management. Many households in Kenya are economically challenged and find it difficult to procure supplies required for the management of diabetes, such as insulin and blood glucose monitors. That is why the study calls for financial solutions aimed to ensure that children are able to access the items critical to their effective self-management (including funded insulin and diabetes consumables). The importance of social support emphasizes the critical role of friends, family members and health care professionals in assisting children with type 1 diabetes. Social support has been found to be a crucial factor that helps children navigate the challenges of regulating their diabetes, according to the study. The study emphasizes the need for community-based treatments that help children with type 1 diabetes and their families establish social support networks. The study also adopted the picture diary approach in an effort to understand the daily experiences of living with diabetes for children in Kenya who have type 1 diabetes. In this context, the picture diaries offer a unique and rich insight into the daily challenges faced by children with T1DM. This study emphasizes the

multifaceted needs of Kenyan children with type 1 diabetes and the significant impact of psychosocial factors on their diabetes management.

2.3 Review of the literature on type 1 diabetes mellitus self-efficacy and quality of life (QOL)

Type 1 diabetes (T1DM) is a chronic disease affecting millions of people around the world, and its incidence is increasing. Despite advancement in diabetes care, people with type 1 diabetes (T1DM) are still required to manage their food and exercise but also continuously monitor blood glucose and take insulin. These barriers tend to lead to big drops in quality of life for those with T1DM, particularly when such individuals are young adults (age: 18 to 35). Kent & Quinn (2018) aim to explore associating factors of this population's quality of life including diabetes self-efficacy, fear of complications, particularly hypoglycemia, and diabetes self-care. of diabetes. They collected 180 young individuals with T1DM for investigation. The participants filled an online series of surveys, such as Demographic/ General Health Survey, Diabetes Knowledge Test, Hypoglycemia Fear Scale, Diabetes Behavior Rating Scale, Fear of Complications Questionnaire and Self-Efficacy for Diabetes Self-Management. The analysis of our data was performed using multiple linear regression. Hypoglycemia anxiety, fear of complications, and self-efficacy were significantly correlated with quality of life. Diabetes awareness and diabetic self-care practices, however, were not significantly associated with quality of life. According to this data, young individuals with T1DM quality of life is affected by hypoglycemic fear, complication fear and self-efficacy. Conclusions Health-related quality of life (HRQoL) in young people with type 1 diabetes (T1D) will be improved by focusing on reducing fears related to hypoglycemia and being prepared for potential consequences of hypoglycemia and ensuring access to opportunities for improving self-efficacy in managing T1D. These findings can help to develop interventions that will improve the physical and emotional health of people with type 1 diabetes. They should look into any further factors that influence the quality of life of patients with T1D to provide a more complete understanding of the challenges that this patient group is facing. Alvarado-Martel et al. examined the patients with type 1 diabetes demands and their perception of quality of life being diabetes, and treatment satisfaction as well as the association with QoL. To find

out the independent variables of QoL, a cross-sectional study was conducted. Patients with type 1 diabetes presented in an outpatient endocrinology clinic at a reference hospital were recruited through a standardized questionnaire that gathers their clinical and sociodemographic, including quality of life due to diabetes, from interviews during an open interview try to explore treatment satisfaction as well as diabetes' influence, long-term fears, flexibility, restrictions, and self-perception of QoL. Descriptive statistics, bivariate regression, and multivariate regression were carried out to ascertain the independent variables of QoL. According to the International Federation of Clinical Chemistry [IFCC], for the patient, the mean patient's age was 31.4±11.6 years, the duration of diabetes was 14.2±9.3 years, and glycated hemoglobin (HbA1c) level was 8.5%±1.9% (69±20.8 mmol/mol). Quality of life questionnaires average rating(94.6+22.9) and treatment satisfaction rating(25.7±6.7) were good. However, QoL decreases as the patient has higher HbA1c, was female, the number of comorbidities, and lower education (r2=0.283, P8). There was no association between SEDM and A1C. Adolescents with diabetic distress were more likely to have been poorly controlled glycemically, while adolescents considered ready for the transition were less likely to have been so. The role of transition preparedness and diabetes distress are additional factors for healthcare practitioners to consider to help optimize adolescents glycemic control and to prepare them for adult care. Abolfotouh et al. (2011) conducted an experimental study to investigate the impact of educational interventions on the quality of life (QoL) of adolescents with type 1 diabetes. The study, conducted using the Diabetes Quality of Life Instrument for Youth, involved 503 teens who answered questions. After the teenagers filled out the questionnaire, they were randomly assigned to an experimental or control group. The Experimental group, nor Control group received any intervention, whereas during the four months, the Experimental group experienced four 120-minute teaching. Medical charts of the participants were also audited to measure the outcome of the intervention. Overall mean QoL score was 76.51 ± 9.79 and 38% of teenagers reported an excellent quality of life according to the findings of the study. The study also found that worse QoL was associated with older age, higher depression, more hospital admissions in the last 6 months, low self-esteem and low self-efficacy. These findings suggest that adolescents with type 1 diabetes experience multiple problems that can have an impact on their quality of life. These study findings

included QoL of the experimental group significantly decreased ($p \leq 0.008$) in all aspects after intervention. This was, however, significantly smaller than the decline found in the control group. This suggests that the educational intervention may have buffered the experimental group's quality of life. These factors were significantly better in the experimental group than in the control group globally. Exercise adherence, glucose monitoring and treatment, self-efficacy, family management involvement, glycemic control, and life satisfaction were other scenarios where the experimental group scored higher than the control group. To conclude, an educational approach for adolescents with type 1 diabetes may protect from future deterioration of quality of life and glycemic control. This study concludes that quality of life in adolescents with type 1 diabetes can be significantly improved by an educational intervention program. Consequently, they must consider the implementation of educational matters as an important component of type 1 diabetes management during adolescence. Further studies are needed to design and evaluate more appropriate educational strategies in response to the specific needs and challenges of adolescents with type 1 diabetes. People-Centered Approaches: Tailored Education for Adolescents with Type 1 Diabetes and Their Families The results indicate that data from the person-centered communication and reflection education paradigm, Guided Self-Determination-Young (GSD-Y), can be integrated in an educational programme for youngsters with type 1 Diabetes mellitus mellitus. For GSD-Y, a group program for adolescents starting continuous subcutaneous insulin infusion (CSII) and their parents, whether it makes a difference in self-perception and health and happiness and family fighting over diabetes. Brorsson et al. conducted a fancy study. In a randomised controlled study of 71 adolescents on CSII,12 study participants were followed up with for one year. The participants in the treated group (n = 37) participated in seven group training sessions for five months using the GSD-Y paradigm, and the control group was given standard care. They tracked measures including HbA1c, subjective health, quality of life, family arguments, confidence, and use of continuous glucose monitoring. At 12 months, they found a difference between the groups in sugar management, with the intervention group doing better (62 vs. 70 mmol/mol, P =. 009). After accounting for family arguments and analyzing boys and girls separately, they found that a difference was present in boys at only 12 months (P =. 019). But the intervention did not meaningfully

improve their perceptions of their confidence, family conflicts, health or quality of life. GSD-Y Helps Teens Control Blood Sugar GSD-Y may help teens better manage their blood sugar. Our GSD-Y group activities might be a model to provide person-centered care for adolescents with type 1 diabetes. Ayar et al. investigated the efficiency of web-based diabetes education in Turkey upon improving metabolic control, self-efficacy for diabetes self-management, and quality of life in adolescents with type 1 diabetes mellitus. in their 2021 study. The study was conducted in the university hospital of Turkey's western region. The research included 62 teenagers with type 1 diabetes, in all. Thirty were in the intervention group, which received online diabetes education, and 32 were in the control group, which got diabetes education in a clinical setting. Although those in the intervention group also used the internet to learn about diabetes management, the teenagers in the control group received standard medical treatment, but had no contact with the website. Quality of life, self-efficacy, and A1C levels were assessed throughout the six-month trial. Blood A1C levels were collected before and after the experiment. Measurements of quality of life and self-efficacy were made at the beginning of the trial, three months later and at the end. The study results showed no statistical significant difference in A1C levels between the intervention and control groups. Whereas between the groups there was a statistically significant difference in self-efficacy. This study reported that the web-based diabetes education program did not affect A1C, but raised the self-efficacy and quality of life of diabetic teenagers. Investment in diabetes education is also very important to improve the living standard of teenagers with type 1 diabetes, the study stated. This study highlights the value of supplementing conventional diabetes education of Turkish adolescents with diabetes with web-based diabetes education. Further research Indeed has been shown Supports the benefits of web-based diabetes education on the quality of life and self-efficacy of adolescents with type 1 diabetes mellitus and their ability to control their diabetes.

CHAPTER III

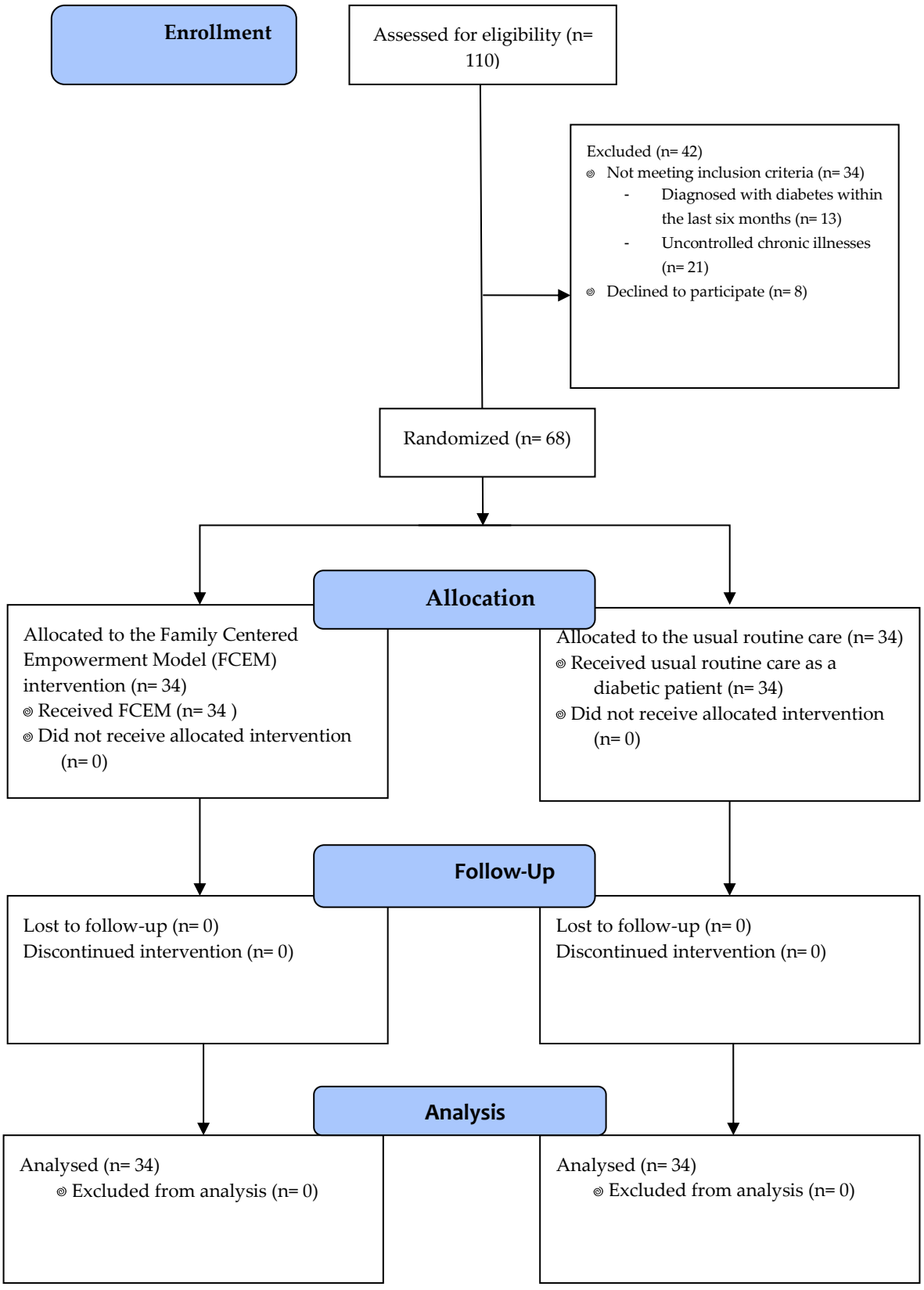
Methodology

3.1 Study design.

A randomized controlled clinical trial was conducted from April to October 2023 at the Jordanian Royal Medical Services in Amman, Jordan, and 68 participants were gathered by October 1, 2023. Analysis of the data was completed on November 15, 2023 (Figure1). The study was reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT) statement (http://www.consort-statement.org/).

Figure1

Flowchart of study population enrollment



3.2 Population & the Sample

3.2.1 Sample size calculation considering the drop-out rate:

The following formula can be used to determine sample size when taking the drop-out rate into account:

$$Nd = N/(1 - d)$$

N: sample size before considering drop-out

d: expected drop-out rate

ND: sample size considering drop-out

Now the sample size for this study is calculated as 54. If the drop-out rate (missing or incomplete data) The sample size taking drop-out into account will be equal to 54/(1-0.2) = 67.5 = 68, with a 20% (0.2) predicted during the research procedure. Randomization will be done in computer environment using: //www.randomizer.org/website.

This clinical trial involved individuals with T1DM, aged 12-18 years, who had not taken part in any professional diabetes education program for the preceding month of the study and who had been diagnosed at least 6 months earlier. According to the direction of medical professionals, the course discussed topics such as diabetes types, blood sugar regulation, self-monitoring, exercise, diet, medicine administration, and problem-solving methods, which frequently include psychosocial support. The study excluded adolescents who had severe long-term diseases or newly diagnosed T1DM. An official diabetes education program is a planned educational endeavor designed to provide people with diabetes and their families the information and abilities they need to manage their condition effectively. These parameters were adopted to ensure that the study takes place in a controlled environment and targets the aspects of intervention of the study. To ensure a representative sample from the clinic, many recruitment techniques were used for this study. In the waiting rooms, we distributed brochures and announcements with information. The recruitment of adolescents with T1DM for this study involved invited participants with T1DM attending the Jordanian Royal Medical Services clinics. Overall, 110 patients were assessed for eligibility; of them, 68 adolescents fulfilled the aforementioned inclusion criteria. After being recruited, the study design and objectives were illustrated to the patients and their families, and written informed consent was obtained.

The participants were given anonymous serial numbers, which were randomized using an electronic randomizing app, Research Randomizer (version 4.0; Social Psychology Network). The sample was representative of the clinic's demographics, including age, sex, and socioeconomic status, according to a comparison of the clinical and demographic characteristics of the recruited participants with the clinic's larger patient population. Patients were followed up for a period of 6 months. There was no loss of follow-up, and none of the enrolled patients withdrew from the study. With respect to the study population, the mean duration of diabetes was 4.69 (SD 3.3) years for the intervention group and 3.581 (SD 2.2) years for the control group. Pen-based insulin administration systems were used, using rapid-acting and long-acting formulations. Traditional glucometer readings were used to regulate glycemia without continuous glucose monitoring. The intervention and control groups were derived from a combination of evidence-based practices gleaned from previous similar studies, pilot studies, and clinical experiences.

3.2.2 Inclusion Criteria:

- Adolescents who were agree to participate in the study.
- To be between the 12- to 18-year-age range.
- Having been diagnosed at least six months earlier.
- Not participating in any other official diabetic teaching program through the one month prior to the study.
- Being literate in Arabic language.
- The adolescent should have a smart phone.
- Having internet connection.

3.2.3 Exclusion Criteria:

- Adolescents with type 1 diabetes recently diagnosed.
- Adolescents with additional serious long-term illnesses.

3.3 Data collection and sampling

In order to reach the minimum and maximum number of the samples to be selected, it is stated that the effect sizes of these studies should be determined from the mean and standard deviation levels obtained from the scales of the intervention and control groups obtained from previous similar studies, pilot studies, or experiences. (Kang, 2021).

The sample size of this study were calculated by using the G*Power software (latest version. 3.1.9.7), 80% power, in two-way hypothesis based on the t-test independent group in two groups = 0.5 significant level, effect size = 0.7844645, and an equal sample size in both groups. (Kang, 2021).

There were 64 participants in this research who have type 1 diabetes in their teens. Using the basic random sample technique, the participants was randomly chosen and divided into two groups: control (n = 34) and intervention (n = 34).

3.4. Data collection and procedure:

The study's data was collected from participants using the following methods: a sociodemographic questionnaire, a self-efficacy questionnaire, a pediatric quality of life-diabetes module questionnaire, and medical records for the glycemic control data.

3.4.1 Questionnaire for Clinical and Demographic Data. (Appendix B)

Adolescents filled out a standardized questionnaire designed by researcher, specifically for the study, which was used to gather demographic and clinical data about the participants. Participants' age, gender, educational attainment, parents' marital status, parenting style, father's work history, mother's work history, health insurance, length of illness, age at diagnosis, a family history of diabetes, and co-morbidities associated with diabetes were all recorded Each participant will receive a thorough explanation from the researcher of the study's objectives and its regulations regarding anonymity, along with information about the mode of insulin delivery, number of daily injections, frequency of daily blood glucose measurements, number of being hospitalized due to diabetes last year, and episodes of reported hypoglycemia last month. Participants are free to go at any moment. Consent from, (Appendix B) the subjects was signed and received prior to the study commencing.

3.4.2. The Pediatric Quality of Life Inventory 3 Diabetes Model (Appendix C)

PedsQL was created to assess the HRQoL that is unique to diabetes in children and teenagers with T1DM who are between the ages of 12 and 18 (Varni et al., 2003). There are five subscales in the PedsQL, with 28 questions total: Treatment Adherence (7 items), Symptoms of Diabetes (11 items), Treatment Barriers (4 items), Worry (3 items), and Communication (3 items). Using a 5-point Likert scale (0 = never a problem, 4 = usually often a problem), respondents scored their

replies. Two versions of the scale are available: the parent proxy and child proxy. This study used the kid form, which measures adolescents' HRQoL. (Varni and others, 2003). Cronbach's alpha statistics were used to evaluate internal reliability and consistency of the original version. This tool has been previously used with Arabic speaking T1D children and demonstrated acceptable internal consistency reliability 875087 (Cronbach's alpha >. 70). Construct validity of the Arabic-language version of the instrument was assessed with the interclass correlation coefficient (ICC) test according to the agreement (Mean difference ±SD and 95% CI) between PedsQL GCS subscales and PedsQL-MD subscales. Abdul-Rasoul et al after Kudo et al. (2012) demonstrated that there was a good correlation between the subscales (ICC =. 81). This study scoring was based on the work of Varni (2014), "Scaling and Scoring of the Pediatric Quality of Life Inventory". To derive each score, all components were inverted and linearly mapped to a 0-100 scale. The higher the score, the better the HRQoL, or the fewer symptoms or difficulties related to the disease. . The total score was computed by adding all items on the whole scale and dividing by the total number of answered items. If more than 50% of the elements in the scale were missing, the scale score was not calculated in order to account for missing data. The self-reported metrics were taken from the pediatric quality of life diabetes section.

3.4.3. Self-Efficacy Questionnaire (SEQ). (Appendix D).

It was taken from Muris (2001) to evaluate teenagers' self-efficacy. Three subscales make up the instrument: items 1, 4, 7, 10, 13, 16, 19, and 22 pertain to academic self-efficacy; items 2, 6, 8, 11, 14, 17, 20, and 23 pertain to social self-efficacy; and items 3, 5, 9, 12, 15, 18, 21, and 24 pertain to emotional self-efficacy. Eight items are included in each subscale. The test had 24 items in total, with a 5-point Likert scale used for scoring. Method of scoring: The available score range for each item was 24–120. The scores for each item were as follows: 1 (not at all), 2 (very ill), 3 (unwell), 4 (well), and 5 (very well). A strong self-efficacy level is indicated by a high score. As a result, the self-efficacy scores fell into three categories: low (less than 60%), moderate (between 60% and 80%), and high (more than 80%). The researchers translated the instrument into Arabic, and five experts, three professors from the Faculty of Nursing at Ain Shams University and two pediatric nursing professors from Benha University tested it for content

validity. Once the suggested changes were made, the completed form was prepared for usage. And Cronbach's alpha coefficients were used to assess the tool's internal consistency and dependability. (Bassam, Said, and Sabaq, 2022).

3.4.4. Measurement of Glycemic Control. (Appendix E)

HbA1c values were used to monitor glucose management. Using a data sheet created specifically for this study, values were retrospectively retrieved from the participants' medical records at the time of their clinic visit. To enhance stability and uniformity throughout the sample, the HbA1c levels of the subjects were calculated by averaging the two most recent readings from the previous year. HbA1c readings for teenagers should be less than 7%, according to the ADA (2023). Poor glycemic control is indicated by high HbA1c values.

3.5 Data analysis:

The data review was conducted using SPSS version 22. Initially, any necessary adjustments were performed once the data was examined for data entry problems. For descriptive data, the variables mean, percentage, and number were employed; steepness and skewness were assessed in relation to the scale data's normal distribution. The frequency distribution was employed for categorical variables, while the mean and standard deviation were used for continuous variables. The test known as the T-test was used for comparing means between a pair of continuous variables, while the Chi-square test was used to look at the connection between two categorical variables. Furthermore, the two independent sample t-test was employed to examine if there was a statistically significant difference between the intervention and control groups. We evaluated the relationship between glycemic control, self-efficacy, and quality of life using the Pearson's correlation coefficient. A P-value of less than 0.05 indicated that the results were significant.

3.6 Study Plan

The study protocol was approved by the institutional review board committee of the Near East University on January 26, 2023. (acceptance NEU/2023/110-1681) (Appendix F). And also the permissions from authors to use the tools were

approved (Appendix F). This trial was registered on ClinicalTrials.gov (NCT06694467). Adolescents and their families received complete details about the study's goals, methods, risks, and benefits before giving their informed permission. The recruitment process maintained the privacy of participants, promoting an open and ethical research setting, and all the collected data were anonymized and used solely for statistical analysis. As a measure of respecting the research subjects, participants and their guardians provided their written informed consent (Appendix B). Informed consent was first given by 12- to 18-year-old adolescents regarding the aims and overall procedures of the study and possible risks and benefits of participation. Additionally, the parents or the guardians and the adolescents were allowed to ask questions in order to be clear on the aspects involving their participation. We explained that the participation was voluntary, and the participant could withdraw from the study with any consequences to health care. Compensation was not provided in order not to affect participants' motivation. The consent process also played a crucial role in ensuring and gaining the confidence of the families, meaning reliable data were collected. Consistent with the principles of procedural protectiveness, this comprehensive procedural plan corresponds with the family-centered intervention literature, indicating that a strong foundation of ethical practice is key to intervention completion and participant response. With this information included, the study can adequately discuss the ethical considerations that are present in research involving adolescents and stress that involving families may help to improve the care of adolescents with T1DM.

Chapter IV

Findings and Comments

4.1 Patients' characteristics:

There were 68 T1DM adolescents enrolled in the research. There was a significant difference between the two groups in the mean score for age (p = 0.000), weight (p
= 0.006), and student level (p = 0.000) of the patients. The results of the statistical test showed that there was no statistically significant difference between the two groups based on gender, height, mother and father's educational level, and insurance (Table 1).

Table 2 shows that insulin injections were administered three times a day to both groups of T1DM patients, and most of the patients had type 1 diabetes mellitus for five years or more with no appreciable changes. A first-degree family history of diabetes mellitus was present in 26% of the intervention group and 6% of the control group, respectively, however most members of the two groups had just one hospitalization.

Table 1.

Comparison of the Participant Demographics in the Intervention and Control Groups. (n=68)

Variable	**Intervention group (n=34)**	**Control group (n=34)**	**p-value**
Age (years)	15.1 (1.4)	13.3 (1.6)	0.000
Gender			
Female	20 (58.8%)	14 (41.2%)	0.146
Male	14 (41.2%)	20 (58.8%)	
Weight (kg)	57.9 (12.1)	48.7 (14.5)	0.006
Height (cm)	158.8 (9.9)	153.8 (12.3)	0.073
Student level (grade)	9.5 (1.5)	7.5 (1.8)	0.000
≤ 8^{th} Grade	8 (23.5%)	27 (79.4%)	0.000
> 8^{th} Grade	26 (76.5%)	7 (20.6%)	
Educational level of father			
Less than high school	6 (17.6%)	6 (17.6%)	0.670
High school degree or equivalent	16 (47.1%)	18 (52.9%)	

Table 1 (Continued)

College degree	3 (8.8%)	3 (8.8%)	
Bachelor degree	7 (20.6%)	6 (17.6%)	
Master degree	0 (0.0%)	1 (2.9%)	
Doctoral degree	2 (5.9%)	0 (0.0)	
Educational level of mother			
Less than high school	8 (23.5%)	9 (26.5%)	0.434
High school degree or equivalent	13 (38.2%)	13 (38.2%)	
College degree	7 (20.6%)	3 (8.8%)	
Bachelor degree	5 (14.7%)	9 (26.5%)	
Master degree	1 (2.9%)	0 (0.0%)	
Doctoral degree	0 (0.0%)	0 (0.0%)	
Do you live with both of them			
Yes	33 (97.1%)	32 (94.1%)	0.555
No	1 (2.9%)	2 (5.9%)	
Insurance (yes)	33 (97.1%)	34 (100 %)	0.314

Chi-square test and t-test

Table 2.

Comparison of Participant Characteristics Linked to Diabetes Between the Intervention and Control Groups. (n=68)

Variable	**Intervention group(n=34)**	**Control group (n=34)**	**p-value**
Age at diagnosis (years)	10.4 (3.1)	9.5 (2.4)	0.185
Duration of diabetes (years)			
1 - < 2	12 (35.3%)	10 (29.4%)	0.074
2 - < 3	1 (2.9%)	9 (26.5%)	
3 - <4	1 (2.9%)	2 (5.9%)	
4 - < 5	5 (14.7%)	4 (11.8%)	
> 5	15 (44.1%)	9 (26.5%)	
Do any members of your family have a history of diabetes?			
Yes	9 (26.5%)	2 (5.9)	0.021

Table 2 (Continued)

No	25 (73.5)	32 (94.1%)	
Number of injections per day	3.1 (0.6)	3.0 (0.4)	0.601
HOW often is a daily blood sugar test performed?	2.6 (1.2)	3.5 (2.1)	0.056
Once	6 (17.6%)	9 (26.5%)	0.008
Twice	5 (14.7%)	0 (0.0%)	
Three or more time	16 (47.1%)	24 (70.6%)	
Never	7 (20.6%)	1 (2.9%)	
HOW many times did diabetes keep you in the hospital last year?	1.5 (1.6)	1.3 (1.1)	0.442
Once	13 (38.2%)	18 (52.9%)	0.652
Twice	5 (14.7%)	3 (8.8%)	
Three or more time	7 (20.6%)	6 (17.6%)	
Never	9 (26.5%)	7 (20.6%)	
HOW many episodes of hypoglycaemia have you reported last month	2.3 (2.5)	2.2 (2.2)	0.843
Once	5 (14.7%)	3 (8.8%)	0.233
Twice	7 (20.6%)	2 (5.9%)	
Three or more time	12 (35.3%)	15 (44.1%)	
Never	10 (29.4%)	14 (41.2%)	

Chi-square test and t-test

4.2 Self-efficacy of type 1 Diabetes mellitus

Table 3 and 4 demonstrated that, during the post-program follow-up examination, there was a highly statistically significant change (p=0.000) in the mean score of all three self-efficacy categories (academic, social, and emotional) compared to the pre-program period among intervention group.

The majority of T1DM patients (60%) showed low self-efficacy in the pre-program, as Figure (2) showed. But in the post-program follow-up assessment, 15% and more than 27% of them showed moderate and high levels of self-efficacy, respectively.

Table 3.

Mean Diabetes Adolescent Self-Efficacy Scores Throughout the Educational Program Phases Among Intervention Group (n= 34)

Domains of self-efficacy in adolescents	**Intervention group (n=34)**		**p – value**	**Paired t-tests**
	Preprogram Mean (SD)	**Post program Mean (SD)**		
Academic self-efficacy	28.85 (3.9)	34.47 (11.0)	0.004	t=-3.08 &df=33
Social self-efficacy	26.91 (4.8)	30.50 (3.5)	0.000	t= -8.03 & df= 33
Emotional self-efficacy	25.76 (2.9)	30.11 (5.3)	0.000	t= -4.66 & df= 33
Total	81.53 (10.3)	95.09 (14.9)	0.000	t= -8.41 & df= 33

Figure 2

Comparing the Self-Efficacy Levels of the Studied Patients at Each Phase of the Educational Program, Within Both the Control and Intervention Groups (n=68). The Self-Efficacy Levels Were Classified as Low (Less Than 60%), Moderate (Between 60% And 80%), and High (More Than 80%).

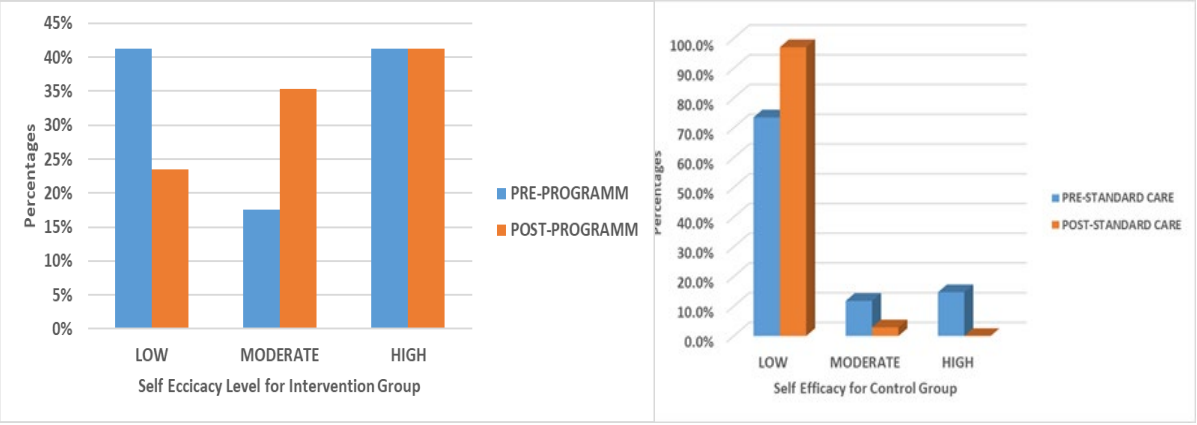


Table 4.

Mean Diabetes Adolescent Self-Efficacy Scores Among Control Group (n= 34)

Domains of self-efficacy in adolescents	**Control group (n=34)**		**p-value**	**Paired t-tests**
	Preprogram Mean (SD)	**Post program Mean (SD)**		
Academic self-efficacy	28.35 (3.1)	28.53 (5.6)	0.852	t= -0.19 & df= 33
Social self-efficacy	23.26 (3.3)	26.0 (8.4)	0.064	t= -1.92 & df= 33
Emotional self-efficacy	21.88 (3.6)	22.03 (6.9)	0.904	t= -0.12 & df= 33
Total	73.50 (9.1)	71.55 (8.6)	0.229	t= 3.72 & df= 33

4.3 Quality of Life during the Type 1 Diabetes Mellitus Educational Program Phases

According to Table 5 and 6, there was a statistically significant variance in treatment barriers, treatment adherence, diabetes symptoms, communication and stress during the post-program follow-up evaluation when compared to the pre-program phase, but there was no statistically significant association in Diabetes symptoms or Treatment barriers between the pre- and post-program phases among control group.

A low quality of life was experienced by 60% of T1DM patients during the pre-program, as Figure (3) illustrates. However, 15% of them and over 27% of them, respectively, indicated moderate and high levels of quality of life in the post-program follow-up evaluation.

Table 5.

Mean Quality of Life Scores for Diabetic Patients Throughout the Educational Program Stages Among Intervention Group (n= 34)

domains of quality of life in adolescents	**Intervention group(n=34)**		**p – value**	**Paired t-tests**
	Preprogram Mean (SD)	**Post program Mean (SD)**		
Diabetes symptoms	32.82 (12.0)	40.44 (10.7)	0.000	t= -6.42 & df= 33
Treatment barriers	55.88 (13.3)	71.69 (12.6)	0.000	t= -9.33 & df= 33
Treatment adherence	63.65 (15.9)	77.31 (10.5)	0.000	t= -8.15 & df= 33
The worry about diabetes	44.85 (21.2)	60.78 (24.0)	0.000	t= -7.41 & df= 33
Communication	73.04 (26.3)	82.35 (20.5)	0.000	t= -4.05 & df= 33

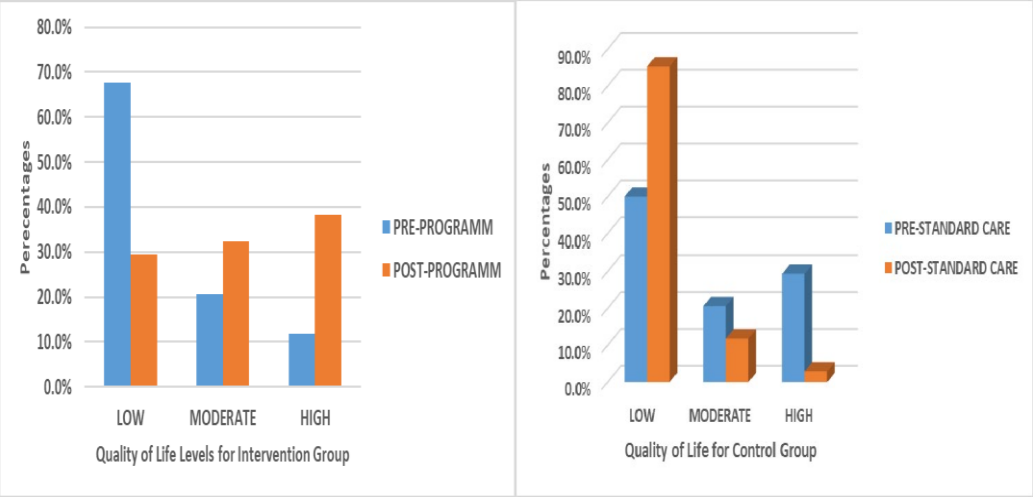
Table 6.

Mean Quality of Life Scores for Diabetic Patients Among Control Group (n= 34)

domains of quality of life in adolescents	**Control group (n=34)**		**p-value**	**Paired t-tests**
	Preprogram Mean (SD)	**Post program Mean (SD)**		
Diabetes symptoms	35.05 (9.7)	33.61 (9.8)	0.053	t= 2.01 & df= 33
Treatment barriers	64.34 (13.0)	62.31 (10.9)	0.117	t= 1.61 & df= 33
Treatment adherence	68.48 (2.7)	66.28 (9.7)	0.003	t= 3.66 & df= 33
The worry about diabetes	49.51 (18.6)	43.31 (19.4)	0.000	t= 3.19 & df= 33
Communication	75.24 (13.8)	66.67 (14.4)	0.000	t= 8.37 & df= 33

Figure 3.

Comparing the Quality-Of-Life Levels of the Studied Patients at Each Phase of the Educational Program, Within Both the Control and Intervention Groups (n=68). We Classified the Scores as Low (0 To 37), Moderate (38 To 74), and High (75 To 112).



4.4 Glycemic control thorough the Educational Program Phases of type 1 Diabetes mellitus

As Table 7 illustrates. Before the family-centered education, the mean HbA1C value was statistically significant in both the intervention and control groups, according to the independent t-test ($p < 0.001$). Following family-centered education, there was a substantial drop ($p<0.001$) in the mean HbA1C score between the intervention and control groups. On the other hand, the control group had a statistically significant rise in difference before and after six months. ($p < 0.001$).

Table 7.

Comparison of HbA1C mean scores before and after intervention, both within and across intervention and control groups

HBA1C	**Intervention group (n=34)**	**Control group (n=34)**	**Mean difference**	**Independent t-test**
First visit	11.25 (2.4)	9.58 (1.5)	1.72	t = 7.43 & df = 33 p <0.001
6 month	10.23 (2.1)	10.21 (1.5)	0.02	t = -6.80 & df = 33 p < 0.001
Mean difference	-1.02 (0.8)	0.63 (0.5)	-0.39	t = -9.91 & df = 65 p < 0.001
Paired t-tests	t = 7.43 & df = 33 p <0.001	t = -6.80 & df = 33 p < 0.001		

4.5 The relationship between the HbA1c, Quality of Life, and Self-efficacy Levels of Diabetic Patients Throughout the Educational Program Phases.

A strong positive correlation between Self-efficacy Levels pre and posttest among intervention (P< 0.001), whereas there is a negative correlation between HbA1c and SEQ- levels posttest without significant values.

In Table 8. comparisons revealed that the intervention group's mean score on the QOL post test and SEQ post- test were significantly higher than those of the control group. HbA1c, however, was not significantly different between the intervention and control groups. In addition, there is a strong positive correlation between Quality of Life Pre-test and quality of Life posttest (P< 0.000).

Table 8. *Differences in HbA1c, Quality of Life, and Self-efficacy Levels between intervention and control group*

	Mean (SD)	**Sum of Squares Between groups)**	**Mean Square**	**F**	**p-value**
HbA1c last					
Intervention group	**10.23 (2.1)**	**0.009**	**0.009**	**0.003**	**0.960**
Control group	**10.21 (1.6)**				
QOL-posttest					
Intervention group	**60.79 (7.5)**	**1783.1**	**1783.1**	**28.39**	**0.000**
Control group	**50.55 (8.3)**				
SEQ-posttest					
Intervention group	**90.97 (7.6)**	**6405.8**	**6405.8**	**96.41**	**0.000**
Control group	**71.56 (8.6)**				

(ANCOVA) test

CHAPTER V
DISCUSSION

The family centered empowerment model (FCEM) gives the patients' families the tools they need to help make sense of their lifestyle issues, to prepare their patient support practices, and to change their own living conditions. This is connected to the self-participation of the patients and, thus, the FCEM can enhance the self-efficacy and self-esteem of a patient. Longitudinal data have evidenced the strong association in between patients' one ability of self-efficacy with their better eating habits. (Mohebi et al., 2013; Madmoli M, 2019)

The results demonstrate that family-centered education is associated with better adherence to therapy and HbA1c results in T1DM patients. Thus, this reflects that family involvement in education can contribute to improving treatment compliance and health indicators.

This demonstrates how involving families in the teaching process may lead to improvements in treatment compliance and health metrics. A typical education program and an empowerment program vary primarily in that the former is a tactic or plan, while the latter is more of a manual for patients and healthcare personnel (Rezasefat Balesbaneh et al., 2014). To the best of our knowledge, this is the first study in Jordan to explore the effect of family centered empowerment model on quality of life, self-efficacy, and Hba1c levels in adolescents with type 1 diabetes.

The results showed no significant differences between the two groups in terms of based on gender, height, mother and father's educational level, duration of diabetes and monthly family income. Thus, the two groups were homogeneous in terms of demographic variables.

The results of the current study indicated that most of the teenagers under investigation had poor levels of self-efficacy in their pre-transition educational programs. This may be because teenagers are still learning a lot of the skills required for self-managing their diabetes and realizing how important it is to have continuous assistance from their families in order to maintain good control of HbA1c level. Our findings were consistent with other research demonstrating the link between strong control of HbA1c level and high levels of self-efficacy. As mentioned earlier, the mean total score of self-efficacy enhanced better in the intervention group after the intervention, compared to that in the control group;

nonetheless, the increase was not significant. This result is consistent with the assessment conducted by Gutierrez-Colina et al. (2020) on 44 young people with type 1 diabetes and discovered that the young adolescent had lower levels of self-efficacy at the baseline evaluation. Survonen et al. (2019), who looked at the psychosocial self-efficacy of 189 teenagers with type 1 diabetes, disagree with this conclusion, saying that the teenagers' self-efficacy level was good at the beginning of the assessment. However, group hope therapy did not appear to have any influence on the self-efficacy of teenagers with type 1 diabetes with regard to their academic performance or their ability to control their blood glucose levels, according to research by Esfahani et al. (2021). And this result support the first hypothesis that the self-efficacy scores in the intervention group of adolescents are significantly higher than those in the control group.

Improving problem-solving skills may help teenagers with type 1 diabetes reduce the detrimental effects of emotional autonomy on their eventual glucose control. Furthermore, in line with our research, Chih et al. (2009) state that teenagers with type 1 diabetes mellitus who also have higher levels of self-efficacy are more likely to reach their diabetes management goals. Additionally, this finding is in accordance with research by Cheraghi et al. (2015) who shown that HbA1c levels were lowered by diabetes patients and their families being empowered in home-centered care. The empowerment model's contribution to greater increases in hemoglobin levels appears to be dependent on family engagement, as evidenced by the comparison of intervention and control groups. Those with lower HbA1c levels likely followed healthy diets and were able to modify their eating patterns, which seems logical. However, this finding is inconsistent with Atashzadeh et al. (2017), with a decrease in hemoglobin levels among both intervention and control groups after the intervention; the mean decrease was significantly lower in the intervention group. This is due to the fact that both the intervention and control groups trained with the empowerment concept with and without family engagement. In addition, the findings of this study revealed that, as over one thirds of the subjects in this study considered that their post-program follow-up evaluations rated in high quality of life. This study suggests that, although young people with type 1 diabetes might encounter challenges in managing treatment demands from their parents, parental involvement could be beneficial in enhancing their diabetes-related quality of life.

One possible explanation for this finding is that the same educational program increases the adolescents' ability to self-manage their disease and the ability to cope with stressful life situations.This result agrees with Stahl-Pehe et al. (2017) who evaluated the impact of self-reported chronic-generic and condition-specific quality of life (QoL) on glycemic control among adolescents and showed that QoL was inversely associated with HbA1c after 3 years in the course of T1D only in patients poorly controlled at baseline. So that this finding agree with the second hypothesis which that the quality of life scores in the intervention group of adolescents are significantly higher than those in the control group.

The conclusion that improved diabetes self-management efficacy raises quality of life (QOL) is consistent with earlier research by Bravo et al. (2020), which found that diabetes patients experience guilt and resentment for their poor self-care; these emotions reduce the desire to practice self-care, which in turn lowers QOL. Low PedsQL subscale scores (<70) are reported by at least 25% to 50% of participants, indicating issues with the physical, emotional, social, and mental domains. The mean HbA1c level was considerably lower in the intervention group six months after the intervention as compared to the control group, as the results showed. In a comparable direction, Chen et al.'s (2021) findings suggest that boosting problem-solving skills and self-efficacy might help improve self-management, which in turn can improve glycemic control. There was a clear correlation between lower 6-month HbA1c levels and higher baseline self-efficacy and self-management at three months. On the other hand this result support the third hypothesis that The HbA1c levels in the intervention group of adolescents are significantly lower than those in the control group. Therefore, the challenges encountered in daily life are also linked to the poor quality of life (QOL) of individuals with type 1 diabetes mellitus, in addition to the need for insulin injections to regulate blood glucose levels. Diabetes results and quality of life can be enhanced by dietary and physical activity changes, according to a prior research by chao et al. (2021). Interventions are thus required to assist people with diabetes become more adept at managing their blood sugar levels in a variety of contexts and coping with stress. Research by Al-Abadla et al. involving 240 diabetic Emirati patients in the United Arab Emirates in 2022 showed a substantial correlation between quality of life and glycemic control. Negative relationships between the glycated hemoglobin % and every QoL subdomain are specifically

noted. Negative correlations show that the several sub-domains of quality of life tend to decline when glycemic management deteriorates (as shown by greater glycated hemoglobin percentages). Several investigations have looked into the findings point to the potential significance of raising self-efficacy for raising overall quality of life in people with Type 1 DM, as there appears to be a significant correlation between the total self-efficacy and total quality of life at both short- and long-term assessments post-program. So that according to study finding which support the fourth hypothesis that the intervention group of adolescents have a significant negative correlation between HbA1c levels, self-efficacy, and quality of life, suggesting a stronger association compared to the control group. Previous research by Stromberg et al. (2021) had demonstrated that physical exercise strongly mediated the association between improved diabetic quality of life and higher juvenile social self-efficacy. More physical activity and a lower HbA1c are correlated, although the association is mediated by diabetes quality of life. Higher levels of social self-efficacy have been linked to higher levels of physical activity, which has been linked to improved diabetic quality of life and, eventually, reduced HbA1c levels, according to the serial mediation model. The 2019 study by Uzark et al. provides the light on the beneficial relationship between adolescents with chronic illnesses' levels of self-efficacy and their quality of life, with a focus on adolescents with diabetes. Based on the research, a teenager's self-management of their chronic illness is linked with their quality of life throughout the transition to adult care. This underscores the importance of focusing on enhancing adolescents with chronic diseases' self-efficacy and disease self-management skillsets to improve their overall wellness. A study conducted by Gangemi et al. (2020), found that, in general, the quality of life of adolescents with chronic illnesses does not correlate with their readiness for transition to adult care. Results of this study and the one by Uzark et al. in 2019 have different perspectives which is important as they outline the multifaceted nature and wide variability in both" experiences of transition and aspects of quality of life among adolescents with chronic conditions. In a prior study, Ayar et al. is null with regard to HbA1C levels, namely but useful in improving the self-efficacy and quality of living of diabetic adolescents (2020) In addition, they have found higher levels of self-efficacy in the intervention group compared to those receiving only standard treatment. Older teenagers with type 1 diabetes need to improve their

self-efficacy to encourage optimal self-management behavior; thus, investigation of this topic is an important aspect of improving patient outcomes. QOL Mean Scores were significantly different between intervention and control groups of adolescents with T1DM ($p<0.01$).

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CHAPTER VI

Conclusıon and Recommendatıons

6.1 Conclusıon

The purpose of this study is to explore the implications for nursing and health policy of the impact of the family-centered empowerment model on Jordanian adolescents with T1DM. Research has concentrated its efforts as a priority on HbA1c levels and on self-efficacy and QOL as it relates to this demographic. Therefore, this study aims to provide sound evidence and information on the family-centered empowerment effect in order to provide a valuable insight that can direct nursing and health developments that help to enhance the support targeted toward Jordanian T1DM adolescents as well as the other implications offered to guide Jordanian health strategies implementation. The results will be essential in developing worldwide instrumented nursing interventions and health policies that will enhance the well-being and outcomes of this population of interest. They also demonstrated greater stress management and communication as well as dealing with treatment adherence and a dramatic decrease in treatment barriers. In comparison, confirms that clinical and psychosocial outcomes were positively influenced by the intervention since the control group did not change in these parameters.

6.2 Recommendation

6.2.1 Recommendations According to Findings

This randomized controlled trial suggests that patients with T1DM should attend regular clinic appointments for continuous care education sessions to assess long-term result implications of the disease. The future of transition: Self-efficacy, QOL & adult care transition programs. Nurses can improve health through treatment plans by including self-care training. Diabetes friendly health educational program should be afforded for patients with type 1 diabetes mellitus which included self-care practices for patients throughout their stay in the hospital to help them to prevent obstetric complications and female diabetic syndrome..

6.2.2 Recommendations for Further Research

Moreover, education programs are also needed to be conducted especially in children and adolescents as they sensitize adherence to diabetes care recommendations and thereby improve QOL among all diabetics. The study will also be important for nurses to include this training in the therapeutic program and educational program for the future studies to improve their quality of life. Further research should be performed on the most common phobia impact on quality of life.

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APPENDICES

Appendix A

A.1 Family Centered Empowerment Model (FCEM) (English Version)

Table of Contents of the Model (FCEM)

First Session of the model

1. Description of the study, aim, role of participant, significant of the study.
2. Definition and Description of the model.
3. Insulin Treatment in Children and adolescents with diabetes.
4. Dietary Guidelines & Recommendation for glucose target.
5. Communication & Safety during school and exercise.

Second Session of the model

1. Assessment & Management of hypoglycemia in children and adolescents with DM.
2. Microvascular & Macrovascular Complications in children and adolescents with DM.
3. Other Complications & Associated Condition in children and adolescents with DM.
4. Screening and prevention of complications.
5. Sick Day Management in children and adolescents with DM.

Third Session of the model

1. Diabetes Management Plan.
2. Fasting during Ramadan by children and adolescents with DM.
3. Potential Complications and Safety in Ramadan.
4. Nutrition Management during Ramadan.
5. Ramadan & Physical Activity.

Fourth Session of the model

1. Glycemic Control Targets & Glucose Monitoring.
2. General Principles Determining Glycemic Targets.
3. Monitoring of Glycemic Control.
4. Finger Stick Blood Glucose Measurements.
5. Best Timing of Self-monitoring of Blood Glucose.

1. First Session of the Model:

Title: Effect of Family Centered Empowerment Model on Quality of Life, Self-Efficacy, and HbA1c levels in Adolescents with Type 1 Diabetes in Amman, Jordan.

The aim of this study: Is to assess the effect of family centered empowerment model, on quality of life, self-efficacy, and HbA1c levels in adolescents with type 1 diabetes in Jordan.

Future implication: This study will provide an increased understanding of the influence of the family-centered empowerment model on quality of life, self-efficacy, and HbA1c levels in adolescents, so that studying Jordanian population will provide needed insight on how these factors could explain and influence on metabolic and clinical outcomes of this population.

With the help of this study, we will be able to better understand how the family-centered empowerment model affects adolescents with type 1 diabetes in Amman, Jordan, in terms of their quality of life, sense of self-efficacy, and HbA1c levels. since cultural variations in family structure, lifestyle, self-efficacy, and glycemic control among adolescents from various countries vary significantly, studying the jordanian population will provide the necessary insight on how these factors could explain and influence on metabolic outcomes differently, enabling for the development of culturally appropriate interventions from academics and clinicians that favorably influence clinical outcomes while promoting and enhancing these qualities.

1.1 The roles and responsibilities of each individual in the study:

Written participate consent in the study will be obtained from the child's and their families (father or mother). Participants will be assured that all the information will remain confidential; right to withdraw from the study will be explained to them; they will be explained that educational programs will not entail any financial loss; and the model materials after the study will be sent to the control group.

Family Centered Empowerment Model (FCEM**),** will be implemented based on the model, including four sessions, in four following weeks. By using smart phone programs through a teaching group, will set up with adolescents and their families, before each session, and the sessions will be held through sharing the video and instruction materials. All individual and group sessions will be held through a phone group. The contents of the designed empowerment model will be implemented based on four steps (perceived threat, problem solving, educational participation, and evaluation) for samples of the study in the case group.

1.2 Definition And Description

The term diabetes mellitus describes a complex metabolic disorder characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Inadequate insulin secretion and/or diminished tissue responses to insulin in the complex pathways of hormone action result in deficient insulin action on target tissues, which leads to abnormalities of carbohydrate, fat, and protein metabolism. Impaired insulin secretion and/or action may coexist in the same patient.

While the etiology of diabetes is heterogeneous, most cases of diabetes can be classified into two broad etiopathogenetic categories: type 1 diabetes, which is characterized primarily by deficiency of insulin secretion; or type 2 diabetes, which results from a combination of resistance to insulin action, as well as an inadequate compensatory insulin secretory response for the degree of insulin resistance. While type 1 diabetes remains the most common form of diabetes in young people in many populations, especially those of European background, type 2 diabetes has become an increasingly important public health concern globally

among children in high risk ethnic populations as well as in those with severe obesity.

Conclusion

The worldwide trends of type 1 diabetes incidence vary by sex, by race, by age group as well as by time period around the world, consistent with disease etiology that involves environmental triggers superimposed on genetic susceptibility. Recent evidence has elucidated that presymptomatic type 1 diabetes progresses through a continuum of three distinct identifiable stages prior to the onset of symptoms.

Management and support of children and adolescents with type 1 diabetes in school

Summary And Recommendations

The following recommendations, reached by consensus, are largely based on expert opinion (E). They represent the "ideal" or best practice approach with acknowledgement that their full implementation may vary geographically both within and between countries according to the availability of and access to resources.

• The number of young people with diabetes attending school is increasing (A), placing a significant burden on families, health care systems, and schools (E).

• Children may spend more than 30 hours per week in the school environment.

• Many children with diabetes worldwide do not have ready access to insulin, diabetes supplies, or education. They should be given the same opportunity as other children to obtain an education (E).

• Irrespective of age and ability, all students with diabetes at school must receive the support, encouragement, and supervision of school personnel (E).

• Optimal management of diabetes at school is a prerequisite for optimal school performance, including learning (B), and for the avoidance of diabetes-related complications (E).

• Maintaining normoglycemia during school hours is important and day-to-day glycemic targets should not differ from any other setting (E).

• The type of insulin regimen used at school should be tailored to the needs, ability, and wishes of the child/family and should not be dictated by the school resources (E).

• Diabetes is classified by “common law” as a disability and legal frameworks exist in many nations to ensure the child has equal opportunity to participate in all aspects of school life (E).

• Schools should make “reasonable adjustments” to facilitate prescribed medical care to allow for children with type 1 diabetes (T1D) to participate in education on the same basis as their peers (E).

•“Reasonable adjustments” include school personnel support with insulin administration, as well as understanding and knowledge of diabetes technologies (including continuous glucose monitoring [CGM] devices and insulin pump settings) (E).

• Administration, or careful supervision, of insulin administration requires school personnel to be legally authorized with informed parental consent (E).

• Schools are responsible for adequately training their personnel about diabetes, but the content of the training is the responsibility of the health care team and parent (E).

• Whether children can self-manage certain aspects of their diabetes and/or self-administer insulin is not necessarily age- dependent and can only be determined by the parent and health care team (E).

• Schools have a non-delegable duty of care to their students, and school personnel should take reasonable care to protect them from harm that is reasonably foreseeable (E).

• Blood glucose (BG) monitoring is central to achieving optimal glycemic control at school and must be familiar to school personnel (E).

• School personnel should be able to manage appropriately the effects of low and high BG levels according to parent and health care team instructions (E).

- Access to food in schools is an integral part of enabling children to grow normally and balance their insulin and food intake (E).

- Use of food pictures may help school personnel assess food servings and their estimated carbohydrate content (E).

- All young people with T1D should be given the same opportunities as their peers to participate safely in all sports and physical activity (E).

- School personnel should be aware of the signs/symptoms of hypoglycemia, and a "first-aid hypoglycemia" management pack should be available at all times (E). Clear instructions for managing hypoglycemia should be provided (E).

- Young people with diabetes must be allowed to monitor their BG levels, administer insulin, and to treat low/high BG values at any time during the school day, with adult supervision if needed (E).

- All young people with diabetes at school should have an individualized diabetes management plan (DMP) in place which must be developed and agreed with parents in advance (E).

- The DMP should be reviewed and amended as and when necessary, according to the needs of the young person with diabetes, and/or at least annually (E).

- Some studies report higher rates of psychological problems such as depression and eating disorders in young people with diabetes (B).

- Schools provide a unique opportunity to identify and treat psychological problems in young people with diabetes and close liaison between school personnel and health care professionals is recommended (E).

- Successful diabetes management at school heavily depends on effective communication and problem-solving with the family (B) and schools should clarify expectations and coordinate communication (E).

- Peer relations, local social stigma, racial and religious perspectives can be a burden to patients and families with T1D (E).

• Young people with diabetes have a significantly increased risk of being exposed to issues of discrimination, which may impact on self-esteem and cause feelings of stigmatization (E).

• School exams or other assessment situations are associated with stress and increased risk of acute transient episodes of hypoglycemia or hyperglycemia (B) that can affect performance (B).

• Specific arrangements may need to be put in place (including access to BG testing equipment; hypoglycemia first-aid pack) for exams (E).

• Parents cannot be expected to “fill the gap” of school resources and attend to their child's medical management during the school day (E).

• With a mutually supportive, collaborative approach between parents and the child's health care team and schools, and with advancements in communication technology, for example, providing sensor glucose data in real time to parents, there is a real opportunity for a truly cooperative approach (E).

1.3 Insulin treatment in children and adolescents with diabetes

Recommendations/Executive Summary

• Insulin treatment must be started as soon as possible after diagnosis (usually within 6 hours if ketonuria is present) to prevent metabolic decompensation and diabetic ketoacidosis [A].

• Intensive insulin regimens delivered by combinations of multiple daily injections or pump therapy with differential substitution of basal and prandial insulin aiming to have optimal metabolic control have become the gold standard for all age groups in pediatric diabetology [E].

• Insulin therapy must be individualized for each patient in order to achieve optimal metabolic control [D/E].

• Improvements in glycemic control by intensive insulin treatment reduce the risks of acute and long-term complications [A]. There is no reason to believe this is not the case also in younger children [E].

• In all age groups, as close to physiological insulin replacement as possible and optimal glycemic control must be the aim using the locally available basal and prandial insulins [A].

Although no insulin injection regimen satisfactorily mimics normal physiology, pre- mixed insulins are not recommended for pediatric use [C].

When insulin is provided through a help organization, the recommendation should be to provide regular and NPH as separate insulins, not premixed [E].

• Whatever insulin regimen is chosen, it must be supported by comprehensive education appropriate for the age, maturity and individual needs of the child and family [A]. • Aim for appropriate insulin dosage throughout 24 hours to cover basal requirements and higher dosage of insulin in an attempt to match the glycemic effect of meals [E].

• Delivering prandial insulin before each meal is superior to post- prandial injection and should be preferred if possible [C]. Daily insulin dosage varies greatly between individuals and changes over time. It therefore requires regular review and reassessment [E].

• The distribution of insulin dose across the day shows great individual variation. Regardless of mode of insulin therapy, doses should be adapted to the circadian variation based on the daily pattern of blood glucose [B].

• All children should have rapid-acting or regular insulin available for crisis management [E].

• It is essential that a small supply of spare insulin should be readily available to all children and adolescents so that the supply is uninterrupted [A].

• Children and adolescents should be encouraged to inject consistently within the same area (abdomen, thigh, buttocks, arm) at a particular time in the day, but must avoid injecting repeatedly into the same spot to prevent lipohypertrophy [B].

• Insulins need to be administered by insulin syringes (or other injection devices) calibrated to the concentration of insulin being used [E].

• Regular checking of injection sites, injection technique and skills remain a responsibility of parents, care providers and health professionals [E].

• Health care professionals have the responsibility to advise parents, other care providers and young people on adjusting insulin therapy safely and effectively. This training requires regular review, reassessment and reinforcement [E].

Storage of Insulin

Regulatory requirements state that the labeled insulin product must retain at least 95% of its potency at expiry date. At room temperature (25C, 77 F), insulin will lose <1.0% of its potency over 30 days. In contrast, insulin stored in a refrigerator will lose <0.1% of its potency over 30 days. Storage recommendations are more often based on regulatory requirements regarding sterility than loss of potency. The individual manufacturer's storage recommendations and expiry dates must be adhered to.98

These usually recommend that:

- Insulin must never be frozen.
- Direct sunlight or warming (in hot climates or inside a car on a sunny day) damages insulin.
- Patients should not use insulin that has changed in appearance (clumping, frosting, precipitation, or discoloration).
- Unused insulin should be stored in a refrigerator (4 C-8 C).

• After first usage, an insulin vial should be discarded after 3 months if kept at 2 C to 8 C or 4 weeks if kept at room temperature. However, for some insulin preparations, manufacturers recommend only 10 to 14 days of use in room temperature.

• In hot climates where refrigeration is not available, cooling jars, earthenware pitcher99 or a cool wet cloth around the insulin will help to preserve insulin activity.

Equally, manufacturers´ guidelines for storage of unused pens or cartridges in use should be adhered to, which can differ from storage of vials. In children on small doses of insulin, 3 mL cartridges or vials, instead of 10 mL vials should be chosen to avoid wasting of insulin.

The usual injection sites are:

- Abdomen (the preferred site when faster absorption is required and it may be less affected by muscle activity or exercise).
- Front of thigh/lateral thigh (the preferred site for slower absorption of longer acting insulins).
- The lateral upper quadrant of the buttocks (the whole upper quadrant is useful).
- Lateral aspect of arm (in small children with little subcutaneous fat, intramuscular injection is more likely and it may cause unsightly bruising).
- Rotation of injection sites are important also within the same area of injection
- Cleaning or disinfection of skin is not necessary unless hygiene is a real problem. Infection at injection sites is rare.101

20 | Problems With Injections

Local hypersensitivity reactions to insulin injections are uncommon but when they do occur, formal identification of the insulin (or more rarely preservative) responsible may be possible with help from the manufacturers. A trial of an alternative insulin preparation may solve the problem. If true allergy is suspected, desensitization can be performed using protocols available from the manufacturers. Adding a small amount of corticosteroids to the insulin may help. Lipohypertrophy with the accumulation of fat in lumps underneath the skin are common in children. Lipoatrophy was said to be uncommon since the introduction of highly purified insulins and analogues. But recent reports indicate that lipoatrophy is a problem increasing inpatients using insulin analogues and possible mostly in patients on pumps.

Painful injections are a common problem in children. Check angle, length of the needle, and depth of injection to ensure injections are not being given intramuscularly and that the needle is sharp. Reused needles can cause more pain. Indwelling catheters (Insuflon, i-port) can decrease injection pain. Leakage of insulin is common and can- not be totally avoided. Encourage slower withdrawal

of needle from skin, stretching of the skin after the needle is withdrawn, or pressure with clean finger over the injection site. Bruising and bleeding are more common after intramuscular injection or tight squeezing of the skin. Use of thinner needles has shown significantly less bleeding at the injection site.

Bubbles in insulin should be removed whenever possible. If the bubble is not big enough to alter the dose of insulin it should not cause problems. When using insulin pens, air in the cartridge can cause drops of insulin appearing on the tip of the pen needle, if with- drawn too quickly.

Insulin Absorption

Insulin activity profiles show substantial variability both day to day in the same individual and between individuals, particularly in children. The onset, peak effect and duration of action depend upon many factors which significantly affect the speed and consistency of absorption. Young people and care providers should know the factors which influence insulin absorption such as:

- Age (young children, less subcutaneous fat ! faster absorption).
- Fat mass (large subcutaneous fat thickness, lipohypertrophy, also with rapid-acting analogs ! slower absorption).
- Dose of injection (larger dose ! slower absorption)
- Site and depth of s.c. injection (abdomen faster than thigh;no good data exist on absorption from thigh vs buttock).
- S.c. vs i.m. injection (i.m. injection ! faster absorption in thigh.

Accidental i.m. injections can cause variable glucose control.

- Exercise (leg injection, leg exercise ! faster absorption).
- Insulin concentration, type and formulation (lower concentration ! faster absorption).
- Ambient and body temperature (higher temperatures! faster absorption).
- In general, the absorption speed of rapid-acting analogs is less affected by the above mentioned factors .

• There is no significant difference in the absorption of glargine from abdomen or thigh. Exercise does not influence glargine absorption. There is a risk of hypoglycemia if injecting glargine intramuscularly, particularly in young and lean individuals.

Note: Faster absorption usually results in shorter duration of action.

Hyaluronidase may increase absorption speed, either added to insulin, or injected prior to inserting an insulin pump infusion set ("pre-administration"). Long-term effectivity and safety need to be established before this can be recommended for a pediatric population.

Insupad is a device that warms an area 2 × 4 cm just prior to injection of bolus insulin. The device should be re-sited daily; it has been shown to reduce the total daily insulin dose by 20%, and achieve a 75% reduction in hypoglycemic episodes. The Insupatch has been developed for insulin pump therapy and has an integral heating element that is activated when a bolus is delivered. The action of insulin aspart peaks at 73 minutes without heat and at 43 minutes with heat. With these new devices the insulin requirements are lower and can achieve an earlier peak reducing the areas under the curve (AUC) for glucose and also to reduce the risk of hypoglycemia.

Administration Of Insulin

It is advisable that all children and adolescents with diabetes should know how to administer insulin by syringe because other injection devices may malfunction.

Appropriate disposal procedures are mandatory. Specifically designed and labeled "sharps containers" may be available from pharmacies and diabetes centers. Special needle clippers (e g, Safe clip) may be available to remove the needle and make it unusable. Without a "sharps container," syringes with needles removed may be stored and disposed of in opaque plastic containers or tins for garbage collection.

Pen Injector Devices

Pen injector devices containing insulin in prefilled cartridges have been designed to make injections easier and more flexible. They eliminate the need for drawing

up from an insulin vial; the dose is dialed up on a scale and they may be particularly useful for insulin administration away from home, at school or on holidays. When using a pen, it is advisable to count to 10 slowly or 20 quickly (wait about 15 seconds) before withdrawing the needle, in order to give time for any air bubble in the cartridge to expand.110,127 Pen needles need to be primed before use, so that a drop of insulin shows at the tip of the needle.

Special pen injection needles of small size (4-6 mm) and diameter are available and may cause less discomfort on injection.109 Pen injectors of various sizes and types are available from the pharmaceutical companies. Some pens can be set to 1/2 unit increments. Half-unit pens are particularly useful for dosing in young children and during the remission phase when small dosing increments may help to avoid hypoglycemia. A few pens have a memory for taken doses, which can be practical especially for teenagers. Availability is a problem in some countries and although pen injectors may improve convenience and flexibility, they are a more expensive method of administering insulin. Pen injector devices are useful in children on multiple injection regimens or fixed mixtures of insulin but are less acceptable when free mixing of insulins is used in a 2- or 3-dose regimen.

Automatic injection devices

Automatic injection devices are useful for children who have a fear of needles. Usually a loaded syringe is placed within the device, locked into place and inserted automatically into the skin by a spring-loaded system. The benefits of these devices are that the needle is hidden from view and the needle is inserted through the skin rapidly. Automatic injection devices for specific insulin injectors are available.

Continuous subcutaneous insulin infusion

The use of external pumps is increasing and is proving to be acceptable and successful. Insulin pump therapy is at present the best way to imitate the physiological insulin profile. Insulin is infused subcutaneously at a pre-programmed basal rate and boluses are added to counterbalance the intake of carbohydrates.

Insulin pump treatment may be hazardous when education and adherence to therapy is inadequate, because of the smaller depot of subcutaneous insulin and the sudden rise in ketones when insulin supply is interrupted.

Injection technique

Injections by syringe are usually given into the deep subcutaneous tissue through a two-finger pinch of skin at a 45 angle. A 90 angle can be used if the s.c. fat is thick enough. Pen injector technique requires careful education including the need to ensure that no airlock or blockage forms in the needle. A delay of 15 seconds after pushing in the plunger helps to ensure complete expulsion of insulin through the needle.

Self injection

It should be emphasized that a proportion of people with diabetes have a severe long-lasting dislike of injections which may influence their glycemic control. Younger children sharing injection responsibility with a parent or other care provider may help to prepare the device or help push the plunger and subsequently under supervision be able to perform the whole task successfully. Self-injection is sometimes triggered by an external event such as overnight stay with a friend, school excursion or diabetes camp. Parents or care providers should not expect that self-injection will automatically continue and should accept phases of non-injection with the need for help from another person. Younger children on multiple injection regimens may need help to inject in sites difficult to reach (eg, buttocks) to avoid lipohypertrophy.

Self-mixing of insulin

When a mixture of two insulins is drawn up (eg, regular mixed with NPH), it is most important that there is no contamination of one insulin with the other in the vials. To prevent this, the following principles apply: There is no uniformity of advice but most often it is taught that regular (clear insulin) is drawn up into the syringe before cloudy insulin (intermediate or long-acting). Vials of cloudy insulin must always be gently rolled (not shaken) at least 10, preferably 20 times, to mix the insulin suspension before carefully drawing it up into the clear insulin. Insulins from different manufacturers should be used together with caution as there may be

interaction between the buffering agents. Rapid acting insulin analogs may be mixed in the same syringe with NPH immediately before injections.

Insulin regimens

The choice of insulin regimen will depend on many factors including: age, duration of diabetes, lifestyle (dietary patterns, exercise schedules, school, work commitments etc.), targets of metabolic control, and particularly individual patient/family preferences.

• The basal-bolus concept (ie, a pump or intermediate-acting/long acting insulin/basal analog once or twice daily and rapid-acting or regular boluses with meals and snacks200) has the best possibility of imitating the physiological insulin profile with dose adjustments.

• Most regimens include a proportion of short- or rapid-acting insulin and intermediate-acting insulin or long-acting basal analog, but some children may during the partial remission phase maintain satisfactory metabolic control (ie, an HbA1c close to the normal range) on intermediate or long-acting insulins only or alternatively prandial insulin without basal alone.

• A different insulin regimen may be recommended during week- days and weekends as the eating and activity pattern during school days and weekends may be completely different.

Insulin Dose Adjustments

Soon after diagnosis

• Frequent advice by members of the diabetes team on how to make graduated alterations of insulin doses at this stage is of high educational value.

• Insulin adjustments should be made until target BG levels and target HbA1c are achieved.

• Many centers teach carbohydrate counting already from the onset of diabetes

Later insulin adjustments

• On twice daily insulin regimens, insulin dosage adjustments are usually based on recognition of daily patterns of blood glucose levels over the whole day, or a number of days or in recognition of glycemic responses to food intake or energy expenditure.

• On basal-bolus regimens, flexible or dynamic adjustments of insulin are made before meals and in response to frequent SMBG. In addition, the daily blood glucose pattern should be taken into account. The rapid-acting analogs require postprandial BG tests approximately 1 to 2 hours after meals to assess their efficacy. Insulin is preferably dosed based on food consumption (carbohydrates) and the current SMBG reading. Pumps have the possibility of delivering the bolus dose in different modalities (normal, dual, square) in order to reduce the postprandial blood glucose excursions. Many newer insulin pumps allow programming algorithms (bolus guide) for these adjustments for current blood glucose and amount of carbohydrate intake.

• Downloading the blood glucose meter to a computer can help in discovering daily patterns in glucose levels.

Advice For Persistent Deviations Of Blood glucose From Target

• Elevated BG level before breakfast ! increase pre- dinner or pre bed intermediate or long-acting insulin (BG tests during the night are needed to ensure that this change does not result in nocturnal hypoglycemia).

• Rise in BG level after a meal ! increase pre meal rapid/regular insulin.

• Elevated BG level before lunch/dinner meal ! increase pre break- fast basal insulin or increase dose of pre breakfast regular/rapid acting insulin if on basal-bolus regimen.

When using rapid acting insulin for basal-bolus regimen, the dose or type of basal insulin may need to be adjusted in this situation as the analog has most of its effect within 2 to 3 hours after injection.

• When using carbohydrate counting, persistent elevations of post- meal BG may require adjustment in the insulin to carbohydrate ratio. The “500-rule” is often used

to obtain an initial ratio when starting with carbohydrate counting (divide 500 by the total daily dose—basal and bolus insulin—to find the amount of carbohydrates in grams that 1 unit of insulin will cover).

• The insulin: carbohydrate ratio for an individual meal, for example breakfast, can be calculated by dividing the carbohydrate content in grams by the insulin dose in units. This method often gives the most accurate results for an individual meal and can preferably be used for breakfast when there usually is an increased insulin resistance. If the glucose before and after the meal differ more than 2 to 3 mol/L (20-30 mg/dL), the correction factor can be used to calculate out how much more (or less) insulin that ideally should have been given for a certain meal.

• Some centers also count protein and fat for calculating insulin requirements when using a pump (FPU, fat-protein units). One FPU equals 100 kcal of fat or protein and requires the same amount of insulin (as an extended bolus) as 10 g of carbohydrates. This may result in postmeal hypoglycemia, and more recent studies have found a lower need of insulin for protein, around 200 kcal equaling 10 g of carbs.

• Correction doses (also called insulin sensitivity factor, correction factor) can be used according to the "1800 rule," that is, divide 1800 by total daily insulin dose to get the mg/dL that 1 unit of rapid-acting insulin will lower the blood glucose. For mol/L, use the "100 rule," that is, divide 100 by total daily insulin dose. For regular insulin, a "1500 rule" can be used for results in mg/dL and a "83-rule" for results in moll/L. However, correction doses follow the same circadian variation of insulin sensitivity as seen for the insulin: carbohydrate ratio.

• Rise in BG level after evening meal ! increase pre evening meal regular/rapid acting insulin.

In addition

• Unexplained hypoglycemia requires re-evaluation of insulin therapy.

• Unexplained hyperglycemia may be caused by a "rebound phenomenon," that is, hypoglycemia followed by hyperglycemia that is potentiated by excessive eating to

cure the hypoglycemia along with hormonal counter-regulation, especially if the pre meal dose is decreased.

• Hyper- or hypoglycemia occurring in the presence of inter current illness requires a knowledge of "sick day management."

• Day-to-day insulin adjustments may be necessary for variations in lifestyle routines, especially exercise or dietary changes.

• Various levels of exercise require adjustment of diabetes management.

• Special advice may be helpful when there are changes of routines, travel, school outings, educational holidays/diabetes camps, or other activities which may require adjustment of insulin doses.

• During periods of regular change in consumption of food (eg, Ramadan), the total amount of insulin should not be reduced but redistributed according to the amount and timing of carbohydrate intake. However, if total calorie/carbohydrate intake is reduced during Ramadan, the daily amount of bolus insulin for meals usually needs to be reduced, for example to two-thirds or three- quarters of the usual dose.

Dawn Phenomenon

Blood glucose levels tend to rise in the hours of the morning (usually after 0500 hours) prior to waking. This is called the dawn phenomenon. In non-diabetic individuals the mechanisms include increased nocturnal growth hormone secretion, increased resistance to insulin action and increased hepatic glucose production. These mechanisms are more potent in puberty.

Pump studies have shown that younger children often need more basal insulin before midnight than after (reversed dawn phenomenon). With a basal/bolus analog regimen this can be achieved by giving regular instead of rapid acting insulin for the last bolus of the day (night time blood glucose levels need to be checked).

In individuals with type 1 diabetes, fasting hyperglycemia is predominantly caused by waning insulin levels, thus exaggerating the dawn phenomenon. Morning hyperglycemia can in some cases be preceded by nighttime hypoglycemia (so

called Somogyi phenomenon), being seen less often in pump therapy compared to MDI. Correction of fasting hyperglycemia is likely to require an adjustment of the insulin regimen to provide effective insulin levels throughout the night and the early morning by the use of:

- Intermediate acting insulin later in the evening or at bedtime a longer acting evening insulin/basal insulin analog.
- Change to insulin pump treatment.

1.4 Dietary Guidelines for Americans Key Recommendations

Healthy eating pattern includes:

- A variety of vegetables from all subgroups—dark green, red and orange, legumes (beans and peas), starchy, and other
- Fruits, especially whole fruits
- Grains, at least half of which are whole grains
- Fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages
- A variety of protein foods, including seafood, lean meats and poultry, eggs, legumes (beans and peas), and nuts, seeds, and soy products
- Oils

Healthy eating pattern limits:

- Saturated fats and trans fats, added sugars, and sodium Key
- Less than 10 percent of calories per day from added sugars
- Less than 10 percent of calories per day from saturated fats
- Less than 2,300 milligrams (mg) per day of sodium
- If alcohol is consumed, it should be consumed in moderation

Strategies for Healthy Eating

- Allow child to enjoy their foods

- Recognize the hunger and full signs
- Let them determine amount
- Make mealtime relaxed and enjoyable
- Variety – Repetition
- Avoid foods that you do not want them to love when they are older
- Balance foods with other attentions
- Be a good role model
- Family eating

Guidelines for nutritional care, education and meal planning

1. Initial dietary advice by a pediatric diabetes dietician should be provided as soon as possible after diagnosis to promote a secure, trusting and supportive relationship.

A dietary history should be taken including:

- Preexisting family dietary habits, traditions and beliefs.
- The child's usual food intake including energy, carbohydrate amount and distribution, fat intake, quality of food choices and meal-times or patterns of food intake.
- The child's daily activities, including the impact of nursery/school/ work, physical activity and exercise schedules.

2. Advice should be given at diagnosis based on the dietician's assessment and the individualized plan provided by the diabetes team. Carbohydrate counting is best commenced at diagnosis for those using intensive insulin therapies. A series of follow-up appointments should be completed with the specialist pediatric dietician within 3 to 6 months after diagnosis with the first review within a month after diagnosis. It is important that the initial or review assessment includes identification of any body image or weight concerns.

3. Contacts thereafter depend on local arrangements, a minimum should include 2 to 4 times in the first year and annual reassessment. These are necessary to keep

pace with the child's growth, diabetes management, lifestyle changes and the identification of specific dietary problems such as dysfunctional eating habits, family issues around food, obesity and Eating Disorders.

4. Continuation of care, support and review by a dietician is essential for optimal care.

5. Circumstances such as changing insulin regimen, dyslipidemia, poor dietary knowledge, excessive weight gain, and co- morbidities such as celiac disease require extra education and dietary intervention with more frequent review.

6. Dietary education should be individualized and appropriate for the age and maturity of the child to help engage the child in active learning.

Education tools and methods

Education tools and methods are used to provide knowledge and skills to optimize glycemic control, growth and cardiovascular outcomes. Dietary quality must be promoted alongside all carbohydrate quantification tools.

- Methods of healthy eating education and tools for carbohydrate quantification are essential.

- There are no high quality, long-term, randomized studies to support one particular method of carbohydrate counting compared with another.

- Blood glucose monitoring (pre- and post-prandial) or continuous glucose monitoring systems (CGMS) provide essential information on postprandial glucose excursions and the need to improve carbohydrate counting accuracy, adjust the prandial insulin timing or amount, or alter the insulin delivery or dose for meals high in fat and protein.

- As families become more confident with managing diabetes, education should be responsive to their observations and education on glycemic index or insulin coverage of high fat, high-protein meals may be discussed.

- As children grow and take more responsibility, regular re-education is essential.

Basic dietary education should cover healthy eating with some method of carbohydrate quantification.

Summary

The nutritional care of children with diabetes is complex. Diabetes management is set within the context of the family, a surrounding social system, issues of non-adherence, peer pressure, emerging independence and the ultimate aim of maintaining quality of life. It requires a deep understanding of the relationship between treatment regimens and changing physiological requirements, including growth, fluctuations in appetite associated with changes in growth velocity, varying nutritional requirement and physical activity.

Evidence suggests that it is possible to improve diabetes out comes through attention to nutritional management and an individualized approach to education. This requires a clear focus on dietary goals in relation to glycemic control and the reduction in cardiovascular risk.

The fundamental premise of successful dietary outcomes is the development of a trusting relationship between the health professional, child and care providers, which facilitates behavior change during the challenges of childhood and adolescent development.

Recent hypoglycemia

Severe hypoglycemia (here defined as blood glucose ≤2.8 mmol/L [50 mg/dL]) or an event including cognitive impairment requiring external assistance for recovery within the previous 24 hours is a contraindication to physical activity.

Significant hypoglycemia (defined as blood glucose <3.0 mmol/L [<54 mg/dL]), is clinically significant and requires immediate attention. It will result in the subsequent deterioration of hormonal counter regulation during physical activity, in turn leading to an increased risk for recurrent hypoglycemia.

Non-severe hypoglycemia (defined as blood glucose 3.0-3.9 mmol/L [52-70 mg/dL]) which occurred relatively recently before planned exercise can result in the subsequent deterioration of hormonal counter regulation during physical activity, in turn leading to an increased risk for recurrent hypoglycemia.

In all situations of documented hypoglycemia prior to physical activity, we recommend vigilance regarding glucose monitoring. Physical activity should be avoided if it is associated with elevated risk for injury/accident (eg, Alpine skiing, rock climbing, swimming, scuba diving).

Access to effective monitoring

Children and adolescents should be counseled that they are best prepared for exercise when blood glucose meters and test strips are readily available, particularly if they are not using glucose monitoring devices (is CGM or CGM).

Children and adolescents should be encouraged to measure their blood glucose level before, during and after exercise or, alternatively, to check sensor-based glucose values on a regular basis and have predictive alerts and low glucose alarms activated to help prevent or reduce the risk of hyperglycemia.

Access to carbohydrates

High glycemic index snacks should be readily available during any form of physical activity. [E]

High glycemic index snacks and hyperglycemia remedies should always be readily available at school. [E]

1.5 Communication and safety

Advice about safety should be given; children and adolescents should be encouraged to wear or carry diabetes ID when exercise is performed in the absence of a responsible adult. Counseling should include consideration of access to a mobile or alternative communication method in case urgent help is required.

Prevention of post exercise hypoglycemia

Hypoglycemia may be anticipated during or shortly after exercise but is also possible up to 24 hours afterward due to increased insulin sensitivity. [A]

Risk of post exercise nocturnal hypoglycemia is high, and care should be taken if bedtime blood glucose level is <7.0 mmol/L (125 mg/dL). However, no specific bedtime glucose value guarantees that nocturnal hypoglycemia will be avoided. [E]

Extra carbohydrate after the activity may be the best option to prevent post exercise hypoglycemia when short duration and high intensity anaerobic activities are performed under hyper insulinemic conditions but is less likely to prevent delayed nocturnal hypoglycemia without appropriate insulin adjustment. [E]

Short sprints added to aerobic exercise can reduce the risk of hypoglycemia early after exercise if the person is mildly hyper insulinemic (<2 hours). [E]

The need for ongoing training of professionals

Professionals should take opportunity to attend camps for children with diabetes to understand better the challenges they face. [E]

Several barriers appear to be related to regular discussion of exercise in youth with diabetes. These include insufficient knowledge and education on the part of both patients and providers. [E]

Methods to improve the frequency and quality of exercise education in the diabetes clinic should be encouraged. [E]

It is important to ensure that all professionals (eg, nurses, diabetes educators, dietitians, physicians) are kept up-to-date with the latest evidence-based guidelines in blood glucose management.

2. Second Session of the Model:

2.1 Assessment and management of hypoglycemia in children and adolescents with diabetes

Executive Summary And Recommendations

• Hypoglycemia is the commonest acute complication of type 1 diabetes. It may also occur in type 2 diabetes when treatment includes insulin or sulfonylurea therapy (B).

• Hypoglycemia presents a major physiological and psychological barrier to achieving optimal glycemic control and may result in significant emotional morbidity for patients and their caregivers (B).

• Monitoring hypoglycemia is a key component of diabetes care as is education about its causes, prevention, and treatment (A). Parents and caregivers need to be

reassured that good glycemic control can be achieved without severe hypoglycemic events (B).

• Hypoglycemia is best defined as a fall in blood glucose level that exposes a patient to potential harm and there can be no single numerical definition of hypoglycemia for all patients and situations (E).

• The aim of diabetes treatment should be to maintain blood glucose level >3.9 mmol/L (70 mg/dL) while striving to achieve the best possible glycemic control without the occurrence of severe hypoglycemia (A).

• In clinical practice, a glucose value ≤3.9 mmol/L (70 mg/dL) is used as the clinical alert or threshold value for initiating treatment for hypoglycemia in diabetes because of the potential for glucose to fall further (E).

• Severe hypoglycemia is defined as an event with severe cognitive impairment (including coma and convulsions) requiring external assistance by another person to actively administer carbohydrates, glucagon, or take other corrective actions. Severe hypoglycemic coma is defined as a subgroup of severe hypoglycemia, as an event associated with a seizure or loss of consciousness (E).

• The incidence of severe hypoglycemic coma has fallen over the last 2 decades with a current rate of 3 to 7 per 100 patient years across international registries. Although lower hemoglobin A1c (HbA1c) was a risk factor for severe hypoglycemia, this association is no longer observed with contemporary therapy in recent surveys (B).

• Young children remain at risk of severe hypoglycemia due to their reduced ability to communicate their need (B).

• Symptoms of hypoglycemia in the young result from adrenergic activation (eg, shakiness, pounding heart, sweatiness) and neuroglycopenia (eg, headache, drowsiness, difficulty in concentrating). In young children, behavioral changes such as irritability, agitation, quietness, and tantrums may be prominent (B).

• Symptoms of hypoglycemia and physiological hormone responses may occur at a higher glucose level in children compared to adults and thresholds for activation

may be altered by chronic hyperglycemia (ie, occur at a higher blood glucose level) or repeated hypoglycemia (ie, occur at a lower blood glucose level) (B).

• In type 1 diabetes, hypoglycemia results from imperfect insulin replacement. The risk of hypoglycemia is further increased by compromised counter regulatory hormone defects, including loss of glucagon response to hypoglycemia that may occur soon after diagnosis (B).

• Common clinical precipitants for hypoglycemia include excessive insulin dosing, missed meals, exercise, sleep and, in adolescents, alcohol ingestion. Risk factors include young age, previous severe hypoglycemic events, and reduced hypoglycemia awareness (B).

• Hypoglycemia with exercise may occur at the time of activity or may be delayed (7-11 hours later) (B). Caregivers and patients should receive education and advice as to how to exercise safely and avoid hypoglycemic events.

• Sleep is a time of particular risk for severe hypoglycemia and asymptomatic hypoglycemia is common (B); because of this, glucose levels are recommended to be monitored overnight particularly if there is an additional risk factor that may predispose to nocturnal hypoglycemia (E). Increased availability of continuous glucose monitors (CGMs) may be especially useful for this (E).

• Impaired hypoglycemia awareness can occur in children with diabetes and when present is associated with a significantly increased risk of severe hypoglycemia. The determination of hypoglycemia awareness should be a component of routine clinical review. Impaired awareness may be corrected by avoidance of hypoglycemia (B).

Treatment of hypoglycemia

• Severe hypoglycemia requires urgent treatment. In a hospital setting, this may include intravenous glucose (10% glucose, 2-3 mL/kg) (B). In the home or ambulatory setting, intramuscular (IM) or subcutaneous (SC) glucagon should be given (1 mg for children >25 kg and 0.5 mg for children <25 kg).

• Glucagon should be readily accessible to all parents and caregivers, especially when there is a high risk of severe hypoglycemia. Education on administration of

glucagon is essential (E). Intranasal glucagon is a promising alternative to IM glucagon and would provide an unmet need for an easily administered glucagon preparation.

• Milder hypoglycemic events should be treated with oral glucose (10-15 g glucose). Depending on the circumstances, rapid acting glucose should be followed by additional carbohydrates to prevent recurrence of hypoglycemia (B).

• Treatment of hypoglycemia should increase the blood glucose by nearly 3 to 4 mmol/L (54-70 mg/dL). This can be accomplished by giving glucose tablets or sweetened fluids. Approximately 9 g of glucose is needed for a 30 kg child and 15 g for a 50 kg child (approximately 0.3 g/kg) (C).

• Following initial hypoglycemia treatment, blood glucose should be retested in 10 to 15 minutes. If there is no response or an inadequate response, repeat hypoglycemia treatment. Retest the blood glucose in another 10 to 15 minutes to confirm that target glucose (100 mg/dL) has been reached (E).

Prevention of hypoglycemia

• Hypoglycemia should be prevented because its occurrence is frequently predictable, and it is often associated with significant psychosocial dysfunction; more importantly, it can rarely lead to permanent long-term sequelae and may be potentially life threatening.

• Diabetes education is critical to preventing hypoglycemia (A).

• Education about the risk factors for hypoglycemia should be given to patients and families to alert them as to times and situations when increased glucose monitoring is required and when treatment regimens need to be changed (E).

• Equipment for blood glucose measurement must be available to all children with diabetes for immediate confirmation and safe management of hypoglycemia (E).

• Blood glucose monitoring should be performed prior to exercise, and extra carbohydrates may be consumed based on the blood glucose level and the expected intensity and duration of exercise (B).

• Particular attention should be given to training children, parents, school teachers, and other caregivers to recognize the early warning signs of hypoglycemia and treat low blood glucose immediately and appropriately (E).

• Patients and their parents should be trained to contact their diabetes care provider if hypoglycemia is documented without symptoms or if the symptoms are those of neuroglycopenia and not autonomic symptoms (ie, impaired hypoglycemia awareness) (E).

• In patients and families with significant fear of hypoglycemia, interventions through educational and/or behavioral strategies may be considered although evidence in children is limited (E).

• Children and adolescents with diabetes should wear some form of identification or alert of their diabetes (E).

• An immediate source of glucose must always be available to young people with diabetes (A).

• Blood glucose goals may need to be adjusted upwards in patients with recurrent hypoglycemia and/or impaired hypoglycemia awareness (B).

• If unexplained hypoglycemia is frequent, evaluation for unrecognized celiac and Addison's disease should be considered (E).

• Currently available technologies like CGM, automated insulin suspensions (suspend on low, suspend before low) have reduced the duration of hypoglycemia (A). Newer technologies (artificial pancreas systems) improve glucose control and reduce hypoglycemia in outpatient settings compared to conventional pump therapy (A).

Hypoglycemia signs and symptoms

Autonomic signs and symptoms

Shakiness, Sweatiness, Trembling, Palpitations, Pallor.

Neuroglycopenic signs and symptoms

Poor concentration, Blurred or double vision, Disturbed color vision, Difficulty hearing, Slurred speech, Poor judgment and confusion, Problems with short-term memory, Dizziness and unsteady gait, Loss of consciousness, Seizure.

Behavioral signs and symptoms

Irritability, Erratic behavior, Agitation, Nightmares, Inconsolable crying.

Non-specific symptoms

Hunger, Headache, Nausea, Tiredness.

2.2 Microvascular and macrovascular complications in children and adolescents

Recommendations

1. Commence screening for microvascular complications at age 11 years (formerly 10 years)

2. Screening for microvascular disease should be performed preconception and during each trimester of pregnancy

3. Screen for lipid abnormalities in the non-fasting state

4. Screen for renal disease by first morning albumin creatinine ratio as the preferred method

2.3 Recommendations—Screening for and prevention of complications

Prevention

- Intensive education and treatment should be used in children and adolescents to prevent or delay the onset and progression of vascular complications. A

- Achievement of target glycemic control will reduce the risk for onset and progression of diabetes vascular complications. A

• Screening should be performed preconception and each trimester of pregnancy.

Albuminuria

• Screening for albuminuria should start from age 11 years with 2 to 5 years diabetes duration. C

• Annual screening for albuminuria should be undertaken by first morning urine samples for urinary albumin/creatinine ratio (ACR). E

• Because of biological variability, two of three urine samples should be used as evidence of albuminuria. Confounders are exercise, menstrual bleeding, infections, fever, kidney diseases, and marked hyperglycemia. Abnormal screening tests should be repeated, as albuminuria may be transient. E

• Angiotensin converting enzyme inhibitors (ACEIs) or angiotensin receptor blockers (ARBs) agents should be used in adolescents with persistent albuminuria to prevent progression to proteinuria. E

Retinopathy

• Screening for diabetic retinopathy should start from age 11 years with 2 to 5 years diabetes duration. B

• Screening for diabetic retinopathy should be performed by an ophthalmologist, optometrist, or a trained experienced observer through dilated pupils via bio-microscopy examination or fundal photography. B

• For those with diabetes duration less than 10 years, mild non- proliferative retinopathy (micro aneurysms only) and good glycemic control, biennial screening assessment by biomicrocopic examination or fundal photography can occur. The frequency of retinopathy screening in general should occur biennially for these patients, but should be more frequent if there are high risk features for visual loss (Table 1). E

• Because of potential worsening of retinopathy for patients with longstanding poor glycemic control when control is rapidly improved, ophthalmological monitoring

is recommended before initiation of intensive treatment and at three monthly intervals for 6 to 12 months thereafter, particularly if retinopathy is moderate non-proliferative stage or worse at the time of intensification. E

• Laser treatment and intravitreal injections of anti-VEGF agents reduce the rate of visual loss for individuals with vision- threatening stages of retinopathy (severe non-proliferative retinopathy or worse and/or diabetic macular edema). A

Other ocular conditions

• A comprehensive initial eye examination should also be considered to detect cataracts, major refractive errors, or other ocular disorders. E

Neuropathy

• Screening for peripheral neuropathy should start from age 11 years with 2 to 5 years diabetes duration and annually thereafter. C

• Specific tests to evaluate diabetic neuropathy include assessment of sensation, vibration and reflexes in the feet for peripheral neuropathy, and orthostatic, heart rate variability for cardiac auto- nomic neuropathy. E

Blood pressure

• Blood pressure (BP) should be measured at least annually. E. Hypertension is defined as average systolic BP (SBP) and/or diastolic BP (DBP) that is ≥95th percentile for gender, age, and height on three or more occasions B.

• Confirmation of hypertension may be assisted by 24 hours ambulatory BP measurements. E

• ACEI are recommended for use in children with diabetes and hypertension E. They have been effective and safe in children in short-term studies A, but are not safe during pregnancy. B

Lipids

• Screening for dyslipidemia should be performed soon after diagnosis (when diabetes stabilized) in all children with type 1 diabetes from age 11 years E. If normal results are obtained, this should be repeated every 5 years. If there is a

family history of hypercholesterolemia, early cardiovascular disease (CVD) or if the family history is unknown, screening should commence as early as age 2 years E.

• Screening with a fasting lipid profile is ideal but not always practical in youth with diabetes mellitus. Non-fasting lipids screening may be obtained and if triglycerides or Low density lipoprotein (LDL) levels are elevated, a fasting lipid profile would then be indicated. E

• High LDL cholesterol is defined as >2.6 mmol/L (100 mg/dL) E. If this is present then interventions to improve metabolic control, dietary changes and increased exercise should be instituted.

• If the above interventions do not lower LDL cholesterol <3.4 mmol/L (130 mg/dL), statins should be commenced in children from age 11 years E

Lifestyle

• Prevention or cessation of smoking will reduce progression of albuminuria and CVD B.

Macrovascular disease

• Screening of BP and lipids is recommended, as above. The benefit of routine screening for other markers of macrovascular complications outside the research setting is unclear.

2.4 Other complications and associated conditions in children and adolescents with type 1 diabetes

Recommendations

• Regular monitoring of anthropometric measurements and physical development, using growth standards, are essential in the continuous care of children and adolescents with type 1 diabetes (E).

• Screening of thyroid function by measurement of thyroid stimulating hormone (TSH) and antithyroid peroxidase antibodies is recommended at the diagnosis of diabetes (A) and, thereafter, every second year in asymptomatic individuals. More

frequent assessment may be indicated in the presence of symptoms, goiter or positive thyroid autoantibodies (E).

• Screening for celiac disease should be performed at the time of diabetes diagnosis, and at 2 and 5 years thereafter, as it is frequently asymptomatic (B). More frequent assessment is indicated if the clinical situation suggests the possibility of celiac dis- ease or the child has a first-degree relative with celiac disease (E).

• Screening for IgA deficiency should be performed at diabetes diagnosis. In people with confirmed IgA deficiency, screening for celiac disease should be performed using IgG-specific anti- body tests (tTG or EmA IgG, or both) (B).

• Measurement of human leukocyte antigen (HLA)-DQ2 and HLA- DQ8 is rarely helpful to exclude celiac disease in patients with type 1 diabetes and not recommended as a screening test (B).

• Children with type 1 diabetes detected to have positive celiac antibodies on routine screening, should be referred to a pediatric gastroenterologist, as positive serologic testing alone is not diagnostic for celiac disease in this population (E).

• Upon confirmation of the diagnosis of celiac disease, patients should receive educational support from an experienced pediatric dietitian. Educational materials for patients and families should be made available (E).

• Diabetes care providers should be alert for the symptoms and signs of adrenal insufficiency (due to Addison's disease [AD]) in children and adolescents with type 1 diabetes although the occurrence is rare (E).

• Routine clinical examination should be undertaken for skin (eg, lipodystrophy) and joint changes (eg, limited joint mobility). Regular screening by laboratory or radiological methods is not recommended (E).

• Patient education regarding proper injection techniques, rotating injection sites with each injection and non-reuse of needles remain the best strategies to prevent lipohypertrophy or lipoatrophy (E).

• Injection sites should be regularly assessed at each clinic visit for lipohypertrophy and lipoatrophy as they are potential causes of glucose variability (C).

• Diabetes care providers should be aware of potential skin irritation with use of insulin pumps and continuous glucose monitoring (CGM) by recommending rotation of pump and sensor insertion sites (E).

• Screening for vitamin D deficiency, particularly in high risk groups (celiac disease, darker skin pigmentation) should be considered in young people with type 1 diabetes and treated using appropriate guidelines (E).

2.5 Sick day management in children and adolescents with diabetes

Executive Summary And Recommendations

The diabetes care team should provide clear guidance to patients and families on how to manage diabetes during inter current illnesses, and how to contact the diabetes team as well as emergency medical personnel, if needed (24-hour diabetes team telephone contacts, mobile telephones, emergency medical assistance procedures, etc.). In addition to inter current illnesses, patients and families should feel comfortable and be encouraged to call for help at times of mismanagement, either accidental (missed insulin doses, incorrect timing of doses [eg, AM given in PM], pump occlusion, etc.) or intentional (insulin restriction, etc.) in order to avoid prolonged out-of-range glucose levels and progression either to diabetic ketoacidosis (DKA) or severe hypoglycemia. Reeducation should be repeated annually, for example, at the time of annual flu shot administration, in order to avoid:

- uncontrolled or symptomatic hyperglycemia
- dehydration
- ketoacidosis
- severe hypoglycemia

Patients and families/care providers should be reminded:

- Never to stop insulin completely [A]

• When vomiting occurs in a child or adolescent with diabetes, it should always be considered a sign of insulin deficiency until proven otherwise [E]

• The insulin dose usually needs to be increased (in addition to usual dose) when there is fever, with many acute illnesses (except for GI illnesses with emesis), during/following surgical procedures, treatment with corticosteroids (eg, asthma flare, poison ivy, nephrotic syndrome, etc.), and with any major stress based on knowledge of clinical symptoms and signs and, especially, with awareness of monitored blood glucose and blood (or urine) ketone levels checked frequently [E].

Five general sick day diabetes management principles:

1. Sick day guidelines, including insulin adjustments, should be taught soon after diagnosis and reviewed at least annually with patients and family members in order to reduce risk for DKA and for severe hypoglycemia (with GI illnesses).

2. More frequent blood glucose and ketone (blood or urine) monitoring.

3. DO NOT STOP INSULIN.

4. Monitor and maintain hydration with adequate salt and water balance.

5. Treat any underlying, precipitating illness.

3 Third Session of the Model:

3.1 Diabetes management plan

Even if there is more than one child with diabetes at school, it is highly likely that their treatment will not be the exactly the same. Moreover, some children need support all the time while others may be more independent; accordingly, it is important that an individualized or personalized DMP is provided for each child to meet their specific needs.

The DMP is a formal document about the child`s specific diabetes management requirements at school. The DMP should be provided by the parents/carers of the child with diabetes and should be developed with input from the diabetes health care team. The school should make “reasonable adjustments” in order to ensure the DMP can be delivered. The DMP should have all significant information to guide

school personnel in assisting children with diabetes during school hours. The parents/guardians are the ultimate authorities to direct the prescribed treatment for managing their child's medical condition. The plan should be clearly documented and easy to implement.

The individualized/personalized DMP should include the following:

- Identification: Name, date of birth, parents' names, age of diagnosis, and type of diabetes.

- Contact information: phone numbers of parents, physician/Health- care professional (HCP), and emergencies contacts.

- Monitoring: Times to measure, target ranges of glucose, preferred locations for testing, CGM/is CGM information.

- Insulin treatment: type of insulin and device (pen, syringe, pump), guidance to doses adjustments, and formulas to calculate correction and carbohydrate doses.

- Hypoglycemia: Individual symptoms, values that define intervention, type of intervention, glucagon orientation and situations that warrant calling for emergency assistance or taking to emergency rooms.

- Hyperglycemia: Individual symptoms, values that define intervention, type of intervention, insulin doses.

- Food: Definition of the meal plan, modifications needed to the regular menu, authorization and instructions to participate in parties at school.

- Exercise: Authorization to participate in school sports, orientation on the use of carbohydrate and insulin before exercise depending on glucose levels.

- Self-care: Describe what procedures the child is able to do alone or with supervision—for example, finger stick testing, monitor BG values and their interpretation, adjustment of food and insulin based on BG results, preparation and insulin injection.

- Hypoglycemia-kit: provision and access to preferred fast-acting carbohydrate and glucagon.

• Responsibilities: informed consent, clarification, and specification of specific responsibilities to support the child with diabetes.

3.2 Fasting during Ramadan by young people with diabetes

Executive Summary And Recommendations

Pre-Ramadan Counseling

• Children and adolescents with type 1 diabetes mellitus (T1DM) who want to fasting during Ramadan should receive pre-Ramadan counseling and diabetes education. (E)

• Pre-Ramadan education should address insulin type and action, glucose monitoring, nutrition, physical activity, sick day and hyper- glycemia, and recognition and treatment of hypoglycemia. (E).

• The education should be directed to both the young person and his/her family by experts in diabetes management for this age group (E).

• Counseling on the permissibility and necessity of skin pricking for glucose monitoring or insulin injection during fasting to prevent acute complications must be given prior to Ramadan (E).

• Optimizing glycemic control before Ramadan is an essential measure to ensure safe fasting (C).

• Hypoglycemia unawareness needs to be excluded pre-Ramadan and monitored during Ramadan (C).

Glucose Monitoring

• Frequent blood glucose measurement or continuous glucose monitoring (CGM) is necessary during Ramadan to minimize the risk of hypoglycemia and detect periods of hyperglycemia (B).

• Using CGM or intermittently scanned continuous glucose monitoring (isCGM) may facilitate the adjustments of insulin during Ramadan fasting (E).

Nutritional Management

• Consideration of the quality and quantity of food offered during Ramadan is needed to guard against acute complications, excessive weight gain, and adverse changes in lipid profile (C).

• Meals should be based on low glycemic index carbohydrates and include fruit, vegetables, and lean protein. Monounsaturated and polyunsaturated fats should be used instead of saturated fat. Sweets and fried foods should be limited and sweetened drinks avoided (C).

• The pre-dawn meal (Suhor) should be as late as possible (E).

• Carbohydrate counting particularly at the pre-dawn (Suhor) and sun- set (Iftar) meals enables the rapid-acting insulin dose to be matched to the carbohydrate intake (C). Hydration should be maintained by drinking water and other non-sweetened drinks at regular intervals during non-fasting hours (E).

Breaking The Fasting

• Breaking fasting immediately in hypoglycemia is recommended regardless of the timing. This recommendation applies to symptomatic hypoglycemia and asymptomatic hypoglycemia below 70 mg/dl (3.9 mmol/L) (E)

Principles Of Care

• Care for young people with T1DM during Ramadan should be undertaken by experts in the management of diabetes in this age group (C).

• Regular supervision by health-care professionals during the month of Ramadan is necessary to minimize potential risks including hyperglycemia, hypoglycemia, ketoacidosis, and dehydration (C).

Medico Religious Recommendations

• We recommend that a consensus/guideline on the minimum age of fasting is established by task-force members with knowledge and interest in Ramadan. This should be endorsed by religious scholars to unify rules on fasting licensing and exemption.

• Proper understanding of Islamic rules on fasting and sickness, which allows individuals with medical conditions to not fasting, is important. Liaison with

religious scholars should help to persuade those who do not qualify for fasting and avoid their feelings of guilt.

Ramadan fasting is obligatory for all healthy adolescents and adults, but individuals with illnesses are exempted if they feel fasting is going to adversely affect their health. How- ever, many individuals with diabetes choose to fasting.

Should Children And Adolescents With T1dm Fasting During Ramadan?

In many diabetes centers with a Muslim population, health-care professionals agree that adolescents can fasting if they have reasonable glycemic control, good hypoglycemia awareness and are willing to frequently monitor their blood glucose levels during the fasting.17 A recent survey indicated that almost 80% of physicians looking after children and adolescents with diabetes would allow their patients to fasting if they wished, provided they fulfill the above criteria.14

Although some experts would consider fasting during Ramadan a high risk for metabolic deterioration, recent studies have demonstrated that individuals with T1DM can fasting during Ramadan pro- vided they comply with the Ramadan focused management plan and are under close professional supervision. Mohsin et al elaborated how to assess, counsel, monitor, and manage people with T1DM who wish to fasting during Ramadan.18

Children and adolescents with diabetes may fasting during Ramadan provided they fulfill certain criteria.

Pre-Ramadan Diabetes Education

Pre-Ramadan assessment and education are vital to ensure the suit- ability and safety of young people with T1DM who are planning to fasting. Many diabetes units run special education sessions prior to the month of Ramadan to ensure safe fasting.

Strategies include the following:

1. Ramadan-focused diabetes education, including nutrition, physical activity, and insulin adjustment as well as emergency management of hypoglycemia, hyperglycemia, and diabetic ketoacidosis.

2. Pre-Ramadan medical assessment including evaluation of hypoglycemia awareness.

3. Optimization of glycemic control before Ramadan to reduce the potential risks associated with fasting and minimize glucose fluctuation.

4. Frequent blood glucose monitoring or the use of CGM or is CGM technologies and the training on how to interpret and act on outcomes.

5. The requirement is to immediately break the fasting to treat hypo-glycemia or to prevent acute complications.

The lack of pre-fast assessment and proper diabetes education are considered major obstacles to facilitating safe Ramadan fasting in T1DM patients. Eid et al evaluated the feasibility of promoting safe Ramadan fasting through diabetes self-management education to determine the effect of education on hypoglycemic episodes. This prospective study consisted of an educational program that involved weekly sessions before and during Ramadan.20 The study showed that the program was effective in enabling patients to fasting during Ramadan and the number of hypoglycemic events per month declined.

Telemonitoring

A pilot study evaluated the short-term benefits of a telemonitoring supplemented focused diabetes education compared with education alone in 37 participants with T2DM who were fasting during Ramadan.21

The telemonitoring group was less likely to experience hypoglycaemia than the usual care group with no compromise of glycemic control at the end of the study. Participants viewed telemedicine as a more convenient alternative although technological barriers remain a concern. Telemonitoring offers an attractive option requiring further research in children and adolescents with T1DM.

Targeted educational program for the young person and the family before Ramadan is essential for safe fasting.

Physiology Of Fasting

During fasting of healthy individuals, circulating glucose levels tend to fall, leading to decreased secretion of insulin. In addition, levels of glucagon and

catecholamines rise, stimulating the breakdown of glycogen and gluconeogenesis. In people with T1DM, hypoglycemia that occurs during fasting may not elicit an adequate glucagon response. In addition, individuals with autonomic neuropathy can have defective epinephrine secretion to counteract hypoglycemia. The changes of sleep pattern and food intake in Ramadan are found to be associated with changes in cortisol levels, which might influence the response to hypoglycemia. Several studies have focused on the changes in glucose homeostasis during Ramadan fasting. The risk of hypoglycaemia is high during fasting in some adult data; but data on children and adolescents with diabetes are limited.

Psychology And Attitude Toward Fasting

Many children and adolescents with T1DM prefer to fasting to feel equal to their peers without diabetes, who are fasting. Fasting may boost their self-esteem and make them feel happier as they are considered "mature and capable" in fulfilling their religious obligations. Considering the risk of acute metabolic complications in individuals with T1DM, they are often advised not to fasting, despite the fact that having T1DM means exemption from fasting is permissible, youth with diabetes still undergo fasting based on social and cultural reasons and a religious sense of fulfillment.

They can also be psychologically and spiritually led to fasting and often fasting without the approval of their physicians. Globally, a high number of children and adolescents with T1DM are passionate about fasting during Ramadan. Predictably, there is a general perceived fear by both patients and their health-care providers about the use of insulin therapy during Ramadan. Insulin is considered to be associated with increased risk of hypoglycemia. The risk of hypoglycemia during the daytime is the most disliked complication as its treatment entails the intake of carbohydrate with resulting premature breaking of the fasting. The interruption of fasting may induce a sense of guilt and failure by the “faithful” patients. Fear of complications may influence the attitude of youth or their parents' toward fasting. Despite their awareness of potential complications, many children and adolescents with diabetes fasting during Ramadan to feel equal to their non-diabetic peers and avoid social stigma.

3.3 Ramadan: Potential Complications And Safety

Several authors have highlighted the various potential risks of fasting during Ramadan, including hyperglycemia, hypoglycemia, ketoacidosis, thrombotic episodes, and dehydration. However, most of the available data are based on adult studies; data in the pediatric age group are lacking.

Ramadan fasting has potential complications; however, the available data suggest that it can be safely practiced by some children and adolescents with diabetes.

Acute Complications

1. **Hypoglycemia**

Hypoglycemia can be a major complication of Ramadan fasting. In a study of a pediatric population by Kaplan and Afandi, symptomatic hypoglycemia resulted in breaking the fasting on 15% of the days. In addition, wide blood glucose fluctuation during fasting and eating hours and episodes of unreported hypoglycemia were observed in the CGM data. Also, Afandi et al, evaluated the CGM data during fasting in 21 adolescents (15 ± 4 years) with T1DM for 6 ± 3 years in relation to their pre-Ramadan diabetes control. The percentages of hypoglycemia, hyperglycemia, and severe hyperglycemia were significantly higher in the group with worse diabetes control. In this study, hypoglycemia was defined as blood glucose <70 mg (3.9 mmol/L). The overall durations of hypoglycemia, hyperglycemia, and severe hyperglycemia in the uncontrolled group were longer by 30%, 14%, and 135%, respectively, than those who had better glycemic control.

In a study of 63 fasting young people using insulin pump therapy, 17 patients had hypoglycemia requiring breaking the fasting, but no severe hypoglycemia was reported. Afandi et al elucidated further the frequency, timing, and severity of hypoglycemia in 25 adolescents with T1DM during fasting the month of Ramadan using the is CGM. The study showed that hypoglycemia is typically encountered during the hours preceding Iftar (sunset meal).

Breaking fasting in hypoglycemia

Monitoring blood glucose during fasting is essential to predict, prevent, and treat hypoglycemia. It is generally advised that the fasting should be interrupted if significant hypoglycemia arises. However, young people do not necessarily agree to break their fasting, particularly if hypoglycemia occurs close to sunset, which marks the end of fasting for the day. This behavior might predispose them to severe hypoglycemia. A study conducted among 33 children with T1DM in Bangladesh showed that only 3 out of 13 children broke their fasting due to development of hypoglycemia symptoms. However, intense education might persuade these youngsters to break the fasting when hypoglycemia occurs. A study by Deeb et al30 showed that the majority of fasting children and adolescents were willing to terminate their fasting on the occurrence of hypoglycemia regardless of the timing of the day. It is of paramount importance that blood glucose is checked if any symptom suggestive of hypoglycemia is experienced.

Diabetes Ketoacidosis

Fasting increases glucagon levels and accelerates lipolysis and ketosis. These pathophysiological changes in conjunction with fasting may lead to metabolic decompensation in diabetes. Diabetes ketoacidosis (DKA) has been reported during Ramadan fasting. However, in a recent critical reappraisal of the literature, the frequency of DKA during fasting was not found to be higher than that in the non-fasting state. The authors did not consider different age groups separately. Detection of euglycemic ketosis during fasting in Ramadan requires a proper evaluation of acid-base state, urine glucose, and ketone values (ideally finger-prick blood ketone measurements if available) to differentiate diabetic ketoacidosis from ketosis due to prolonged fasting.

Frequent blood glucose monitoring during Ramadan fasting is necessary to minimize hypoglycemia and prevent DKA. Fasting should be interrupted if hypoglycemia is detected regardless of symptoms.

Insulin Management During Ramadan

Knowledge on insulin action, how to interpret the glucose measurements and how to adjust insulin for Iftar and Suhor meals, is a prerequisite for a safe Ramadan. Based on clinical experience, different therapeutic recommendations regarding how to adjust the type, dose, and timing of insulin in adults have been suggested.

Adjustment of oral glucose-lowering medication during Ramadan is extensively detailed in the recently launched International Diabetes Federation (IDF) guidelines. However, clear evidence-based guidelines on insulin adjustment for children and adolescents with T1DM are lacking.

Current recommendations for patients treated with multiple daily injection (MDI) include a reduction of the total daily dose (TDD) of insulin to 70% to 85% of the pre-fasting TDD or to 60% to 70% of the basal insulin. For pump-treated patients, a reduction of the basal rate of insulin infusion by 20% to 40% in the last 3 to 4 hours of fasting is recommended. The South Asian Guidelines for Management of Endocrine Disorders in Ramadan recommends reducing basal insulin by 10% to 20% during the fasting days. However, these recommendations are not based on data from large study cohorts or randomized-controlled studies.

Insulin Regimens For Children And Adolescents With T1dm

The treatment should be discussed depending on the individual patient and the access to different insulins and technology. Culture, region, and season also affect the response to fasting. Once the fasting has started, insulin dosing should be regularly adjusted based on glucose monitoring. Frequent blood glucose measurement is essential for those who want to fasting. Only a limited number of small mainly observational studies in children and adolescents have evaluated risk/ benefit of different insulin regimens. Although none of the currently available treatments is compatible with physiological insulin replacement, the meal adjusted (basal-bolus) and pump treatment approach are the preferred options. In some regions, treatment with two or three daily injections with NPH and human short-acting insulin may be used. Use of twice daily premixed insulin regimens requires a fixed intake of carbohydrates at set times because the insulin profile has two peaks of activity. This may be difficult to use safely with fasting and should not be advised.

3.4 Nutrition Management During Ramadan

1. **Pre-Ramadan nutrition education**

Pre-Ramadan nutrition assessment and education is essential to ensure the safety of the young person planning for Ramadan fasting. An individualized meal plan is

required based on energy requirements, commonly eaten foods during Ramadan, the timing of Suhor (pre-dawn) and Iftar (after sunset) meals, the insulin regimen, and the exercise pattern. Ongoing monitoring of food intake with appropriate insulin adjustment is necessary during Ramadan to help prevent hypo- and hyperglycemia. It is recommended that fluids, such as water or non- sweetened fluids be consumed at regular intervals in the non-fasting hours to prevent dehydration.

2. **Meal-time routines during Ramadan**

Ramadan fasting represents a major shift in meal timing and content and daily lifestyle and exercise patterns. All these changes have a direct impact on blood glucose levels. The two main meals eaten during Ramadan are Iftar, the meal consumed after sunset usually between 6 PM to 7:30 PM, and Suhor, the predawn meal usually consumed between 3 AM and 5.30 AM. Meal times vary between countries with the hours of sunrise and sunset. The predawn meal should be eaten as close to dawn as possible to minimize the fasting period. In addition, a late evening meal or supper is commonly eaten before bed (about 10 PM). This usually contains traditional sweets. A snack such as milk and dates or juice may initially be taken before Iftar to break the fasting.

3. **Guidelines for nutritional care and meal planning**

The nutritional compositions of foods eaten during Ramadan are different from the rest of the year. Eltoum et al examined the effect of Ramadan fasting on the dietary habits and nutrient intake of 54 adolescents (13-18 years old) with T1DM. The study demonstrated that young people had significant changes in nutrient intake with higher fat and sugar intakes during Ramadan. The authors recommended that adolescents with T1DM should lower saturated fat and sugar intakes during Ramadan. Low glycemic index (GI) carbohydrates should be the basis of foods consumed at Iftar and Suhor. Lean protein and low GI carbohydrates are particularly important at the predawn meal to enhance satiety during the day. Moderation in traditional sweet intake and fried food are strongly recommended, particularly at the sunset meal. This should be covered by prandial rapid-acting insulin to prevent rapid postprandial glycemic excursions.

For those using intensive insulin therapy, education on carbohydrate counting is recommended to allow adjustment of the prandial insulin dose to match carbohydrate intake at Iftar, Suhor and the supper meal. Daily consistency in carbohydrate intake at Iftar and Suhor is necessary for those on a twice daily injection regimen. Continual snacking overnight after Iftar should be discouraged. Pre-prandial bolus insulin is preferable to insulin administered during or after the meal.66

4. **Maintaining healthy weight and lowering of cardiovascular risk factors during Ramadan**

It is important to prevent hyperlipidemia and excessive weight gain in Ramadan. A diet rich in fruit, vegetables, dairy, legumes, and whole grains should be encouraged to reduce adverse changes in lipid profiles and to prevent excessive weight gain. A systematic review undertaken in adults to investigate alterations in cardio metabolic risk profile found the effect of Ramadan fasting on blood lipids was equivocal; some studies found a significant increase in blood fats, while others reported decreases in LDL and total cholesterol. The IDF and Diabetes and Ramadan (DAR) International Alliance recommend that for adults the calorie load during Ramadan fasting should be similar to the rest of the year. In children and adolescents with T1DM, both weight gain and weight loss have been reported in Ramadan; accordingly, an individualized plan with an appropriate energy intake to maintain growth and development is necessary. Regular follow-up of children and adolescents undertaking fasting is needed to monitor and prevent rapid weight changes during Ramadan. Weight loss can be associated with deterioration in glycemic control and this should be monitored.

5. **Meal-time insulin bolus**

The use of an extended bolus delivered by an insulin pump, where some of the insulin is delivered promptly and the remainder over 2 to 6 hours, enables bolus insulin to match the glycemic effect of the meal. This is particularly useful for high-fat meals such those consumed at Iftar.

CGM is a useful tool to show the impact of meals consumed during Ramadan. It can guide changes in the timing of insulin administration and the insulin dose to

match the profile of high fat foods. Studies are needed regarding ways to optimize postprandial glycemia in Ramadan particularly following the evening meal.

Creating an individualized meal plan well before Ramadan is essential. This should aim to maintain the daily calories and avoid excessive weight changes. The plan should take into account the insulin regimen, change of the meal times and type of food consumed during Ramadan.

3.5 Ramadan And Physical Activity

Exercise patterns in children and adolescents are different from adults as they vary from unpredictable play to planned sport. Typically, out- side of fasting periods, additional carbohydrate is advised for spontaneous activities to avoid hypoglycemia.69 During Ramadan fasting, careful attention to insulin adjustment is required to enable normal levels of physical activity during fasting hours without hypo- or hyper- glycemia. Pre-Ramadan diabetes education should discuss physical activity with a plan for appropriate insulin adjustment, hydration and hypoglycemia treatment as part of individualized care.

It is recommended that a reasonable level of activity be maintained in Ramadan, with consideration of avoidance of strenuous activities in the hours before the sunset meal when hypoglycemia is most likely. Exercise patterns in Ramadan vary depending on the geographic region and the need for school attendance. The difference in sleep patterns coupled with fasting in the daylight hours impact the amount and type of physical activity youth participate in. It has been reported that in adolescents without diabetes a decrease in physical activity accompanies Ramadan fasting69; however, further studies are needed.

There are limited studies on nutrition and sports management during Ramadan that focus on children and adolescents. A review of studies conducted in healthy adult athletes who participated in Ramadan fasting concluded changes in training, fluid intake, diet, and sleep patterns can be managed to minimize, but not wholly mitigate, the impact of Ramadan on athletic performance. The review concluded athletes with T1DM should consider a medical exemption from fasting; how- ever, the review emphasized if an athlete chooses to fasting the need for an individual plan to optimize performance and ensure safety. Nutritional management for

athletic performance in T1DM has been outlined, however, it requires adaptation in meal timing for fuel and recovery for athletes choosing to observe the fasting. Specific guidance should be provided on meeting fluid, energy, electrolytes, carbohydrate, and protein requirements during non-fasting hours while allowing for adequate sleep. Further studies are needed to examine the implications of Ramadan fasting on performance and ways to meet sports nutrition goals in young athletes with T1DM.

Children and adolescent are encouraged to exercise during fasting Ramadan but avoid strenuous activities closer to the sunset meal where hypoglycemia is more likely.

Monitoring Of Blood Glucose During Fasting

Optimizing glycemic control pre-Ramadan is an essential measure to ensure safe fasting. Frequent blood glucose measurements are needed for a safe fasting during Ramadan and this does not violate the observance of Ramadan. The use of CGM also facilitates the adjustments of insulin during the Ramadan. Capillary blood glucose monitoring remains the most widely used method of monitoring. The concept among Muslim communities that pricking the skin for blood glucose testing invalidates the Ramadan fasting is an incorrect interpretation. This should be strongly emphasized in educational programs.

Glucose measurements during Ramadan are based on the same principles of monitoring outside Ramadan with the times being related to meals, medications and symptomatology. To assess adequacy of postprandial control, readings are recommended 2 hours after the main evening meal (Iftar) and before the predawn meal. A measurement on waking up is essential as it will enable patients to judge their basal dose as well as the Suhor meal insulin coverage. Testing in the last 2 hours of the fasting period is recommended as that timing is known to be associated with an increased likelihood of hypoglycemia. Additional midday monitoring is useful if morning readings were in the low-normal range or when symptoms of hypoglycemia are experienced or suspected.

Continuous Glucose Monitoring

Regular glucose monitoring is essential for safe fasting and individuals should be assured that skin pricking does not invalidate fasting. CGM or isCGM are useful tools to facilitate adjustments of insulin during Ramadan fasting.

Limitations Of Ramadan Studies In Children And Adolescents

There are several limitations to the studies of Ramadan fasting in children and adolescents. The small numbers of subjects and retrospective designs influence the interpretation of the results. Selection bias may be created based on diabetes control, lack of data on the pre- and post-Ramadan period. Country-specific differences in physical exercise and schooling demands may impact the outcome. As the season that Ramadan occurs changes, conclusions are not universally applicable. The impact of physicians' and diabetes educators' knowledge, attitudes, beliefs, and practices in relation to Ramadan highly influence the education and management of patients. Obtaining the approval of ethics committees to undertake such studies in children can be a challenge. This is particularly challenging because cultural and religion-sensitive issues might arise from such research. Further multicenter research studies are needed to increase the understanding of the safe management of Ramadan in children and adolescents with T1DM.

Conclusions

The management of children and adolescents with diabetes during Ramadan fasting is a challenge as there are limited high-quality data in pediatric diabetes. Well-designed, randomized controlled trials are needed to determine optimal insulin regimens to minimize glucose fluctuations throughout the fasting and eating hours. Recent technologic developments such as the use of new insulin analogues, “smart” insulin pumps and advanced glucose monitoring devices and telemonitoring might enhance safe fasting in the future. However, these innovations are not universally accessible. At the present time, careful individual assessment and structured diabetes education remain the mainstay of ensuring safe fasting.

4. Fourth Session of the Model:

4.1 Glycemic control targets and glucose monitoring for children, adolescents, and young adults with diabetes

Executive Summary And Recommendations

Glycemic control of children and adolescents must be assessed by both quarterly hemoglobin A1c (HbA1c) and by regular home glucose monitoring. These permit achieving optimal health by:

• determining with accuracy and precision an individual's glycemic control, including assessment of each individual's glycemic determinants (A),

• reducing the risks of acute and chronic disease complications (A),

• minimizing the effects of hypoglycemia (A) and hyperglycemia (B) on brain development, cognitive function, mood; and optimizing quality of life (E).

Recommendations:

• Regular self-monitoring of glucose (using accurate finger stick blood glucose [BG] measurements, with or without continuous glucose monitoring [CGM] or intermittently scanned CGM [is CGM]), is essential for diabetes management for all children and adolescents with diabetes (A).

○ Each child should have access to technology and materials for self-monitoring of glucose measurements to test enough to optimize diabetes care (B).

○ Diabetes center personnel should advocate to nations, states, and health care funders to ensure that children and adolescents with diabetes have adequate glucose monitoring supplies (E).

○ When finger stick BGs are used, testing may need to be performed 6 to 10 times per day to optimize intensive control. Regular review of these BG values should be performed with adjustments to medication/nutritional therapies to optimize control (B).

○ Real-time CGM data particularly benefit children who cannot articulate symptoms of hypoglycemia or hyperglycemia and those with hypoglycemic unawareness (A).

○ is CGM can complement finger stick BG assessments. Although is CGM provides some similar benefits to CGM, it does not alert users to hypoglycemia or hyperglycemia in real time, nor does it permit calibration. Without robust pediatric use efficacy data, it cannot fully replace BG monitoring (B).

• For children, adolescents, and young adults aged ≤25 years we recommend individualized targets, aiming for the lowest achievable HbA1c without undue exposure to severe hypoglycemia balanced with quality of life and burden of care (E).

• For children, adolescents, and young adults ≤25 years who have access to comprehensive care a target of HbA1c of <53 mmol/ mol (7.0%) is recommended (E).

○ A higher HbA1c goal (in most cases <58 mmol/mol [7.5%]) is appropriate in the following contexts: inability to articulate symptoms of hypoglycemia, hypoglycemia unawareness/history of hypoglycemia, severe lack of access to analog insulin's, advanced insulin delivery technology, ability to regularly check BG, and CGM (E), and individuals who are "high glycators," in whom an at-target HbA1c would reflect a significantly lower mean glucose than 8.6 mmoL/L (155 mg/dL) (E).

○ A lower goal (6.5%) or 47.5 mmol/mol may be appropriate if achievable without excessive hypoglycemia, impairment of quality of life, and undue burden of care (E).

○ A lower goal may be appropriate during the honeymoon phase of type 1 diabetes (E).

○ For patients who have elevated HbA1c, a step-wise approach to improve glycemic control is advised including individualized attention to: dose adjustments (E), personal factors limiting achievement of the target (E), assessment of the psychological effect of goal setting on the individual (E), and incorporation

of available technology to improve glucose monitoring and insulin delivery modalities (E).

- HbA1c measurement should be available in all centers caring for persons with diabetes (B).

  - HbA1c measurements should be performed at least every 3 months (B).

  - Examining variations in HbA1c between centers can assist in evaluating the care provided by health care centers including compliance with agreed standards to improve therapies and delivery of pediatric diabetes care (B).

4.2 General Principles Determining Glycemic Targets

HbA1c reflects mean BG over the prior 3 to 4 months and is currently the only long-term glycemic control measure with robust outcome data. Multiple studies in diverse populations have shown that elevated HbA1c values are associated with chronic complications of diabetes. Intensive management resulting in lower HbA1c concentrations is associated with fewer and delayed development of microvascular and macrovascular chronic complications. Additionally, lower HbA1c shortly after diagnosis is associated with a lower risk of subsequent complications. Follow-up data from the Diabetes Control and Complications Trial (DCCT) indicate that 5 to 7 years of improved glycemic control, including during adolescence and young adulthood, decreased the risk for microvascular and macro-vascular complications and mortality in subsequent years.

Chronic hyperglycemia has adverse effects on neurocognitive function and brain structure and development in children and adolescents with diabetes. Chronic hyperglycemia and wide glucose fluctuations during the years of rapid brain development affect brain structure and development, including impairment of the growth of the hippocampus. These observations call into question the prevalent practice of tolerating some hyperglycemia to minimize the risk of hypoglycemia in young children with T1D. Hypoglycemia is also a significant risk for children and adolescents with diabetes (for a comprehensive review of effects of hypoglycemia, see Assessment and management of hypoglycemia in children and adolescents with diabetes. Severe hypoglycemia, particularly in young children, is associated

with adverse neurocognitive effects. Historically, lower HbA1c values were associated with more frequent acute episodes of severe hypoglycemia, but more recent observational studies in the era of multiple daily injections, pumps, and more intensive glucose monitoring, including use of CGM, suggest this is not as significant a risk. Importantly, recent data suggest that lowering HbA1c targets is associated with a decreased mean HbA1c on a population and individual level without an increased frequency of severe hypoglycemia, even in children who achieve HbA1c levels <53 mmol/mol (7.0%).28

HbA1c measurements are useful both for assessing risk of long- term complications and as a real-time tool for optimizing glycemic control. HbA1c is routinely integrated clinically into decision-making about medical regimens, together with data on documented hypoglycemia and hyperglycemia and other person-specific variables such as age, caregiver knowledge, carbohydrate intake, illness/stress, and exercise patterns. Overall, prolonged periods of significant hyperglycemia and episodes of diabetic ketoacidosis (DKA) should be avoided.

Although HbA1c remains the best measure of long-term glycemia within and between populations, several studies have shown that HbA1c has significant limitations when used in isolation to assess an individual's glycemic control. Although for a population, mean BG is highly correlated to HbA1c,31 when examining individual-level data there are often significant differences between measured glucose values (whether by finger stick BG or CGM) and observed HbA1c values.32 Sometimes these differences are due to conditions that alter the life span of red blood cells or changes in hemoglobin glycation, such as sickle cell disease or anemia. In addition, genetic differences in hemoglobin glycation are also present.33–35 In a recent report from the United States that identified individuals as “black” or “white” based upon self-report, blacks had mean HbA1c values 4.4 mmol/mol (0.4%) higher than whites for the same mean glucose concentration deter- mined using CGM.32 As indicated below, in this study, race may be a surrogate marker for genetic factors that determine the relationship between mean BG and HbA1c.

Several studies have shown significant differences between HbA1c and observed self-monitored glucose values between individuals with- out obvious medical or

racial/ethnic biologic differences.33,36 Data com- paring 13 weeks of Dexcom G4 Platinum CGM measurements with HbA1c (measured using non-porous ion exchange high-performance chromatography) showed wide ranges of HbA1c for similar mean inter- stitial glucose concentrations. For example, for a HbA1c of 64 mmol/ mol (8.0%) the 95% confidence interval for mean glucose ranged from 8.6 mmol/L (155 mg/dL) to 12.1 mmol/L (218 mg/dL).33 These data suggest estimating average glucose concentrations for individuals from measured HbA1c values should be done cautiously. However, the relationship of HbA1c to mean glucose is consistent within an individual in the absence of changes in health.37

It is not yet known whether, for an individual, the HbA1c or over- all glycemic exposure is a better marker for risk of complications. As glycemic control guidelines become more stringent, it is important, when possible, to establish the relationship between a patient's mean BG with their HbA1c, to know whether the individual is a “high or low glycator.”38 Without establishing this idiosyncratic relationship, modifying treatment based on HbA1c may increase the risk of iatrogenic hypoglycemia. For high glycators consideration should be given to additional glucose metrics such as measures of hypoglycemia.

4.3 Monitoring Of Glycemic Control

Home self-monitoring of glucose:

- tracks immediate and daily levels of glucose contro.
- helps to determine immediate and ongoing basal and bolus insulin requirements;
- detects hypoglycemia and assists in its management;
- assists in the appropriate management of hyperglycemia; and
- helps guide insulin adjustments to decrease glucose fluctuations.

4.4 Finger stick Bg Measurements

Greater frequency of finger stick glucose monitoring is associated with lower HbA1c in persons with type 1 diabetes. HbA1c improvements with more frequent glucose measurements are due to better insulin dosing for carbohydrate consumed and an improved ability to quickly correct out-of-target range glucose values. In addition, early detection of decreasing glucose values before symptomatic hypoglycemia occurs permits more precise correction with a decreased risk of overcorrection and resultant hyperglycemia. Self-monitoring of glucose around exercise also allows improved insulin management and a decreased risk for hypoglycemia during and following exercise.

Equipment

There are many types of BG meters; however, significant inaccuracy may arise from operator-related errors. Health care professionals should choose and advise on types that are robust, precise, accurate, and familiar to them as well as affordable to the person with diabetes.

Devices that do not require calibration/coding may be easier to use. Low quality devices, offered sometimes to reduce cost, may compromise safety owing to lack of accuracy. High industry standards, including accuracy, precision, and ability to download and analyze data should be upheld by regulatory agencies. Industry standards state that 95% of readings should be within 15% of the reference value.46 ISPAD recommends exclusive use of glucose meters that achieve this standard.

4.5 Timing of self-monitoring of glucose BG is best measured:

• During the day, before meals and snacks;

• At other times (e g, 2-3 hours after food intake) to determine appropriate meal insulin doses and show levels of BG in response to the action profiles of insulin (at anticipated peaks and troughs of insulin action).

• In association with vigorous exercise (before, during, and several hours after) so that changes may be made in glycemic management

• At bedtime, during the night and on awakening to detect and prevent nocturnal hypoglycemia and hyperglycemia as well as optimize basal insulin;

- Before driving a car or operating hazardous machinery;
- To confirm hypoglycemia and to monitor recovery; and
- During inter current illness to prevent hyperglycemic crises.

The number and regularity of finger stick BG measurements should be individualized depending on:

- Availability of equipment;
- Type of insulin regimen; and
- Ability of the child to identify hypoglycemia.

Successful intensive diabetes management requires self-monitoring of glucose at least 6 to 10 times a day and regular, frequent review of the results to identify patterns requiring adjustment to the diabetes treatment plan.42,48 This includes review by the person with diabetes and their family in addition to consultation with the diabetes care team.

Glucose targets throughout the day should correspond with individualized HbA1c targets (Table 1). Empiric data in pediatrics on which to base glucose targets and how this relates to HbA1c are needed. In the absence of such data, we advocate personalizing the above glucose targets to achieve an HbA1c of <53 mmol/mol (7.0%). Consistent targets, communication, and teamwork are important in improving HbA1c.51–53 See Table 1 for recommended glucose targets to achieve an HbA1c of <53 mmol/mol (7.0%). These need to be individualized based on patient and clinic characteristics.

Appendix A.2 FCEM (Arabic Version)

جدول محتويات النموذج

الجلسة الأولى للدراسة:

1. وصف الدراسة ، الهدف ، دور المشارك ، أهمية الدراسة

2. تعريف ووصف النموذج

3. علاج الأنسولين عند الأطفال والمراهقين المصابين بداء السكري . 4.

الإرشادات الغذائية والتوصيات لهدف الجلوكوز

5 . التواصل والسلامة أثناء المدرسة وممارسة الرياضة

الجلسة الثانية للدراسة:

1. تقييم وإدارة نقص السكر في الدم لدى الأطفال والمراهقين المصابين بمرض السكري

2. مضاعفات الأوعية الدموية الدقيقة والأوعية الدموية الكبيرة لدى الأطفال والمراهقين المصابين بمرض السكري

3. المضاعفات الأخرى والحالات المرتبطة بها لدى الأطفال والمراهقين المصابين بمرض السكري

4. الفحص والوقاية من المضاعفات

5 . إدارة اليوم المرضي لدى الأطفال والمراهقين المصابين بمرض السكري

الجلسة الثالثة للدراسة:

1. خطة إدارة مرض السكري

2. صيام الأطفال والمراهقين المصابين بمرض السكري خلال شهر رمضان المبارك

3. المضاعفات المحتملة والسلامة في رمضان

4. إدارة التغذية خلال شهر رمضان

5 . رمضان والنشاط البدني

الجلسة الرابعة للدراسة:

1.أهداف التحكم في نسبة السكر في الدم ومراقبة الجلوكوز 2.

المبادئ العامة التي تحدد أهداف نسبة السكر في الدم

3. مراقبة التحكم في نسبة السكر في الدم

4. قياسات الجلوكوز في الدم بالإصبع .

5. أفضل توقيت للمراقبة الذاتية لنسبة الجلوكوز في الدم

.

الجزء الاول من برنامج الدراسة

دراسة خاصة بمرضى السكري النوع الاول

عنوان الدراسة: تأثير نموذج التمكين المرتكز على الأسرة على جودة الحياة ، والكفاءة الذاتية ، ومستويات السكر التراكمي لدى الاطفال والمراهقين المصابين بداء السكري من النوع الأول في عمان ، الأردن.

الهدف من هذه الدراسة: هو تقييم تأثير نموذج التمكين المرتكز على الأسرة على نوعية الحياة والكفاءة الذاتية ومستويات السكر التراكمي لدى الطفال والمراهقين المصابين بداء السكري من النوع 1.

نتائج الدراسة المستقبلية: ستوفر هذه الدراسة فهمًا متزايدًا لتأثير نموذج التمكين المرتكز على الأسرة على جودة الحياة والكفاءة الذاتية ومستويات السكر التراكمي لدى الاطفال و المراهقين ، بحيث توفر دراسة السكان الأردنيين الرؤية اللازمة حول كيفية تفسير هذه العوامل. والتأثير على النتائج الأيضية والسريرية لهذه الفئة من السكان.

بمساعدة هذه الدراسة ، سنكون قادرين على فهم أفضل لكيفية تأثير نموذج التمكين المرتكز على الأسرة على المراهقين المصابين بداء السكري من النوع 1 في عمان ، الأردن ، من حيث نوعية حياتهم ، والشعور بالكفاءة الذاتية ، ومستويات السكر التراكمي. نظرًا لأن الاختلافات الثقافية في بنية الأسرة ونمط الحياة والكفاءة الذاتية والتحكم في نسبة السكر في الدم بين الاطفال و المراهقين من مختلف البلدان تختلف اختلافًا كبيرًا ، فإن دراسة السكان الأردنيين ستوفر البصيرة اللازمة حول كيفية تفسير هذه العوامل والتأثير على نتائج التمثيل الغذائي بشكل مختلف ، مما يتيح التنمية من التدخلات المناسبة ثقافيًا من الأكاديميين والأطباء والتي تؤثر بشكل إيجابي على النتائج السريرية مع دعم هذه الصفات وتعزيزها.

دور ومسؤولية كل فرد في هذه الدراسة:

سيتم الحصول على موافقة خطية للمشاركة في الدراسة من المراهقين وعائلاتهم (الأب أو الأم). سيتم التأكيد للمشاركين على أن جميع المعلومات ستبقى سرية ؛ سيتم شرح حق الانسحاب من الدراسة لهم ؛ سيتم توضيح أن البرامج التعليمية لن تترتب عليها أي خسارة مالية.

سيتم تنفيذ نموذج التمكين المرتكز على الأسرة (FCEM) ، بناءً على النموذج ، بما في ذلك أربع جلسات ، في أربعة أسابيع قادمة. باستخدام برامج الهواتف الذكية من خلال مجموعة تعليمية ، سيتم عقدها مع المراهقين وأسرهم ، قبل كل جلسة ، وستعقد الجلسات من خلال مشاركة الفيديو والمواد التعليمية. سيتم تنفيذ

محتويات نموذج التمكين المصمم بناءً على أربع خطوات (التهديد المتصور ، وحل المشكلات ، والمشاركة التعليمية ، والتقييم) لعينات من الدراسة في المجموعة.

أدوات جمع البيانات:

سيتم جمع بيانات البحث من المشاركين من خلال: الاستبيان الاجتماعي الديموغرافي ، استبيان وحدة نوعية الحياة للأطفال - مرض السكري ، استبيان الكفاءة الذاتية ، وسيتم الحصول على بيانات التحكم في نسبة السكر في الدم من السجلات الطبية.

التعريف والوصف للمرض:

يصف مصطلح داء السكري اضطراب استقلابي معقد يتميز بارتفاع سكر الدم المزمن الناتج عن عيوب في إفراز الأنسولين أو عمل الأنسولين أو كليهما. يؤدي إفراز الأنسولين غير الكافي و / أو استجابات الأنسجة المتضائلة للأنسولين في المسارات المعقدة للعمل الهرموني إلى نقص عمل الأنسولين على الأنسجة المستهدفة ، مما يؤدي إلى حدوث خلل في التمثيل الغذائي للكربوهيدرات والدهون والبروتين. قد يتعايش ضعف إفراز الأنسولين و / أو تأثيره في نفس المريض.

في حين أن مسببات مرض السكري غير متجانسة ، يمكن تصنيف معظم حالات مرض السكري إلى فئتين واسعتين من الأمراض المسببة للأمراض:

النوع الأول من مرض السكري ، والذي يتميز بشكل أساسي بنقص إفراز الأنسولين.

و**النوع الثاني** من مرض السكري، والذي ينتج عن مزيج من مقاومة عمل الأنسولين ، بالإضافة إلى استجابة إفرازية تعويضية غير كافية للأنسولين لدرجة مقاومة الأنسولين. في حين أن داء السكري من النوع الاول, لا يزال هو الشكل الأكثر شيوعًا لمرض السكري بين الشباب في العديد من السكان ، وخاصة أولئك الذين ينتمون إلى أصول أوروبية ، فقد أصبح مرض السكري من النوع الثاني مصدر قلق متزايد الأهمية للصحة العامة على مستوى العالم بين الأطفال في المجموعات العرقية المعرضة للخطر وكذلك الأشخاص المصابين بالسمنة المفرطة.

الخلاصة:

تختلف الاتجاهات العالمية لمرض السكري من النوع الأول حسب الجنس والعرق والفئة العمرية وكذلك حسب الفترة الزمنية حول العالم ، بما يتوافق مع مسببات المرض التي تتضمن محفزات بيئية متراكبة على القابلية الوراثية. لقد أوضحت الأدلة الحديثة أن مرض السكري من النوع 1 قبل ظهور الأعراض يتطور من خلال سلسلة متصلة من ثلاث مراحل مميزة يمكن تحديدها قبل ظهور الأعراض.

إدارة ودعم الأطفال والمراهقين المصابين بداء السكري من النوع الأول في المدرسة

ملخص وتوصيات

التوصيات التالية ، التي تم التوصل إليها بتوافق الآراء ، تستند إلى حد كبير إلى رأي الخبراء. وهي تمثل النهج "المثالي" أو أفضل الممارسات مع الاعتراف بأن تنفيذها الكامل قد يختلف جغرافيًا داخل البلدان وفيما بينها وفقًا لتوافر الموارد والوصول إليها.

• يزداد عدد الشباب المصابين بداء السكري الملتحقين بالمدارس، مما يضع عبئًا كبيرًا على الأسر وأنظمة الرعاية الصحية والمدارس.

• قد يقضي الأطفال أكثر من 30 ساعة في الأسبوع في البيئة المدرسية.

• لا يستطيع العديد من الأطفال المصابين بداء السكري في جميع أنحاء العالم الوصول بسهولة إلى الأنسولين أو إمدادات مرض السكري أو التعليم. يجب منحهم نفس الفرصة التي يحصل عليها الأطفال الآخرون للحصول على التعليم.

• بغض النظر عن العمر والقدرة ، يجب أن يتلقى جميع الطلاب المصابين بالسكري في المدرسة الدعم والتشجيع والإشراف من موظفي المدرسة.

• الإدارة المثلى لمرض السكري في المدرسة هي شرط أساسي للأداء المدرسي الأمثل ، بما في ذلك التعلم، ولتجنب المضاعفات المرتبطة بمرض السكري.

• يعد الحفاظ على مستوى السكر في الدم خلال ساعات الدراسة أمرًا مهمًا ويجب ألا تختلف الأهداف اليومية لنسبة السكر في الدم عن أي مكان آخر.

• يجب أن يكون نوع نظام الأنسولين المستخدم في المدرسة مفصلًا وفقًا لاحتياجات وقدرة ورغبات الطفل / الأسرة ولا ينبغي أن تمليه موارد المدرسة.

• يصنف مرض السكري من قبل "القانون العام" على أنه إعاقة وتوجد أطر قانونية في العديد من الدول لضمان حصول الطفل على فرص متكافئة للمشاركة في جميع جوانب الحياة المدرسية .

• يجب على المدارس إجراء "تعديلات معقولة" لتسهيل الرعاية الطبية الموصوفة للسماح للأطفال المصابين بداء السكري من النوع 1 (T1D) بالمشاركة في التعليم على نفس الأساس مثل أقرانهم.

• "التعديلات المعقولة" تشمل دعم العاملين بالمدرسة بإعطاء الأنسولين ، بالإضافة إلى فهم ومعرفة تقنيات مرض السكري (بما في ذلك أجهزة المراقبة المستمرة للجلوكوز [CGM] وإعدادات مضخة الأنسولين).

• تتطلب الإدارة ، أو الإشراف الدقيق ، اعطاء الأنسولين أن يكون موظفو المدرسة مخولين قانونًا بموافقة الوالدين المستنيرة.

• المدارس مسؤولة عن التدريب المناسب لموظفيها حول مرض السكري ، ولكن محتوى التدريب هو مسؤولية فريق الرعاية الصحية وأولياء الأمور.

• ما إذا كان الأطفال يستطيعون إدارة جوانب معينة من مرض السكري و / أو إعطاء الأنسولين ذاتيًا بأنفسهم لا يعتمد بالضرورة على العمر ولا يمكن تحديده إلا من قبل الوالدين وفريق الرعاية الصحية.

• المدارس لديها واجب رعاية طلابها غير قابل للتفويض ، ويجب على موظفي المدرسة توخي العناية المعقولة لحمايتهم من الأذى الذي يمكن توقعه بشكل معقول.

• تعتبر مراقبة نسبة السكر في الدم, أمرًا أساسيًا لتحقيق التحكم الأمثل في نسبة السكر في الدم في المدرسة ويجب أن تكون مألوفة لموظفي المدرسة.

• يجب أن يكون العاملون في المدرسة قادرين على إدارة آثار مستويات السكر المنخفضة والمرتفعة بشكل مناسب وفقًا لتعليمات الوالدين وفريق الرعاية الصحية.

• يعد الوصول إلى الغذاء في المدارس جزءًا لا يتجزأ من تمكين الأطفال من النمو بشكل طبيعي وتحقيق التوازن بين الأنسولين ومدخول الطعام.

• قد يساعد استخدام صور الطعام موظفي المدرسة في تقييم حصص الطعام ومحتوى الكربوهيدرات التقديري لديهم .

• يجب منح جميع الشباب المصابين بالتهاب المفاصل الروماتويدي T1D نفس الفرص التي يتمتع بها أقرانهم للمشاركة بأمان في جميع الألعاب الرياضية والنشاط البدني.

• يجب أن يكون موظفو المدرسة على دراية بعلامات / أعراض نقص السكر في الدم ، ويجب أن تكون حزمة إدارة "نقص السكر في الدم الإسعافات الأولية" متاحة في جميع الأوقات. يجب تقديم تعليمات واضحة لإدارة نقص السكر في الدم.

• يجب السماح للشباب المصابين بالسكري بمراقبة مستويات السكر في الدم لديهم ، وإعطاء الأنسولين ، ومعالجة قيم BG المنخفضة / المرتفعة في أي وقت خلال اليوم الدراسي ، مع إشراف الكبار إذا لزم الأمر.

• يجب أن يكون لدى جميع الشباب المصابين بالسكري في المدرسة خطة فردية لإدارة مرض السكري (DMP) والتي يجب تطويرها والاتفاق عليها مسبقًا مع أولياء الأمور.

• يجب مراجعة خطة إدارة البيانات وتعديلها عند الضرورة ، وفقًا لاحتياجات الشاب المصاب بالسكري ، و / أو سنويًا على الأقل.

• تشير بعض الدراسات إلى ارتفاع معدلات المشاكل النفسية مثل الاكتئاب واضطرابات الأكل لدى الشباب المصابين بداء السكري.

• توفر المدارس فرصة فريدة للتعرف على المشكلات النفسية لدى الشباب المصابين بداء السكري وعلاجها ، ويوصى بالاتصال الوثيق بين العاملين في المدرسة وأخصائيي الرعاية الصحية.

• تعتمد الإدارة الناجحة لمرض السكري في المدرسة بشكل كبير على التواصل الفعال وحل المشكلات مع الأسرة ويجب على المدارس توضيح التوقعات وتنسيق التواصل.

• العلاقات بين الأقران ، وصمة العار الاجتماعية المحلية ، ووجهات النظر العرقية والدينية يمكن أن تكون عبئًا على المرضى والأسر الذين يعانون من (T1D).

• يتعرض الشباب المصابون بالسكري بشكل كبير لخطر التعرض لقضايا التمييز ، مما قد يؤثر على احترام الذات ويسبب الشعور بالوصم.

• الامتحانات المدرسية أو غيرها من حالات التقييم مرتبطة بالإجهاد وزيادة خطر حدوث نوبات عابرة حادة من نقص السكر في الدم أو ارتفاع السكر في الدم التي يمكن أن تؤثر على الأداء.

• قد يلزم وضع ترتيبات محددة (بما في ذلك الوصول إلى معدات اختبار BG ؛ حزمة الإسعافات الأولية لنقص السكر في الدم) للاختبارات.

• لا يُتوقع من أولياء الأمور "سد الفجوة" في الموارد المدرسية والاهتمام بالإدارة الطبية لأطفالهم خلال اليوم الدراسي.

• من خلال نهج تعاوني وداعم بشكل متبادل بين الآباء وفريق الرعاية الصحية للطفل والمدارس ، ومع التطورات في تكنولوجيا الاتصال ، على سبيل المثال ، توفير بيانات الجلوكوز بالمستشعر في الوقت الفعلي للآباء ، هناك فرصة حقيقية لنهج تعاوني حقيقي.

علاج الأنسولين لدى الأطفال والمراهقين المصابين بداء السكري

التوصيات / الملخص التنفيذي

• يجب أن يبدأ العلاج بالأنسولين في أسرع وقت ممكن بعد التشخيص (عادة في غضون 6 ساعات في حالة وجود البيلة الكيتونية) لمنع المعاوضة الأيضية والحماض الكيتوني السكري.

• أصبحت أنظمة الأنسولين المكثفة التي يتم تقديمها عن طريق مجموعات من الحقن اليومية المتعددة أو العلاج بالمضخة مع الاستبدال التفاضلي للأنسولين الأساسي والأنسولين بهدف التحكم الأمثل في التمثيل الغذائي المعيار الذهبي لجميع الفئات العمرية في أمراض السكري لدى الأطفال.

• يجب أن يكون العلاج بالأنسولين فرديًا لكل مريض من أجل تحقيق التحكم الأيضي الأمثل.

• تحسين السيطرة على نسبة السكر في الدم عن طريق العلاج المكثف بالأنسولين حيث يقلل من مخاطر المضاعفات الحادة وطويلة الأجل. لا يوجد سبب للاعتقاد بأن هذا ليس هو الحال أيضًا عند الأطفال الأصغر سنًا.

• في جميع الفئات العمرية ، يجب أن يكون الهدف أقرب ما يمكن من استبدال الأنسولين الفسيولوجي والسيطرة المثلى على نسبة السكر في الدم باستخدام الأنسولين القاعدي والمتوفر محليًا.

على الرغم من عدم وجود نظام حقن الأنسولين يحاكي بشكل مرضٍ فسيولوجيا الجسم الطبيعي ، لا يوصى باستخدام الأنسولين المخلوط مسبقًا للأطفال.

عندما يتم توفير الأنسولين من خلال منظمة مساعدة ، يجب أن تكون التوصية هي توفير الأنسولين المنتظم و NPH كأنسولين منفصل ، وليس ممزوج مسبقًا.

• مهما كان نظام الأنسولين الذي يتم اختياره ، يجب أن يكون مدعومًا بالتعليم الشامل المناسب للعمر والنضج والاحتياجات الفردية للطفل والأسرة.

• اهدف إلى الحصول على جرعة الأنسولين المناسبة على مدار 24 ساعة لتغطية المتطلبات الأساسية والجرعة الأعلى من الأنسولين في محاولة لمطابقة تأثير نسبة السكر في الدم للوجبات.

• إعطاء الأنسولين قبل الأكل' قبل كل وجبة أفضل من الحقن بعد الأكل وينبغي أن يكون مفضلًا إن أمكن. تختلف جرعة الأنسولين اليومية بشكل كبير بين الأفراد وتتغير بمرور الوقت. لذلك يتطلب مراجعة وإعادة تقييم منتظمة.

• يُظهر توزيع جرعة الأنسولين على مدار اليوم تباينًا فرديًا كبيرًا. بغض النظر عن طريقة العلاج بالأنسولين ، يجب أن تتكيف الجرعات مع تغير الساعة البيولوجية بناءً على النمط اليومي لجلوكوز الدم.

• يجب أن يحصل جميع الأطفال على أنسولين سريع المفعول أو أنسولين منتظم متاح لإدارة الأزمات.

• من الضروري توفير كمية صغيرة من الأنسولين الاحتياطي بسهولة لجميع الأطفال والمراهقين حتى لا ينقطع الإمداد.

• يجب تشجيع الأطفال والمراهقين على الحقن باستمرار في نفس المنطقة (البطن ، الفخذ ، الأرداف ، الذراع) في وقت معين من اليوم ، ولكن يجب تجنب الحقن بشكل متكرر في نفس المكان لمنع تضخم الدهون.

• يجب إعطاء الأنسولين بواسطة محاقن الأنسولين (أو أجهزة الحقن الأخرى) التي يتم معايرتها وفقًا لتركيز الأنسولين المستخدم.

• يبقى الفحص المنتظم لمواقع الحقن وتقنيات الحقن ومهاراته مسؤولية الوالدين ومقدمي الرعاية والمهنيين الصحيين.

• يتحمل اختصاصيو الرعاية الصحية مسؤولية تقديم المشورة للآباء ومقدمي الرعاية الآخرين والشباب حول تعديل العلاج بالأنسولين بأمان وفعالية. يتطلب هذا التدريب مراجعة منتظمة وإعادة تقييم وتعزيز.

تخزين الأنسولين

تنص المتطلبات التنظيمية على أن منتج الأنسولين المسمى يجب أن يحتفظ بنسبة 95٪ على الأقل من فعاليته عند تاريخ انتهاء الصلاحية. في درجة حرارة الغرفة (25 درجة مئوية ، 77 فهرنهايت) ، يفقد الأنسولين <1.0٪ من فعاليته على مدار 30 يومًا. في المقابل ، يفقد الأنسولين المخزن في الثلاجة <0.1٪ من فعاليته على مدار 30 يومًا. غالبًا ما تستند توصيات التخزين إلى المتطلبات التنظيمية المتعلقة بالعقم بدلًا

من فقدان الفاعلية. يجب الالتزام بتوصيات التخزين الفردية وتواريخ انتهاء الصلاحية الصادرة عن الشركة الصانعة.

هذه عادة ما توصي بما يلي:

• يجب عدم تجميد الأنسولين أبدًا.

• ضوء الشمس المباشر أو الدفء (في المناخات الحارة أو داخل السيارة في يوم مشمس) يضر الأنسولين.

• يجب على المرضى عدم استخدام الأنسولين الذي تغير في المظهر (التكتل ، التجميد ، الترسيب ، أو تغير اللون).

• يجب تخزين الأنسولين غير المستخدم في الثلاجة (4 C-8).

• بعد الاستخدام الأول ، يجب التخلص من قنينة الأنسولين بعد 3 أشهر إذا تم حفظها في درجة حرارة 2 درجة مئوية إلى 8 درجات مئوية أو 4 أسابيع إذا تم حفظها في درجة حرارة الغرفة. ومع ذلك ، بالنسبة لبعض مستحضرات الأنسولين ، يوصي المصنعون باستخدام 10 إلى 14 يومًا فقط في درجة حرارة الغرفة.

• في المناخات الحارة حيث لا يتوفر التبريد ، تساعد برطمانات التبريد أو إبريق الفخار أو قطعة قماش مبللة باردة حول الأنسولين في الحفاظ على نشاط الأنسولين.

وبالمثل ، يجب الالتزام بإرشادات الشركات المصنعة لتخزين الأقلام أو القوارير غير المستخدمة ، والتي قد تختلف عن تخزين القوارير. في الأطفال الذين يتناولون جرعات صغيرة من الأنسولين ، يجب اختيار قوارير سعة 3 مل ، بدلًا من قوارير سعة 10 مل لتجنب إهدار الأنسولين.

مواقع الحقن المعتادة هي:

• **البطن** (المكان المفضل عند الحاجة إلى امتصاص أسرع وقد يكون أقل تأثراً بالنشاط العضلي أو التمرين).

• **مقدمة الفخذ / جانب الفخذ** (الموقع المفضل لامتصاص أبطأ للإنسولين الأطول مفعولًا).

• **الربع العلوي الجانبي للأرداف** (الربع العلوي كله مفيد).

• **الجانب الجانبي للذراع** (في الأطفال الصغار الذين يعانون من القليل من الدهون تحت الجلد ، يكون الحقن العضلي أكثر احتمالا وقد يسبب كدمات قبيحة).

• دوران مواقع الحقن مهم أيضا في نفس منطقة الحقن

• تنظيف الجلد أو تطهيره ليس ضروريًا ما لم تكن النظافة مشكلة حقيقية. - العدوى في مواقع الحقن نادرة الحدوث

مشاكل الحقن

تفاعلات فرط الحساسية الموضعية لحقن الأنسولين غير شائعة ولكن عند حدوثها ، قد يكون التحديد الرسمي للأنسولين (أو نادرًا مادة حافظة) المسؤول ممكنًا بمساعدة الشركات المصنعة. قد تحل المشكلة تجربة مستحضر بديل للأنسولين. في حالة الاشتباه في وجود حساسية حقيقية ، يمكن إجراء إزالة التحسس باستخدام البروتوكولات المتاحة من الشركات المصنعة. قد تساعد إضافة كمية صغيرة من الكورتيكوستيرويدات إلى الأنسولين. يعد تضخم الدهون مع تراكم الدهون في كتل تحت الجلد أمرًا شائعًا عند الأطفال. قيل إن الضمور الشحمي غير شائع منذ إدخال الأنسولين عالي النقاء ونظائرها. لكن التقارير الأخيرة تشير إلى أن ضمور الدهون هو مشكلة تزيد من استخدام المرضى الداخليين لمضاهات الأنسولين ويمكن أن يحدث في الغالب في المرضى الذين يستخدمون المضخات.

تعتبر الحقن المؤلمة مشكلة شائعة عند الأطفال. تحقق من الزاوية وطول الإبرة وعمق الحقن للتأكد من عدم إعطاء الحقن في العضل وأن الإبرة حادة. يمكن أن تسبب الإبر المعاد استخدامها مزيدًا من الألم. يمكن أن تقلل القسطرة الساكنة (إنسوفلون ، آي بورت) من ألم الحقن. يعتبر تسرب الأنسولين شائعًا ولا يمكن تجنبه تمامًا. شجع على سحب الإبرة بشكل أبطأ من الجلد ، أو شد الجلد بعد سحب الإبرة ، أو الضغط بإصبع نظيف على موقع الحقن. تكون الكدمات والنزيف أكثر شيوعًا بعد الحقن العضلي أو الضغط الشديد على الجلد. أظهر استخدام الإبر الرقيقة نزيفًا أقل بشكل ملحوظ في موقع الحقن.
يجب إزالة فقاعات الأنسولين كلما أمكن ذلك. إذا لم تكن الفقاعة كبيرة بما يكفي لتغيير جرعة الأنسولين ، فلا ينبغي أن تسبب مشاكل. عند استخدام أقلام الأنسولين ، يمكن أن يتسبب الهواء الموجود في الخرطوشة في ظهور قطرات من الأنسولين على طرف إبرة القلم ، إذا تم سحبها بسرعة كبيرة.

امتصاص الأنسولين

تُظهر ملفات نشاط الأنسولين تباينًا كبيرًا على حد سواء يومًا بعد يوم في نفس الفرد وبين الأفراد ، خاصة عند الأطفال. تعتمد البداية وذروة التأثير ومدة التأثير على العديد من العوامل التي تؤثر بشكل كبير على سرعة واتساق الامتصاص. يجب على الشباب ومقدمي الرعاية معرفة العوامل التي تؤثر على امتصاص الأنسولين مثل:

- العمر (الأطفال الصغار ، دهون أقل تحت الجلد! امتصاص أسرع).
- كتلة الدهون (سُمك كبير للدهون تحت الجلد ، تضخم شحمي ، أيضًا مع نظائر سريعة المفعول! امتصاص أبطأ).
- جرعة الحقن (جرعة أكبر! امتصاص أبطأ)
- موقع وعمق منطقة الحقن (البطن أسرع من الفخذ ؛ لا توجد بيانات جيدة عن الامتصاص من الفخذ مقابل الأرداف).

• تمرين (حقن الساق ، تمارين الساق! امتصاص أسرع).

• تركيز الأنسولين ونوعه وتركيبته (تركيز أقل! امتصاص أسرع).

• درجة الحرارة المحيطة والجسم (درجات حرارة أعلى! امتصاص أسرع).

• بشكل عام ، فإن سرعة الامتصاص للنظائر سريعة المفعول أقل تأثراً بالعوامل المذكورة أعلاه.

• لا توجد فروق ذات دلالة إحصائية في امتصاص الغلارجين من البطن أو الفخذ. التمرين لا يؤثر على امتصاص الغلارجين. هناك خطر الإصابة بنقص السكر في الدم إذا تم حقن الغلارجين في العضل ، خاصة عند الأفراد الصغار والضعفاء.

ملحوظة: عادة ما ينتج عن الامتصاص الأسرع مدة عمل أقصر.

اعطاء الأنسولين

من المستحسن أن يعرف جميع الأطفال والمراهقين المصابين بالسكري كيفية إعطاء الأنسولين عن طريق الحقن لأن أجهزة الحقن الأخرى قد تتعطل.

إجراءات التخلص المناسبة إلزامية. قد تتوافر "حاويات الأدوات الحادة" المصممة والموسومة خصيصًا من الصيدليات ومراكز مرض السكري. قد تتوفر مقصات إبر خاصة (مثل مشبك آمن) لإزالة الإبرة وجعلها غير قابلة للاستخدام. بدون "حاوية الأدوات الحادة" ، يمكن تخزين المحاقن التي تم نزع الإبر منها والتخلص منها في حاويات بلاستيكية غير شفافة أو علب لجمع القمامة.

أجهزة حاقن القلم

تم تصميم أجهزة حقن القلم التي تحتوي على الأنسولين في الخراطيش المعبأة مسبقًا لجعل الحقن أسهل وأكثر مرونة. أنها تلغي الحاجة إلى السحب من قارورة الأنسولين ؛ يتم طلب الجرعة على مقياس وقد تكون مفيدة بشكل خاص لإعطاء الأنسولين بعيدًا عن المنزل أو في المدرسة أو في أيام العطلات. عند استخدام قلم ، يُنصح بالعد من 10 ببطء أو 20 بسرعة (انتظر حوالي 15 ثانية) قبل سحب الإبرة ، لإعطاء وقت لتوسيع أي فقاعة هواء في الخرطوشة. استخدم ، بحيث تظهر قطرة من الأنسولين عند طرف الإبرة.

تتوفر إبر خاصة لحقن القلم بحجم صغير (4-6 مم) وقطرها وقد تسبب إزعاجًا أقل عند الحقن. تتوفر محاقن القلم بأحجام وأنواع مختلفة من شركات الأدوية. يمكن ضبط بعض الأقلام على زيادات قدرها 2/1 وحدة. تعتبر الأقلام نصف وحدة مفيدة بشكل خاص في الجرعات عند الأطفال الصغار وأثناء مرحلة الهدوء عندما قد تساعد زيادات الجرعات الصغيرة في تجنب نقص السكر في الدم. تحتوي بعض الأقلام على ذاكرة للجرعات التي يتم تناولها ، والتي يمكن أن تكون عملية خاصة للمراهقين. يعد التوافر مشكلة في بعض البلدان ، وعلى الرغم من أن حقن القلم قد يحسن الملاءمة والمرونة ، إلا أنها طريقة أكثر تكلفة لإعطاء الأنسولين. تعتبر أجهزة الحقن بالقلم مفيدة للأطفال الذين يخضعون لأنظمة الحقن المتعددة أو الخلائط الثابتة من الأنسولين ولكنها أقل قبولًا عند استخدام الخلط الحر للأنسولين في نظام 2 أو 3 جرعات.

الحقن المستمر للأنسولين تحت الجلد

يتزايد استخدام المضخات الخارجية ويثبت أنها مقبول وناجح. يعد العلاج بمضخة الأنسولين حاليًا أفضل طريقة لتقليد ملف الأنسولين الفسيولوجي. يُحقن الأنسولين تحت الجلد بمعدل أساسي مبرمج مسبقًا وتضاف جرعات لموازنة تناول الكربوهيدرات.

قد يكون العلاج بمضخة الأنسولين خطيرًا عندما يكون التثقيف والالتزام بالعلاج غير كافٍ ، بسبب المستودع الأصغر للأنسولين تحت الجلد والارتفاع المفاجئ في الكيتونات عند انقطاع إمداد الأنسولين.

تقنية الحقن

عادة ما يتم إعطاء الحقن عن طريق الحقن في الأنسجة العميقة تحت الجلد من خلال قرصة بإصبعين من الجلد بزاوية 45. يمكن استخدام زاوية 90 إذا كانت طبقة الدهون سميكة بما فيه الكفاية. تتطلب تقنية حاقن القلم تعليمًا دقيقًا بما في ذلك الحاجة إلى التأكد من عدم وجود قفل هوائي أو انسداد في الإبرة. يساعد التأخير لمدة 15 ثانية بعد الضغط على المكبس على ضمان طرد الأنسولين بالكامل من خلال الإبرة.

الحقن الذاتي

يجب التأكيد على أن نسبة من مرضى السكري يعانون من كراهية شديدة وطويلة الأمد للحقن مما قد يؤثر على التحكم في نسبة السكر في الدم لديهم. قد يساعد الأطفال الأصغر سنًا الذين يتشاركون مسؤولية الحقن مع أحد الوالدين أو مقدم رعاية آخر في إعداد الجهاز أو المساعدة في دفع المكبس وبعد ذلك تحت إشراف يكونون قادرين على أداء المهمة بأكملها بنجاح. يتم تشغيل الحقن الذاتي أحيانًا بسبب حدث خارجي مثل المبيت مع صديق أو رحلة مدرسية أو معسكر السكري. يجب ألا يتوقع الآباء أو مقدمو الرعاية أن الحقن الذاتي سيستمر تلقائيًا ويجب أن يقبلوا مراحل عدم الحقن مع الحاجة إلى المساعدة من شخص آخر. قد يحتاج الأطفال الأصغر سنًا الذين يخضعون لأنظمة حقن متعددة إلى المساعدة في الحقن في مواقع يصعب الوصول إليها (مثل الأرداف) لتجنب التضخم الشحمي.

جرعة الأنسولين اليومية

تعتمد الجرعة على العديد من العوامل مثل:

- عمر, وزن , مرحلة البلوغ , مدة ومرحلة مرض السكري , حالة مواقع الحقن , المدخول الغذائي والتوزيع , أنماط التمرين , روتين يومي , نتائج مراقبة نسبة الجلوكوز في الدم والهيموجلوبين السكري , المرض المتداخل.

الطرق الصحيحة لجرعة الانسولين

الجرعة "الصحيحة" من الأنسولين هي التي تحقق أفضل تحكم ممكن في نسبة السكر في الدم لطفل أو مراهق دون التسبب في مشاكل نقص السكر في الدم ، والنمو المتناسق وفقًا للوزن والطول المخططات للأطفال.

• خلال مرحلة الهدأة الجزئية ، تكون جرعة الأنسولين اليومية الكلية أقل من 0.5 وحدة دولية / كجم / يوم.

• يحتاج الأطفال قبل سن البلوغ (خارج مرحلة الهدأة الجزئية) عادة من 0.7 إلى 1.0 وحدة دولية / كجم / يوم.

• خلال فترة البلوغ ، قد ترتفع المتطلبات بشكل كبير فوق 1 وحتى 2 U / كجم / يوم.

لوحظ ارتفاع مستويات السكر في الدم خلال المرحلة الأصفرية من الدورة الشهرية بوساطة مستوى البروجسترون الداخلي. يبدو أن بعض الأفراد أكثر استجابة لتأثيرات الدورة الشهرية على حساسية الأنسولين. يجب تشجيع النساء على استخدام تكنولوجيا المراقبة الذاتية المتاحة لتحديد الاختلاف الدوري المحتمل في جلوكوز الدم الذي قد يتطلب مراجعة الطبيب وتعديل جرعة الأنسولين.

• لقد لوحظ أن الإفراط في إفراز هرمون النمو في داء السكري من النوع 1 خلال فترة البلوغ له آثار كبيرة على تكوين الكيتون. يمكن القضاء على الارتفاع في مستويات بيتا هيدروكسي بوتيرات وأسيتو أسيتات ، بين 2 صباحًا و 3 صباحًا ، الذي لوحظ في سن البلوغ بقمع هرمون النمو. ومن ثم ، يميل المراهقون المصابون بالسكري من النوع 1 إلى عدم المعاوضة بسرعة كبيرة ويطور DKA عند حذف جرعة الأنسولين قبل النوم.

ظاهرة الفجر

تميل مستويات الجلوكوز في الدم إلى الارتفاع في ساعات الصباح (عادة بعد الساعة 0500) قبل الاستيقاظ. وهذا ما يسمى بظاهرة الفجر. في الأفراد غير المصابين بالسكري ، تشمل الآليات زيادة إفراز هرمون النمو الليلي ، وزيادة مقاومة عمل الأنسولين وزيادة إنتاج الجلوكوز في الكبد. هذه الآليات تكون أكثر فاعلية في سن البلوغ.

أظهرت دراسات المضخة أن الأطفال الأصغر سنًا يحتاجون غالبًا إلى المزيد من الأنسولين الأساسي قبل منتصف الليل أكثر من بعده (ظاهرة الفجر المعكوس). باستخدام النظام التناظري الأساسي / البلعي ، يمكن تحقيق ذلك عن طريق إعطاء الأنسولين المنتظم بدلًا من الأنسولين سريع المفعول لآخر جرعة في اليوم (يجب فحص مستويات الجلوكوز في الدم ليلًا).

في الأشخاص المصابين بداء السكري من النوع 1 ، يحدث ارتفاع السكر في الدم أثناء الصيام في الغالب بسبب انخفاض مستويات الأنسولين ، مما يؤدي إلى تضخيم ظاهرة الفجر. يمكن أن يسبق ارتفاع السكر في الدم الصباحي في بعض الحالات نقص سكر الدم الليلي (ما يسمى بظاهرة سوموجي) ، والذي يظهر في

كثير من الأحيان في العلاج بالمضخة مقارنةً. من المحتمل أن يتطلب تصحيح فرط سكر الدم أثناء الصيام تعديل نظام الأنسولين لتوفير مستويات الأنسولين الفعالة طوال الليل وفي الصباح الباكر باستخدام:

• الأنسولين متوسط المفعول في وقت لاحق من المساء أو في وقت النوم ، وهو أنسولين مسائي طويل المفعول / أنسولين أساسي.

• التغيير إلى العلاج بمضخة الأنسولين.

علاج التغذية

أهداف العلاج الغذائي

• تقريب مستويات الجلوكوز في الدم الطبيعية

• مستويات الدهون المثلى

• سعرات حرارية كافية للحفاظ على الوزن الأمثل للبالغين ، والنمو الطبيعي والتطور للأطفال والمراهقين

• منع أو تأخير أو علاج المضاعفات المتعلقة بالتغذية

• تحسين الصحة العامة من خلال التغذية الجيدة

المبادئ التوجيهية الغذائية و التوصيات الرئيسية:

يشمل نمط الأكل الصحي:

• مجموعة متنوعة من الخضروات من جميع المجموعات الفرعية - الأخضر الداكن والأحمر والبرتقالي والبقوليات (الفاصوليا والبازلاء) والنشوية وغيرها

• الفاكهة وخاصة الفاكهة الكاملة

• الحبوب ، نصفها على الأقل من الحبوب الكاملة

• منتجات الألبان الخالية من الدسم أو قليلة الدسم ، بما في ذلك الحليب والزبادي والجبن و / أو مشروبات الصويا المدعمة

• مجموعة متنوعة من الأطعمة البروتينية ، بما في ذلك المأكولات البحرية واللحوم والدواجن الخالية من الدهون والبيض والبقوليات (الفاصوليا والبازلاء) والمكسرات والبذور ومنتجات الصويا

• الزيوت

حدود نمط الأكل الصحي:

• الدهون المشبعة والدهون المتحولة والسكريات المضافة ومفتاح الصوديوم

• أقل من 10 في المائة من السعرات الحرارية في اليوم من السكريات المضافة

• أقل من 10 في المائة من السعرات الحرارية من الدهون المشبعة في اليوم

• أقل من 2300 ملليجرام من الصوديوم يوميًا

• في حالة تناول الكحول ، يجب تناوله باعتدال

استراتيجيات الأكل الصحي

• اسمح للطفل بالاستمتاع بأطعمته

• التعرف على الجوع والعلامات الكاملة

• دعهم يحددون المبلغ

• اجعل وقت تناول الطعام مريحًا وممتعًا

• التنوع - التكرار

• تجنب الأطعمة التي لا تريدهم أن يحبوها عندما يكبرون

• وازن بين الأطعمة ومظاهر الانتباه الأخرى

• كن قدوة جيدة

• الأكل العائلي

خطة الوجبات الغذائية لمرضى السكري

• خطة فردية

- ليس "نظام غذائي لمرضى السكري" -

التقاليد الثقافية والعائلية

• العد المتقدم للكربوهيدرات (مطابقة الأنسولين مع الكربوهيدرات) - وزن وقياس الطعام

• أكل صحي

- الدهون والبروتين ومؤشر نسبة السكر في الدم

• قم بتغطية جميع الوجبات والوجبات الخفيفة بالأنسولين - احسب!

• الأطعمة المجانية مقابل الأطعمة غير الكربوهيدراتية

• لا ينصح بتقليل نسبة الكربوهيدرات

• كثرة زيارات اختصاصي تغذية / تغذية

إدارة التغذية لدى الأطفال والمراهقين المصابين بداء السكري

ملخص لما هو جديد / مختلف

• تم تحديث دليل توزيع المغذيات الكبيرة وتعزيز أنماط الأكل الصحي.

• تم التأكيد على أهمية الإجراءات الروتينية لوقت الوجبات مع قيود على تناول الوجبات الخفيفة من أجل تحسين جودة النظام الغذائي وتحسين نتائج نسبة السكر في الدم.

• يجب مراعاة تأثير الدهون والبروتينات الغذائية عند حساب جرعة الأنسولين وقت الوجبة وكيفية توصيلها.

• تعد المراقبة المستمرة للجلوكوز أداة مفيدة لتثقيف كل من الطبيب والشاب المصاب بالسكري بالسلوكيات المتعلقة بالغذاء وتأثير وجبات معينة على مستويات الجلوكوز.

صيام رمضان من قبل الشباب المصابين بالسكري

الملخص التنفيذي والتوصيات

استشارات ما قبل رمضان

• يجب أن يتلقى الأطفال والمراهقون المصابون بداء السكري من النوع الأول والذين يرغبون في الصيام خلال شهر رمضان المشورة والتثقيف حول مرض السكري قبل رمضان.

• يجب أن يتناول التعليم قبل رمضان نوع الأنسولين ومدى تأثيره ، ومراقبة الجلوكوز ، والتغذية ، والنشاط البدني ، ويوم المرض وارتفاع السكر في الدم ، والتعرف على نقص السكر في الدم وعلاجه.

• يجب أن يتم توجيه التعليم إلى كل من الشاب وعائلته من قبل خبراء في إدارة مرض السكري لهذه الفئة العمرية.

• يجب تقديم المشورة بشأن جواز وضرورة وخز الجلد لمراقبة الجلوكوز أو حقن الأنسولين أثناء الصيام للوقاية من المضاعفات الحادة قبل شهر رمضان.

• يعد تحسين التحكم في نسبة السكر في الدم قبل شهر رمضان إجراءً ضروريًا لضمان الصيام الآمن.

• يجب استبعاد الجهل بنقص السكر في الدم قبل شهر رمضان ومراقبته خلال شهر رمضان.

مراقبة الجلوكوز

• من الضروري قياس نسبة الجلوكوز في الدم بشكل متكرر أو المراقبة المستمرة للجلوكوز (CGM) خلال شهر رمضان لتقليل مخاطر نقص السكر في الدم واكتشاف فترات ارتفاع السكر في الدم.

• قد يؤدي استخدام المراقبة المستمرة للسكري أو المراقبة المستمرة للجلوكوز الممسوحة ضوئيًا بشكل متقطع إلى تسهيل تعديل الأنسولين خلال صيام رمضان.

إدارة التغذية

• يجب مراعاة نوعية وكمية الطعام الذي يتم تقديمه خلال شهر رمضان للوقاية من المضاعفات الحادة وزيادة الوزن المفرطة والتغيرات السلبية في مستوى الدهون .

• يجب أن تعتمد الوجبات على الكربوهيدرات ذات المؤشر الجلايسيمي المنخفض وتشمل الفاكهة والخضروات والبروتينات الخالية من الدهون. يجب استخدام الدهون الأحادية غير المشبعة والدهون المتعددة غير المشبعة بدلًا من الدهون المشبعة. يجب الحد من الحلويات والأطعمة المقلية وتجنب المشروبات المحلاة.

• يجب أن تكون وجبة السحور متأخرة قدر الإمكان.

• عد الكربوهيدرات خاصة في وجبات ما قبل الفجر (السحور) ووجبات الإفطار تمكن من مطابقة جرعة الأنسولين سريع المفعول مع كمية الكربوهيدرات. يجب الحفاظ على الترطيب عن طريق شرب الماء وغيره من المشروبات غير المحلاة على فترات منتظمة خلال ساعات عدم الصيام.

الافطار

• ينصح بالفطر الفوري في حالة نقص السكر في الدم بغض النظر عن التوقيت. تنطبق هذه التوصية على نقص السكر في الدم المصحوب بأعراض ونقص السكر في الدم بدون أعراض أقل من 70 مجم / ديسيلتر (3.9 ملي مول / لتر)

توصيات الطبية و الدينية

• نوصي بوضع إجماع / مبادئ توجيهية حول الحد الأدنى لسن الصيام من قبل أعضاء فريق العمل ذوي المعرفة والاهتمام بشهر رمضان. وينبغي أن يؤيد ذلك علماء الدين لتوحيد قواعد الترخيص والإعفاء للصيام.

• من المهم الفهم الصحيح للقواعد الإسلامية المتعلقة بالصيام والمرض ، والتي تسمح للأفراد الذين يعانون من حالات طبية بالفطر. يجب أن يساعد الاتصال بعلماء الدين في إقناع غير المؤهلين للصيام وتجنب الشعور بالذنب.

• صيام رمضان إلزامي على جميع المراهقين والبالغين الأصحاء ، ولكن يُعفى المصابون بالأمراض إذا شعروا أن الصيام سيؤثر سلباً على صحتهم. ومع ذلك ، يختار العديد من المصابين بالسكري الصيام.

هل يجب أن يصوم الأطفال والمراهقون في رمضان؟

في العديد من مراكز السكري التي بها سكان مسلمون ، يتفق أخصائيو الرعاية الصحية على أن المراهقين يمكنهم الصيام إذا كان لديهم تحكم معقول في نسبة السكر في الدم ، ووعي جيد بنقص السكر في الدم ومستعدون لمراقبة مستويات السكر في الدم بشكل متكرر أثناء الصيام .

أشارت دراسة حديثة إلى أن 80 تقريبًا النسبة المئوية للأطباء الذين يعتنون بالأطفال والمراهقين المصابين بالسكري سيسمحون لمرضاهم بالصيام إذا رغبوا في ذلك ، بشرط استيفاء المعايير المذكورة أعلاه .

على الرغم من أن بعض الخبراء قد يعتبرون أن الصيام خلال شهر رمضان يمثل خطرًا كبيرًا على تدهور التمثيل الغذائي ، فقد أظهرت الدراسات الحديثة أن الأفراد الذين يعانون من مرض السكر النوع الاول يمكنهم الصيام خلال شهر رمضان و يقترحون امتثالهم لخطة إدارة رمضان المركزة ويخضعون لإشراف مهني دقيق. و أوضح آخرون كيفية تقييم وتقديم المشورة ومراقبة وإدارة الأشخاص الذين يعانون من مرض السكري النوع الاول والذين يرغبون في الصيام خلال شهر رمضان .

يمكن للأطفال والمراهقين المصابين بداء السكري الصيام خلال شهر رمضان بشرط استيفاء معايير معينة.

التقييم والتعليم لمرضى السكري قبل رمضان

يعد التقييم والتعليم قبل رمضان أمرًا حيويًا لضمان ملاءمة وسلامة الشباب الذين يعانون من مرض السكري النوع الاول الذين يخططون للصيام. تدير العديد من وحدات مرض السكري جلسات تثقيفية خاصة قبل شهر رمضان لضمان صيام آمن.

وتشمل الاستراتيجيات ما يلي:

1. التوعية بمرض السكري التي تركز على رمضان ، بما في ذلك التغذية والنشاط البدني وتعديل الأنسولين بالإضافة إلى إدارة الطوارئ لنقص السكر في الدم وارتفاع السكر في الدم والحامض الكيتوني السكري.
2. التقييم الطبي قبل رمضان بما في ذلك تقييم الوعي بنقص السكر في الدم.
3. تحسين السيطرة على نسبة السكر في الدم قبل رمضان لتقليل المخاطر المحتملة المرتبطة بالصيام وتقليل تقلب الجلوكوز.
4. المراقبة المتكررة لنسبة الجلوكوز في الدم أو استخدام المراقبة المستمرة للسكري أو تقنيات المراقبة المستمرة للسكري والتدريب على كيفية تفسير النتائج والعمل وفقًا لها.
5. يشترط الإفطار فوراً لعلاج نقص السكر في الدم أو لمنع المضاعفات الحادة.

يعتبر الافتقار إلى التقييم قبل الصيام والتثقيف المناسب عن مرض السكري عقبات رئيسية أمام تسهيل صيام رمضان الآمن لمرضى السكري النوع الاول. يعد البرنامج التعليمي الموجه للشباب والأسرة قبل رمضان أمرًا ضروريًا للصيام الآمن.

فسيولوجيا الصيام

أثناء صيام الأفراد الأصحاء ، تميل مستويات الجلوكوز المنتشرة إلى الانخفاض ، مما يؤدي إلى انخفاض إفراز الأنسولين. بالإضافة إلى ذلك ، ترتفع مستويات الجلوكاجون والكاتيكولامينات ، مما يؤدي إلى تحلل الجليكوجين وتكوين السكر. في الأشخاص الذين يعانون من مرض السكري النوع الاول ، قد لا يؤدي نقص السكر في الدم الذي يحدث أثناء الصيام إلى استجابة مناسبة للجلوكاجون. بالإضافة إلى ذلك ، يمكن أن يعاني الأفراد المصابون بالاعتلال العصبي اللاإرادي من خلل في إفراز الأدرينالين لمواجهة نقص السكر في الدم. تم العثور على أن التغيرات في نمط النوم وتناول الطعام في رمضان مرتبطة بالتغيرات في مستويات الكورتيزول ، والتي قد تؤثر على الاستجابة لنقص السكر في الدم.

الإفطار في حالة نقص السكر في الدم

تعد مراقبة مستوى الجلوكوز في الدم أثناء الصيام أمرًا ضروريًا للتنبؤ بنقص السكر في الدم والوقاية منه وعلاجه. يُنصح عمومًا بضرورة التوقف عن الصيام في حالة ظهور نقص السكر في الدم. ومع ذلك ، لا يوافق الشباب بالضرورة على الإفطار ، خاصة إذا حدث نقص السكر في الدم بالقرب من غروب الشمس ، وهو ما يمثل نهاية صيام اليوم. قد يعرضهم هذا السلوك لنقص السكر في الدم الشديد.

إدارة التغذية في رمضان

1. التثقيف الغذائي قبل رمضان

تقييم التغذية والتعليم قبل رمضان ضروريان لضمان سلامة الشاب الذي يخطط لصيام رمضان. مطلوب خطة وجبات فردية بناءً على متطلبات الطاقة ، والأطعمة التي يتم تناولها بشكل شائع خلال شهر رمضان ، وتوقيت وجبات السحور (قبل الفجر) والإفطار (بعد غروب الشمس) ، ونظام الأنسولين ، ونمط التمرين. المراقبة المستمرة لتناول الطعام مع ضبط الأنسولين المناسب أمر ضروري خلال شهر رمضان للمساعدة في منع نقص السكر وارتفاع السكر في الدم. يوصى بتناول السوائل مثل الماء أو السوائل غير المحلاة على فترات منتظمة في غير ساعات الصيام للوقاية من الجفاف.

2. روتين الوجبات خلال شهر رمضان

يمثل صيام رمضان تحولًا كبيرًا في توقيت الوجبة ومحتواها ونمط الحياة اليومية وأنماط التمارين الرياضية. كل هذه التغييرات لها تأثير مباشر على مستويات السكر في الدم. الوجبتان الرئيسيتان اللتان يتم تناولهما خلال شهر رمضان هما الإفطار ، وهي الوجبة التي يتم تناولها بعد غروب الشمس عادة بين الساعة 6 مساءً وحتى 7:30 مساءً ، والسحور ، وهي وجبة ما قبل الفجر عادة ما يتم تناولها بين الساعة 3 صباحًا و 5:30 صباحًا. تختلف أوقات الوجبات بين البلدان مع ساعات شروق الشمس وغروبها. يجب تناول وجبة ما قبل الفجر في أقرب وقت ممكن من الفجر لتقليل فترة الصيام. بالإضافة إلى ذلك ، عادة ما يتم تناول وجبة أو عشاء متأخر في المساء قبل النوم (حوالي الساعة 10 مساءً). يحتوي هذا عادة على حلويات تقليدية. يمكن تناول وجبة خفيفة مثل الحليب والتمر أو العصير في البداية قبل الإفطار للإفطار.

3. مبادئ توجيهية للعناية التغذوية وتخطيط الوجبات

تختلف التركيبات الغذائية للأطعمة التي يتم تناولها في رمضان عن باقي العام. أظهرت الدراسات أن الشباب قد يتغيروا بشكل كبير في تناول العناصر الغذائية مع زيادة تناول الدهون والسكر خلال شهر رمضان. أوصى الباحثون بأن المراهقين الذين يعانون من مرض السكري النوع الاول يجب أن يقللوا من تناول الدهون المشبعة والسكر خلال شهر رمضان. يجب أن تكون الكربوهيدرات ذات المؤشر الجلايسيمي المنخفض أساس الأطعمة التي يتم تناولها في الإفطار والسحور. البروتينات الخالية من الدهون والكربوهيدرات منخفضة السكريات مهمة بشكل خاص في وجبة ما قبل الفجر لتعزيز الشبع خلال النهار. ينصح بشدة بالاعتدال في تناول الحلويات التقليدية والأطعمة المقلية ، خاصة عند غروب الشمس. يجب تغطية ذلك عن طريق الأنسولين سريع المفعول أثناء الأكل لمنع النزهات السريعة لنسبة السكر في الدم بعد الأكل.

بالنسبة لأولئك الذين يستخدمون العلاج المكثف بالأنسولين ، يوصى بالتثقيف حول حساب الكربوهيدرات للسماح بتعديل جرعة الأنسولين الأولية لتتناسب مع تناول الكربوهيدرات في الإفطار والسحور ووجبة العشاء. يعتبر الاتساق اليومي في تناول الكربوهيدرات في الإفطار والسحور ضروريًا لمن يتبعون نظام الحقن مرتين يوميًا. يجب عدم تشجيع تناول الوجبات الخفيفة المستمرة طوال الليل بعد الإفطار. ويفضل أنسولين الأنسولين قبل الأكل على الأنسولين أثناء أو بعد الوجبة.

4. الحفاظ على وزن صحي وتقليل عوامل الخطر القلبية الوعائية خلال شهر رمضان

من المهم منع فرط شحميات الدم وزيادة الوزن المفرطة في رمضان. يجب تشجيع اتباع نظام غذائي غني بالفواكه والخضروات ومنتجات الألبان والبقوليات والحبوب الكاملة لتقليل التغييرات السلبية في ملامح الدهون ومنع زيادة الوزن المفرطة. وجدت مراجعة منهجية أجريت على البالغين للتحقيق في التغيرات في ملف مخاطر التمثيل الغذائي للقلب أن تأثير صيام رمضان على نسبة الدهون في الدم كان واضحا". وايضا" وجدت بعض الدراسات زيادة ملحوظة في نسبة الدهون في الدم ، بينما أشارت دراسات أخرى إلى انخفاض مستوى الكوليسترول الضار والكوليسترول الكلي. يوصي التحالف الدولي للاتحاد الدولي للسكري بأن يكون حمل السعرات الحرارية للبالغين أثناء صيام رمضان مماثلًا لبقية العام. في الأطفال والمراهقين الذين يعانون من مرض السكري النوع الاول ، تم الإبلاغ عن زيادة الوزن وفقدان الوزن في رمضان ؛ وفقًا لذلك ، من الضروري وضع خطة فردية مع كمية مناسبة من الطاقة للحفاظ على النمو والتنمية. هناك حاجة إلى المتابعة المنتظمة للأطفال والمراهقين الصائمين لمراقبة ومنع التغيرات السريعة في الوزن خلال شهر رمضان. يمكن أن يرتبط فقدان الوزن بتدهور التحكم في نسبة السكر في الدم ويجب مراقبة ذلك.

. جرعة الأنسولين وقت الوجبة

إن استخدام جرعة ممتدة يتم توصيلها بواسطة مضخة الأنسولين ، حيث يتم توصيل بعض الأنسولين على الفور والباقي على مدى 2 إلى 6 ساعات ، يتيح للأنسولينالجرعة أن يتطابق مع تأثير نسبة السكر في الدم للوجبة. هذا مفيد بشكل خاص للوجبات الغنية بالدهون مثل تلك التي يتم تناولها في الإفطار.

السيطرة المستمرة على سكر الدم هي أداة مفيدة لإظهار تأثير الوجبات التي يتم تناولها خلال شهر رمضان. يمكن أن يوجه التغييرات في توقيت إعطاء الأنسولين وجرعة الأنسولين لتتناسب مع صورة الأطعمة الغنية بالدهون. هناك حاجة لدراسات بشأن طرق تحسين نسبة السكر في الدم بعد الأكل في رمضان خاصة بعد وجبة المساء.

يعد وضع خطة وجبات فردية قبل رمضان أمرًا ضروريًا. يجب أن يهدف هذا إلى الحفاظ على السعرات الحرارية اليومية وتجنب التغيرات المفرطة في الوزن. يجب أن تأخذ الخطة بعين الاعتبار نظام الأنسولين وتغيير أوقات الوجبات ونوع الطعام الذي يتم تناوله خلال شهر رمضان.

رمضان والنشاط البدني

تختلف أنماط التمرين لدى الأطفال والمراهقين عن البالغين لأنها تختلف من لعب لا يمكن التنبؤ به إلى رياضة مخططة. عادة ، خارج فترات الصيام ، يُنصح بتناول كربوهيدرات إضافية للأنشطة العفوية لتجنب نقص السكر في الدم. خلال صيام رمضان ، يجب الانتباه بعناية لتعديل الأنسولين لتمكين المستويات الطبيعية من النشاط البدني خلال ساعات الصيام دون نقص أو ارتفاع السكر في الدم. يجب أن يناقش التثقيف حول مرض السكري قبل رمضان النشاط البدني مع خطة لتعديل الأنسولين المناسب ، والترطيب وعلاج نقص السكر في الدم كجزء من الرعاية الفردية.

يوصى بالمحافظة على مستوى معقول من النشاط في رمضان ، مع مراعاة تجنب الأنشطة الشاقة في الساعات التي تسبق وجبة الغروب حيث يكون احتمال حدوث نقص السكر في الدم هو الأكثر احتمالا. تختلف أنماط التمرين في رمضان حسب المنطقة الجغرافية والحاجة للالتحاق بالمدرسة. يؤثر الاختلاف في أنماط النوم المقترن بالصيام في ساعات النهار على مقدار ونوع النشاط البدني الذي يشارك فيه الشباب. وقد تم الإبلاغ عن انخفاض النشاط البدني لدى المراهقين غير المصابين بالسكري مع صيام رمضان ؛ ومع ذلك ، هناك حاجة إلى مزيد من الدراسات.

هناك دراسات محدودة حول التغذية وإدارة الرياضة خلال شهر رمضان تركز على الأطفال والمراهقين. خلصت مراجعة للدراسات التي أجريت على الرياضيين البالغين الأصحاء الذين شاركوا في صيام رمضان إلى أن التغييرات في التدريب ، وتناول السوائل ، والنظام الغذائي ، وأنماط النوم يمكن إدارتها لتقليل ، ولكن ليس التخفيف تمامًا ، من تأثير رمضان على الأداء الرياضي. خلصت المراجعة إلى أنه يجب على الرياضيين الذين يعانون من مرض السكري النوع الاول النظر في الإعفاء الطبي من الصيام ؛ ومع ذلك ، أكدت المراجعة ما إذا كان الرياضي يختار الصيام على الحاجة إلى خطة فردية لتحسين الأداء وضمان السلامة. تم تحديد الإدارة الغذائية للأداء الرياضي في مرض السكري النوع الاول ، ومع ذلك ، فإنها تتطلب التكيف في توقيت الوجبة للوقود والتعافي للرياضيين الذين يختارون مراقبة الصيام. يجب تقديم إرشادات محددة بشأن تلبية متطلبات السوائل والطاقة والشوارد والكربوهيدرات والبروتينات خلال ساعات عدم الصيام مع السماح بالنوم الكافي. هناك حاجة إلى مزيد من الدراسات لفحص آثار صيام رمضان على الأداء وطرق تحقيق أهداف التغذية الرياضية لدى الرياضيين الشباب الذين يعانون من مرض السكري النوع الاول. يتم تشجيع الأطفال والمراهقين على ممارسة الرياضة أثناء صيام رمضان ولكن تجنب الأنشطة الشاقة مع اقتراب موعد تناول وجبة الغروب حيث تزداد احتمالية حدوث نقص السكر في الدم.

مراقبة نسبة الجلوكوز في الدم أثناء الصيام

يعد تحسين التحكم في نسبة السكر في الدم قبل رمضان إجراءً ضروريًا لضمان الصيام الآمن. يلزم إجراء قياسات متكررة لنسبة الجلوكوز في الدم من أجل صيام آمن خلال شهر رمضان وهذا لا ينتهك صيام شهر رمضان. إن استخدام السيطرة المستمرة على سكر الدم يسهل أيضًا تعديل الأنسولين خلال شهر رمضان.

تبقى مراقبة الجلوكوز في الدم الشعري هي الطريقة الأكثر استخدامًا للرصد. المفهوم السائد بين المجتمعات الإسلامية بأن وخز الجلد لاختبار الجلوكوز في الدم يبطل صيام رمضان هو تفسير غير صحيح. يجب التأكيد بقوة على هذا في البرامج التعليمية.

تعتمد قياسات الجلوكوز خلال شهر رمضان على نفس مبادئ المراقبة خارج شهر رمضان مع ربط الأوقات بالوجبات والأدوية والأعراض. لتقييم مدى كفاية التحكم بعد الأكل ، يوصى بالقراءات بعد ساعتين من الوجبة المسائية الرئيسية (الإفطار) وقبل وجبة قبل الفجر. يعد قياس الاستيقاظ أمرًا ضروريًا لأنه سيمكن المرضى من الحكم على الجرعة الأساسية بالإضافة إلى تغطية الأنسولين في وجبة السحور. يوصى بإجراء الاختبار في آخر ساعتين من فترة الصيام حيث من المعروف أن هذا التوقيت مرتبط بزيادة احتمالية الإصابة بنقص السكر في الدم. تعد المراقبة الإضافية في منتصف النهار مفيدة إذا كانت قراءات الصباح في النطاق الطبيعي المنخفض أو عند ظهور أعراض نقص السكر في الدم أو الاشتباه بها.

المراقبة المستمرة للجلوكوز

المراقبة المنتظمة للجلوكوز ضرورية للصيام الآمن ويجب التأكد من أن وخز الجلد لا يبطل الصيام وهي أدوات مفيدة لتسهيل تعديل الأنسولين خلال صيام رمضان.

الخلاصة

تعتبر إدارة الأطفال والمراهقين المصابين بمرض السكري خلال صيام شهر رمضان تحديًا نظرًا لوجود بيانات محدودة عالية الجودة في مرض السكري لدى الأطفال. هناك حاجة لتجارب داعمة ذات شواهد جيدة التصميم لتحديد أنظمة الأنسولين المثلى لتقليل تقلبات الجلوكوز خلال ساعات الصيام وتناول الطعام. التطورات التكنولوجية الحديثة مثل استخدام نظائر الأنسولين الجديدة ومضخات الأنسولين "الذكية" وأجهزة مراقبة الجلوكوز المتقدمة والمراقبة عن بُعد قد تعزز الصيام الآمن في المستقبل. ومع ذلك ، لا يمكن الوصول إلى هذه الابتكارات عالميًا. في الوقت الحالي ، يبقى التقييم الفردي الدقيق والتثقيف المنظم حول مرض السكري الدعامة الأساسية لضمان الصيام الآمن.

الجزء الثاني من برنامج الدراسة:

تقييم وإدارة نقص السكر في الدم لدى الأطفال والمراهقين المصابين بداء السكري

الملخص التنفيذي والتوصيات

• يعتبر نقص السكر في الدم من أكثر المضاعفات الحادة شيوعاً لمرض السكري من النوع الأول. قد يحدث أيضًا في مرض السكري من النوع 2 عندما يشمل العلاج علاج الأنسولين أو السلفونيل يوريا.

• يمثل نقص السكر في الدم حاجزًا فسيولوجيًا ونفسيًا رئيسيًا لتحقيق التحكم الأمثل في نسبة السكر في الدم وقد يؤدي إلى اعتلال عاطفي كبير للمرضى والقائمين على رعايتهم.

• مراقبة نقص السكر في الدم هو عنصر أساسي في رعاية مرضى السكري كما هو الحال مع التثقيف حول أسبابه والوقاية منه وعلاجه. يحتاج الآباء ومقدمو الرعاية إلى أن يطمئنوا إلى أن التحكم الجيد في نسبة السكر في الدم يمكن تحقيقه دون أحداث نقص السكر في الدم في الحالات الشديدة.

• من الأفضل تعريف نقص السكر في الدم على أنه انخفاض في مستوى الجلوكوز في الدم وذلك يعرض المريض لضرر محتمل ولا يمكن أن يكون هناك تعريف رقمي واحد لهبوط السكر في الدم لجميع المرضى والمواقف.

• يجب أن يكون الهدف من علاج مرض السكري هو الحفاظ على مستوى السكر في الدم> 3.9 ملي مول / لتر (70 مجم / ديسيلتر) مع السعي لتحقيق أفضل تحكم ممكن في نسبة السكر في الدم دون حدوث نقص حاد في سكر الدم.

• في الممارسة السريرية ، يتم استخدام قيمة الجلوكوز ≥3.9 مليمول / لتر (70 مجم / ديسيلتر) كتنبيه سريري لبدء علاج نقص السكر في الدم في مرض السكري بسبب احتمالية انخفاض الجلوكوز أكثر.

• يُعرَّف نقص السكر في الدم بأنه حدث له ضعف إدراكي شديد (بما في ذلك الغيبوبة والتشنجات) يتطلب مساعدة خارجية من شخص آخر لإدارة الكربوهيدرات والجلوكاجون أو اتخاذ إجراءات تصحيحية أخرى. تُعرَّف غيبوبة نقص السكر في الدم الحادة بأنها مجموعة فرعية من نقص السكر في الدم الحاد ، كحدث مرتبط بنوبة صرع أو فقدان للوعي.

• انخفض معدل حدوث غيبوبة نقص السكر في الدم على مدى العقدين الماضيين بمعدل حالي من 3 إلى 7 لكل 100 مريض/ سنة عبر السجلات الدولية. على الرغم من أن انخفاض الهيموغلوبين A1c, كان عامل خطر لنقص السكر في الدم الشديد ، إلا أن هذا الارتباط لم يعد يُلاحظ مع العلاج المعاصر في الدراسات الاستقصائية الحديثة.

• يبقى الأطفال الصغار معرضين لخطر الإصابة بنقص سكر الدم الشديد بسبب ضعف قدرتهم على إيصال احتياجاتهم.

• تنجم أعراض نقص السكر في الدم عند الشباب عن التنشيط الأدرينالي (مثل الاهتزاز ، وخفقان القلب ، والعرق) ونقص السكر في الدم (مثل الصداع ، والنعاس ، وصعوبة التركيز). عند الأطفال الصغار ، قد تكون التغيرات السلوكية مثل التهيج ، والإثارة ، والهدوء ، ونوبات الغضب بارزة.

• قد تحدث أعراض نقص السكر في الدم والاستجابات الهرمونية الفسيولوجية عند مستويات جلوكوز أعلى لدى الأطفال مقارنة بالبالغين ، وقد تتغير عتبات التنشيط بسبب ارتفاع السكر في الدم المزمن (أي يحدث عند ارتفاع مستوى السكر في الدم) أو نقص السكر في الدم المتكرر (أي يحدث عند انخفاض مستوى السكر في الدم).

• في مرض السكري من النوع 1 ، ينتج نقص السكر في الدم عن نقص استبدال الأنسولين. يزداد خطر الإصابة بنقص السكر في الدم بسبب عيوب الهرمونات التنظيمية المضادة ، بما في ذلك فقدان استجابة الجلوكاجون لنقص السكر في الدم الذي قد يحدث بعد التشخيص بفترة وجيزة.

• تشمل المسببات السريرية الشائعة لنقص السكر في الدم جرعات الأنسولين المفرطة ، والوجبات الفائتة ، والتمارين الرياضية ، والنوم ، وابتلاع الكحول عند المراهقين. تشمل عوامل الخطر صغر السن ، وأحداث نقص السكر في الدم الشديدة السابقة ، وانخفاض الوعي بنقص السكر في الدم.

• قد يحدث نقص السكر في الدم مع ممارسة الرياضة في وقت النشاط أو قد يتأخر (بعد 7-11 ساعة). يجب أن يتلقى مقدمو الرعاية والمرضى التثقيف والمشورة حول كيفية ممارسة الرياضة بأمان وتجنب أحداث سكر الدم.

• النوم هو الوقت الذي ينطوي على مخاطر خاصة لنقص السكر في الدم الشديد ونقص السكر في الدم بدون أعراض هو أمر شائع ؛ لهذا السبب ، يوصى بمراقبة مستويات الجلوكوز طوال الليل خاصةً إذا كان هناك عامل خطر إضافي قد يؤهب لنقص سكر الدم الليلي. قد تكون زيادة توافر أجهزة مراقبة الجلوكوز المستمرة (CGMs) مفيدة بشكل خاص لهذا.

• يمكن أن يحدث ضعف الوعي بنقص السكر في الدم لدى الأطفال المصابين بداء السكري وعندما يكون مرتبطًا بزيادة كبيرة في خطر الإصابة بنقص السكر في الدم الشديد. يجب أن يكون تحديد الوعي بنقص السكر في الدم أحد مكونات المراجعة السريرية الروتينية. يمكن تصحيح ضعف الوعي عن طريق تجنب نقص السكر في الدم.

علاج نقص السكر في الدم

• نقص السكر في الدم الشديد يتطلب علاجاً عاجلًا. في المستشفى ، قد يشمل ذلك الجلوكوز في الوريد (10٪ جلوكوز ، 2-3 مل / كغ). في المنزل أو الإسعاف ، يجب إعطاء الجلوكاجون العضلي (IM) أو تحت الجلد للأطفال> 25 كجم و 0.5 مجم للأطفال أقل من 25 كجم).

• يجب أن يكون الجلوكاجون متاحًا بسهولة لجميع الآباء ومقدمي الرعاية ، خاصةً عندما يكون هناك خطر كبير للإصابة بنقص سكر الدم الشديد. التعليم على إدارة الجلوكاجون أمر ضروري. يعتبر الجلوكاجون عن طريق الأنف بديلًا واعدًا للجلوكاجون العضلي وسيوفر حاجة غير ملباة لتحضير الجلوكاجون الذي يتم إدارته بسهولة.

• يجب معالجة حالات انخفاض سكر الدم الأكثر اعتدالًا باستخدام الجلوكوز الفموي (10-15 جم جلوكوز). اعتمادًا على الظروف ، يجب أن يتبع الجلوكوز سريع المفعول كربوهيدرات إضافية لمنع تكرار نقص السكر في الدم.

• يجب أن يؤدي علاج نقص السكر في الدم إلى زيادة نسبة السكر في الدم بما يقرب من 3 إلى 4 مليمول / لتر (54-70 مجم / ديسيلتر). يمكن تحقيق ذلك عن طريق إعطاء أقراص الجلوكوز أو السوائل المحلاة. يحتاج الطفل البالغ وزنه 30 كجم تقريبًا 9 جم من الجلوكوز و 15 جم للطفل البالغ وزنه 50 كجم (حوالي 0.3 جم / كجم).

• بعد العلاج الأولي لنقص السكر في الدم ، يجب إعادة اختبار نسبة السكر في الدم خلال 10 إلى 15 دقيقة. إذا لم يكن هناك استجابة أو استجابة غير كافية ، كرر علاج نقص السكر في الدم. أعد اختبار مستوى الجلوكوز في الدم بعد 10 إلى 15 دقيقة أخرى للتأكد من الوصول إلى الجلوكوز المستهدف (100 مجم / ديسيلتر).

الوقاية من نقص السكر في الدم

• ينبغي الوقاية من نقص السكر في الدم لأن حدوثه يمكن التنبؤ به في كثير من الأحيان ، وغالبًا ما يكون مرتبطًا بخلل وظيفي نفسي اجتماعي كبير. والأهم من ذلك ، أنه نادرًا ما يؤدي إلى نتائج دائمة طويلة الأمد وقد يهدد الحياة.

• التثقيف بشأن مرض السكري أمر بالغ الأهمية لمنع نقص السكر في الدم.

• يجب تقديم التثقيف حول عوامل الخطر لنقص السكر في الدم للمرضى وأسرهم لتنبيههم إلى الأوقات والمواقف التي تتطلب زيادة مراقبة الجلوكوز وعندما يلزم تغيير نظم العلاج.

• يجب أن تكون أجهزة قياس نسبة الجلوكوز في الدم متاحة لجميع الأطفال المصابين بداء السكري من أجل التأكيد الفوري والإدارة الآمنة لنقص السكر في الدم.

• يجب إجراء مراقبة جلوكوز الدم قبل التمرين ، ويمكن استهلاك المزيد من الكربوهيدرات بناءً على مستوى الجلوكوز في الدم والشدة المتوقعة ومدة التمرين.

• ينبغي إيلاء اهتمام خاص لتدريب الأطفال وأولياء الأمور ومعلمي المدارس ومقدمي الرعاية الآخرين للتعرف على علامات الإنذار المبكر لنقص السكر في الدم ومعالجة انخفاض مستوى الجلوكوز في الدم على الفور وبشكل مناسب.

• يجب تدريب المرضى وأولياء أمورهم على الاتصال بمقدم رعاية مرضى السكري إذا تم توثيق نقص السكر في الدم بدون أعراض أو إذا كانت الأعراض هي أعراض نقص السكر في الدم وليس الأعراض اللاإرادية (أي ضعف الوعي بنقص السكر في الدم).

• في المرضى والأسر التي لديها خوف كبير من نقص السكر في الدم ، يمكن النظر في التدخلات من خلال الاستراتيجيات التعليمية و / أو السلوكية على الرغم من أن الأدلة على الأطفال محدودة.

• يجب أن يرتدي الأطفال والمراهقون المصابون بداء السكري شكلًا من أشكال التعريف أو التنبيه لمرض السكري لديهم.

• يجب أن يكون المصدر الفوري للجلوكوز متاحًا دائمًا للشباب المصابين بداء السكري.

• قد تحتاج أهداف جلوكوز الدم إلى تعديلها بشكل تصاعدي في المرضى الذين يعانون من نقص السكر في الدم المتكرر و / أو ضعف الوعي بنقص السكر في الدم.

• التقنيات المتاحة حاليًا مثل المراقبة المستمرة للسكري ، ومعلقات الأنسولين الآلية (التعليق عند انخفاض ، والتعليق قبل الانخفاض) قللت من مدة نقص السكر في الدم. تعمل التقنيات الحديثة (أنظمة البنكرياس الاصطناعية) على تحسين التحكم في الجلوكوز وتقليل نقص السكر في الدم في العيادات الخارجية مقارنةً بالعلاج بالمضخة التقليدية.

علامات وأعراض نقص السكر في الدم

العلامات والأعراض اللاإرادية

رجفة ، تعرق ، خفقان ، شحوب.

العلامات والأعراض العصبية

ضعف التركيز ، عدم وضوح الرؤية أو ازدواجها ، اضطراب رؤية الألوان ، صعوبة في السمع ، تداخل الكلام ، ضعف الحكم والارتباك ، مشاكل في الذاكرة قصيرة المدى ، دوخة ومشية غير مستقرة ، فقدان الوعي ، نوبات صرع.

العلامات والأعراض السلوكية

التهيج ، السلوك غير المنتظم ، الهياج ، الكوابيس ، البكاء الذي لا يهدأ.

أعراض غير محددة

الجوع والصداع والغثيان والتعب.

مضاعفات الأوعية الدموية الدقيقة والأوعية الدموية الكبيرة عند الأطفال والمراهقين

التوصيات

1 - بدء فحص مضاعفات الأوعية الدموية الدقيقة في سن 11 سنة (10 سنوات سابقاً)

2. يجب إجراء فحص لأمراض الأوعية الدموية الدقيقة قبل الحمل وخلال كل ثلاثة أشهر من الحمل 3. فحص الشذوذ الدهني في حالة عدم الصيام

4. الكشف عن أمراض الكلى عن طريق نسبة الكرياتينين الزلال في الصباح الأول كطريقة مفضلة

التوصيات - الكشف عن المضاعفات والوقاية منها.

وقاية

• يجب استخدام التعليم والعلاج المكثف للأطفال والمراهقين لمنع أو تأخير ظهور وتطور مضاعفات الأوعية الدموية.

• إن تحقيق السيطرة المستهدفة على نسبة السكر في الدم سيقلل من مخاطر ظهور مضاعفات الأوعية الدموية لمرض السكري وتفاقمها.

• يجب إجراء الفحص قبل الحمل وفي كل ثلاثة أشهر من الحمل.

بيلة الألبومين

• يجب أن يبدأ فحص البول الزلالي من سن 11 عامًا ومدة مرض السكري من 2 إلى 5 سنوات.

• يجب إجراء الفحص السنوي لبيلة الألبومين بواسطة عينات بول الصباح الأولى لمعرفة نسبة الألبومين في البول / الكرياتينين (ACR).

• بسبب التباين البيولوجي ، يجب استخدام عينتين من ثلاث عينات من البول كدليل على بيلة الألبومين. المربكات هي التمرين ، ونزيف الحيض ، والالتهابات ، والحمى ، وأمراض الكلى ، وارتفاع السكر في الدم بشكل ملحوظ. يجب تكرار اختبارات الفحص غير الطبيعية ، لأن بيلة الألبومين قد تكون عابرة.

• يجب استخدام مثبطات الإنزيم المحول للأنجيوتنسين (ACEIs) أو حاصرات مستقبلات الأنجيوتنسين (ARBs) في المراهقين المصابين ببول الزلال المستمر لمنع تطور البيلة البروتينية.

اعتلال الشبكية

• يجب أن يبدأ فحص اعتلال الشبكية السكري من سن 11 سنة ومدة داء السكري من 2 إلى 5 سنوات.

• يجب أن يتم فحص اعتلال الشبكية السكري من قبل طبيب عيون أو فاحص بصريات أو مراقب متمرس من خلال التلاميذ المتوسعة عن طريق الفحص المجهري الحيوي أو تصوير قاع العين.

• بالنسبة لأولئك الذين يعانون من مرض السكري لمدة تقل عن 10 سنوات ، يمكن أن يحدث اعتلال الشبكية الخفيف غير التكاثري (تمدد الأوعية الدموية الدقيقة فقط) والتحكم الجيد في نسبة السكر في الدم ، ويمكن إجراء تقييم الفحص كل سنتين عن طريق الفحص المجهري الحيوي أو التصوير الفوتوغرافي الأساسي. يجب أن يحدث تواتر فحص اعتلال الشبكية بشكل عام كل سنتين لهؤلاء المرضى ، ولكن يجب أن يكون أكثر تكرارًا إذا كانت هناك ميزات عالية الخطورة لفقدان البصر.

• بسبب التدهور المحتمل لاعتلال الشبكية للمرضى الذين يعانون من ضعف التحكم في نسبة السكر في الدم منذ فترة طويلة عندما تتحسن السيطرة بسرعة ، يوصى بمراقبة طب العيون قبل البدء في العلاج المكثف وعلى ثلاث فترات شهرية لمدة 6 إلى 12 شهرًا بعد ذلك ، خاصةً إذا كان اعتلال الشبكية معتدلًا في المرحلة غير التكاثرية أو أسوأ في وقت التكثيف.

• العلاج بالليزر والحقن داخل الجسم الزجاجي للعوامل المضادة لعامل نمو بطانة الأوعية الدموية يقلل من معدل فقدان البصر للأفراد الذين يعانون من مراحل تهدد الرؤية من اعتلال الشبكية (اعتلال الشبكية الحاد غير التكاثري أو الأسوأ و / أو الوذمة البقعية السكرية).

حالات بصرية أخرى

• ينبغي أيضًا النظر في إجراء فحص أولي شامل للعين للكشف عن إعتام عدسة العين أو أخطاء الانكسار الرئيسية أو اضطرابات العين الأخرى.

الاعتلال العصبي

• يجب أن يبدأ فحص الاعتلال العصبي المحيطي من سن 11 سنة مع 2 إلى 5 سنوات من السكري ومدة كل سنة بعد ذلك.

• تشمل الاختبارات المحددة لتقييم الاعتلال العصبي السكري تقييم الإحساس والاهتزاز وردود الفعل في القدمين لاعتلال الأعصاب المحيطية ، وتقلبات معدل ضربات القلب التقويمية للاعتلال العصبي الذاتي القلبي.

ضغط الدم

• يجب قياس ضغط الدم (BP) سنويًا على الأقل. يتم تعريف ارتفاع ضغط الدم على أنه متوسط ضغط الدم الانقباضي (SBP) و / أو ضغط الدم الانبساطي (DBP) الذي يساوي ≥ 95 بالمائة للجنس والعمر والطول في ثلاث مناسبات أو أكثر.

• يمكن المساعدة في تأكيد ارتفاع ضغط الدم من خلال قياسات ضغط الدم المتنقل على مدار 24 ساعة.

• يوصى باستخدام ACEI للأطفال المصابين بداء السكري وارتفاع ضغط الدم. لقد كانت فعالة وآمنة عند الأطفال في الدراسات قصيرة المدى ، ولكنها ليست آمنة أثناء الحمل.

الدهون

• يجب إجراء فحص لخلل شحميات الدم بعد التشخيص بفترة وجيزة (عند استقرار مرض السكري) في جميع الأطفال المصابين بداء السكري من النوع الأول بدءًا من سن 11 عامًا. إذا تم الحصول على نتائج طبيعية ، فيجب تكرار ذلك كل 5 سنوات. إذا كان هناك تاريخ عائلي لفرط كوليسترول الدم ، أمراض القلب والأوعية الدموية المبكرة (CVD) أو إذا كان التاريخ العائلي غير معروف ، يجب أن يبدأ الفحص في وقت مبكر من عمر سنتين.

• يعد الفحص باستخدام ملف تعريف الدهون أثناء الصيام مثاليًا ولكنه ليس عمليًا دائمًا لدى الشباب المصابين بداء السكري. يمكن الحصول على فحص الدهون بدون صيام وإذا كانت مستويات الدهون الثلاثية أو البروتين الدهني منخفض الكثافة (LDL) مرتفعة ، فسيتم بعد ذلك الإشارة إلى ملف تعريف الدهون أثناء الصيام.

• يُعرَّف ارتفاع نسبة الكوليسترول الضار على أنه> 2.6 ملي مول / لتر (100 مجم / ديسيلتر) هـ. إذا كان هذا موجودًا ، فيجب البدء في التدخلات لتحسين التحكم في التمثيل الغذائي ، والتغييرات الغذائية وزيادة التمارين الرياضية.

• إذا لم تؤد التدخلات المذكورة أعلاه إلى خفض نسبة الكوليسترول الضار أقل من 3.4 مليمول / لتر (130 ملجم / ديسيلتر) ، فيجب البدء في تناول العقاقير المخفضة للكوليسترول في الأطفال من سن 11 عامًا

أسلوب الحياة

• منع أو الإقلاع عن التدخين سيقلل من تطور البول الزلالي والأمراض القلبية الوعائية.

مرض الأوعية الدموية الكبيرة

• يوصى بفحص ضغط الدم والدهون على النحو الوارد أعلاه. إن فائدة الفحص الروتيني للعلامات الأخرى لمضاعفات الأوعية الدموية الكبيرة خارج بيئة البحث غير واضحة.

المضاعفات الأخرى والحالات المرتبطة بها لدى الأطفال والمراهقين المصابين بداء السكري من النوع الأول

التوصيات

• تعتبر المراقبة المنتظمة للقياسات البشرية والنمو البدني ، باستخدام معايير النمو ، ضرورية في الرعاية المستمرة للأطفال والمراهقين المصابين بداء السكري من النوع 1.

• يوصى بفحص وظائف الغدة الدرقية عن طريق قياس الهرمون المنبه للغدة الدرقية (TSH) والأجسام المضادة لبيروكسيداز الغدة الدرقية عند تشخيص مرض السكري ، وبعد ذلك ، كل سنتين في حالة الأفراد الذين لا يعانون من أعراض. يمكن الإشارة إلى التقييم الأكثر تواترًا في حالة وجود الأعراض أو تضخم الغدة الدرقية أو الأجسام المضادة للغدة الدرقية الإيجابية.

• يجب إجراء فحص الداء البطني في وقت تشخيص مرض السكري ، وبعد ذلك بعامين وخمس سنوات ، لأنه غالبًا ما يكون بدون أعراض. يتم إجراء تقييم أكثر تواترًا إذا كانت الحالة السريرية تشير إلى احتمال الإصابة بمرض الاضطرابات الهضمية أو كان لدى الطفل قريب من الدرجة الأولى مصاب بمرض الاضطرابات الهضمية.

• يجب إجراء فحص لنقص IgA عند تشخيص مرض السكري. في الأشخاص الذين يعانون من نقص IgA المؤكد ، يجب إجراء فحص لمرض الاضطرابات الهضمية باستخدام اختبارات مضادات الجسم الخاصة بـ tTG IgG أو EmA IgG ، أو كليهما.

• يجب إحالة الأطفال المصابين بداء السكري من النوع 1 الذين تم الكشف عن وجود أجسام مضادة للداء الزلاقي إيجابية في الفحص الروتيني ، إلى أخصائي أمراض الجهاز الهضمي للأطفال ، حيث أن الاختبار المصلي الإيجابي وحده لا يشخص مرض الاضطرابات الهضمية في هذه الفئة من السكان.

• عند تأكيد تشخيص مرض الاضطرابات الهضمية ، يجب أن يتلقى المرضى دعمًا تعليميًا من اختصاصي تغذية متمرس للأطفال. يجب توفير المواد التعليمية للمرضى وأسرهم.

• يجب أن يكون مقدمو رعاية مرضى السكري متيقظين لأعراض وعلامات قصور الغدة الكظرية (بسبب مرض أديسون [AD]) لدى الأطفال والمراهقين المصابين بداء السكري من النوع 1 على الرغم من ندرة حدوثه.

• يجب إجراء الفحص السريري الروتيني للجلد (على سبيل المثال ، الحثل الشحمي) وتغيرات المفاصل (على سبيل المثال ، محدودية حركة المفاصل). لا يوصى بالفحص المنتظم عن طريق المختبر أو بالطرق الإشعاعية.

• يبقى تثقيف المريض فيما يتعلق بتقنيات الحقن المناسبة ، وتناوب مواقع الحقن مع كل حقنة وعدم إعادة استخدام الإبر هي أفضل الاستراتيجيات لمنع الضخم الشحمي أو الضمور الشحمي.

• يجب تقييم مواقع الحقن بانتظام في كل زيارة للعيادة من أجل الضخامة الشحمية والضمور الشحمي لأنها من الأسباب المحتملة لتقلب الجلوكوز.

• يجب أن يكون مقدمو رعاية مرضى السكري على دراية باحتمالية حدوث تهيج للجلد باستخدام مضخات الأنسولين والمراقبة المستمرة للجلوكوز (CGM) من خلال التوصية بتدوير مواقع إدخال المضخة وأجهزة الاستشعار.

• يجب أن يؤخذ في الاعتبار فحص نقص فيتامين د ، لا سيما في الفئات المعرضة للخطر (مرض الاضطرابات الهضمية ، وتصبغ الجلد الداكن) لدى الشباب المصابين بداء السكري من النوع 1 ومعالجته باستخدام الإرشادات المناسبة.

إدارة اليوم المرضي للأطفال والمراهقين المصابين بداء السكري

الملخص التنفيذي والتوصيات

يجب أن يقدم فريق رعاية مرض السكري إرشادات واضحة للمرضى وأسرهم حول كيفية إدارة مرض السكري أثناء الأمراض الحالية ، وكيفية الاتصال بفريق مرض السكري وكذلك الموظفين الطبيين في حالات الطوارئ ، إذا لزم الأمر (اتصالات هاتفية لفريق السكري على مدار 24 ساعة ، هواتف محمولة ،

إجراءات المساعدة الطبية الطارئة ، وما إلى ذلك). بالإضافة إلى الأمراض المتداخلة الحالية ، يجب أن يشعر المرضى والعائلات بالراحة وأن يتم تشجيعهم على طلب المساعدة في أوقات سوء الإدارة ، إما عرضيًا (جرعات الأنسولين الفائتة ، توقيت غير صحيح للجرعات [على سبيل المثال ، إعطاء AM في PM] ، انسداد المضخة ، إلخ.) أو عن قصد (تقييد الأنسولين ، وما إلى ذلك) من أجل تجنب مستويات الجلوكوز لفترات طويلة خارج النطاق والتقدم إما إلى الحماض الكيتوني السكري (DKA) أو نقص السكر في الدم الشديد. يجب تكرار إعادة التثقيف سنويًا ، على سبيل المثال ، في وقت إعطاء لقاح الأنفلونزا السنوي ، **من أجل تجنب:**

• ارتفاع السكر في الدم غير المنضبط أو المصحوب بأعراض

• تجفيف

• الحماض الكيتوني

• نقص سكر الدم الشديد

يجب تذكير المرضى والأسر / مقدمي الرعاية:

• لا تتوقف عن الأنسولين تمامًا.

• عند حدوث القيء لدى طفل أو مراهق مصاب بداء السكري ، يجب اعتباره دائمًا علامة على نقص الأنسولين حتى يثبت العكس.

• عادة ما تحتاج جرعة الأنسولين إلى الزيادة (بالإضافة إلى الجرعة المعتادة) عند وجود حمى ، مع العديد من الأمراض الحادة (باستثناء أمراض الجهاز الهضمي المصحوبة بالتقيؤ) ، أثناء / بعد الإجراءات الجراحية ، العلاج بالكورتيكوستيرويدات (على سبيل المثال ، نوبة الربو ، السم اللبلاب ، والمتلازمة الكلوية ، وما إلى ذلك) ، ومع أي إجهاد كبير يعتمد على معرفة الأعراض والعلامات السريرية ، وخاصةً ، مع الوعي بمستويات الجلوكوز في الدم المراقبة ومستويات الكيتون في الدم (أو البول) التي يتم فحصها بشكل متكرر.

خمسة مبادئ عامة لإدارة مرض السكري في اليوم المرضي:

1. يجب تدريس إرشادات اليوم المرضي ، بما في ذلك تعديلات الأنسولين ، بعد التشخيص بفترة وجيزة ومراجعتها سنويًا على الأقل مع المرضى وأفراد الأسرة من أجل تقليل مخاطر الإصابة بـ DKA ونقص السكر في الدم الحاد (مع أمراض الجهاز الهضمي).

2. زيادة تواتر مراقبة نسبة السكر في الدم والكيتون (الدم أو البول). 3.

لا توقف الأنسولين.

4. مراقبة والحفاظ على الترطيب مع توازن الماء والملح الكافي. 5.

علاج أي مرض مستبطن ، وعاجل.

الجزء الثالث من برنامج الدراسة

خطة إدارة مرض السكري

خطة إدارة السكري هي وثيقة رسمية حول متطلبات إدارة مرض السكري الخاصة بالطفل في المدرسة. يجب أن يتم توفيرها من قبل الوالدين / مقدمي الرعاية للطفل المصاب بداء السكري ويجب تطويرها بمدخلات من فريق الرعاية الصحية لمرض السكري. يجب على المدرسة إجراء "تعديلات معقولة" من أجل ضمان إمكانية تسليم برنامج إدارة البيانات للخطة, و يجب أن يحتوي برنامج إدارة البيانات على جميع المعلومات المهمة لتوجيه موظفي المدرسة في مساعدة الأطفال المصابين بداء السكري خلال ساعات الدراسة. الآباء / الأوصياء هم السلطات النهائية لتوجيه العلاج الموصوف لإدارة الحالة الطبية لأطفالهم. يجب أن تكون الخطة موثقة بشكل واضح وسهلة التنفيذ.

يجب أن تتضمن خطة إدارة مرض السكري الفردي / الشخصي ما يلي:

• التعريف: الاسم وتاريخ الميلاد واسم الوالدين وسن التشخيص ونوع مرض السكري.

• معلومات الاتصال: أرقام هواتف الوالدين والطبيب / أخصائي الرعاية الصحية (HCP) وجهات الاتصال في حالات الطوارئ.

• المراقبة: أوقات القياس ، النطاقات المستهدفة للجلوكوز ، المواقع المفضلة للاختبار ، CGM

• علاج الأنسولين: نوع الأنسولين والجهاز (قلم ، حقنة ، مضخة) ، إرشادات لتعديل الجرعات ، وصيغ لحساب التصحيح وجرعات الكربوهيدرات.

• نقص السكر في الدم: الأعراض الفردية ، والقيم التي تحدد التدخل ، ونوع التدخل ، والتوجه نحو الجلوكاجون ، والمواقف التي تستدعي طلب المساعدة في حالات الطوارئ أو الذهاب إلى غرف الطوارئ.

• ارتفاع السكر في الدم: الأعراض الفردية ، القيم التي تحدد التدخل ، نوع التدخل ، جرعات الأنسولين.

• الغذاء: تعريف خطة الوجبة ، والتعديلات اللازمة على القائمة العادية ، والتفويض والتعليمات للمشاركة في الحفلات في المدرسة.

• التمرين: الإذن بالمشاركة في الرياضة المدرسية ، والتوجيه حول استخدام الكربوهيدرات والأنسولين قبل التمرين حسب مستويات الجلوكوز.

• الرعاية الذاتية: صف الإجراءات التي يستطيع الطفل القيام بها بمفرده أو تحت إشراف - على سبيل المثال ، اختبار عصا الأصابع ، ومراقبة قيم نسبة السكر في الدم وتفسيرها ، وتعديل الطعام والأنسولين بناءً على نتائج السكر والتحضير وحقن الأنسولين.

• مجموعة أدوات نقص السكر في الدم: توفير وإمكانية الحصول على الكربوهيدرات سريعة المفعول والجلوكاجون.

• المسؤوليات: الموافقة المستنيرة والتوضيح وتحديد المسؤوليات المحددة لدعم الطفل المصاب بالسكري.

أدوات وطرق التعليم

تُستخدم أدوات وطرق التعليم لتوفير المعرفة والمهارات لتحسين التحكم في نسبة السكر في الدم والنمو ونتائج القلب والأوعية الدموية. يجب تعزيز جودة النظام الغذائي جنبًا إلى جنب مع جميع أدوات قياس كمية الكربوهيدرات.

• طرق التثقيف حول الأكل الصحي وأدوات تقدير كمية الكربوهيدرات ضرورية.

• لا توجد دراسات عشوائية عالية الجودة وطويلة الأجل لدعم طريقة معينة لحساب الكربوهيدرات مقارنة بأخرى.

• توفر مراقبة نسبة الجلوكوز في الدم (قبل وبعد تناول الطعام) أو أنظمة مراقبة الجلوكوز المستمرة (CGMS) معلومات أساسية عن رحلات الجلوكوز بعد الأكل والحاجة إلى تحسين دقة حساب الكربوهيدرات ، وضبط توقيت أو كمية الأنسولين أثناء تناول الطعام ، أو تغيير توصيل الأنسولين أو جرعة لوجبات غنية بالدهون والبروتين.

• عندما تصبح العائلات أكثر ثقة في التعامل مع مرض السكري ، يجب أن يستجيب التثقيف لملاحظاتهم وتثقيفهم حول مؤشر نسبة السكر في الدم أو تغطية الأنسولين للوجبات الغنية بالدهون والبروتين.

• مع نمو الأطفال وتحملهم المزيد من المسؤولية ، فإن إعادة التعليم المنتظمة ضرورية.

يجب أن يغطي التعليم الغذائي الأساسي الأكل الصحي مع بعض طرق قياس كمية الكربوهيدرات.

الخلاصة:

الرعاية الغذائية للأطفال المصابين بالسكري معقدة. يتم وضع إدارة مرض السكري في سياق الأسرة ، والنظام الاجتماعي المحيط ، وقضايا عدم الالتزام ، وضغط الأقران ، والاستقلال الناشئ والهدف النهائي المتمثل في الحفاظ على جودة الحياة. يتطلب فهمًا عميقًا للعلاقة بين أنظمة العلاج والمتطلبات الفسيولوجية المتغيرة ، بما في ذلك النمو والتقلبات في الشهية المرتبطة بالتغيرات في سرعة النمو والمتطلبات الغذائية المتغيرة والنشاط البدني.

تشير الدلائل إلى أنه من الممكن تحسين مرض السكري من خلال الاهتمام بإدارة التغذية واتباع نهج فردي في التعليم. وهذا يتطلب تركيزًا واضحًا على الأهداف الغذائية فيما يتعلق بالتحكم في نسبة السكر في الدم وتقليل مخاطر الإصابة بأمراض القلب والأوعية الدموية.

الفرضية الأساسية للنتائج الغذائية الناجحة هي تطوير علاقة ثقة بين المهنيين الصحيين والأطفال ومقدمي الرعاية ، مما يسهل تغيير السلوك أثناء تحديات نمو الطفولة والمراهقة.

ممارسة الرياضة لدى الأطفال والمراهقين المصابين بداء السكري

إدارة التمرين الأولي

يجب تقديم تعليم مستمر للأطفال والمراهقين وأفراد الأسرة ذوي الصلة حول أحدث ما في إدارة جلوكوز الدم أثناء التمرين.

يجب تزويد الأطفال والمراهقين وأفراد الأسرة ذوي الصلة بنسخة مكتوبة أو عبر الإنترنت من الإرشادات المبنية على الأدلة الحديثة وسهلة الاستخدام والتي تركز على إدارة نسبة الجلوكوز في الدم أثناء التمرين.

يجب فحص سلوكيات نمط الحياة الخاملة بشكل روتيني وتثبيطها في عيادة مرض السكري.

يجب تقديم إستراتيجيات عملية لتحسين المشاركة بأسلوب حياة نشط لجميع المرضى.

يجب وضع خطة فردية لإدارة جلوكوز الدم لكل مريض حيث أن النصيحة الدقيقة والتخطيط بشأن التمرين والإدارة ضروريان (على سبيل المثال ، تقليل جرعة الأنسولين وتناول الكربوهيدرات وتوقيت التمرين).

يجب أن تتضمن هذه الخطة على وجه التحديد ما يلي:

• ناقش نوع وكمية الكربوهيدرات المطلوبة لممارسة معينة.

• ناقش النسبة المئوية للتخفيضات في الأنسولين قبل التمرين.

• ناقش أفضل الأوقات لممارسة الرياضة بأمان.

يجب تضمين النصائح المكتوبة حول التمارين والرياضة ضمن خطة إدارة المدرسة لمقدمي الرعاية / المعلمين.

يجب الحرص على أن يكون جهاز قياس نسبة السكر في الدم وشرائط الاختبار المختارة مناسبين للبيئة التي سيتم استخدامهما فيها.

حيثما كان ذلك مناسبًا ومتاحًا ، يجب إبلاغ المرضى وأسرهم بأن الحقن اليومية المتعددة أو المضخة قد يكون من الأسهل الجمع بينها وبين التمارين الرياضية.

يجب تشجيع المرضى على الاحتفاظ بسجلات مفصلة لنشاطهم البدني ، والأنسولين ، والغذاء ، ومستويات الجلوكوز لأن هذه السجلات مهمة لإدارة جلوكوز الدم والنصائح السريرية.

قد تكون التقنيات الجديدة ، على سبيل المثال ، المدمجة في الهواتف الذكية مفيدة.

على الرغم من أن انتشار مضاعفات مرض السكري منخفض عند الأطفال ، يجب تقديم تصريح طبي لإبلاغ المهنيين (مثل المدربين) ومقدمي الرعاية بأي قيود على المشاركة في التمرين.

يجب على المرضى الذين يعانون من اعتلال الشبكية التكاثري أو اعتلال الكلية تجنب التمارين القائمة على المقاومة أو التمارين اللاهوائية التي تؤدي إلى ارتفاع ضغط الدم الشرياني.

احتياطات عامة قبل كل جلسة تمرين

الكيتونات المرتفعة

من المهم تحديد سبب ارتفاع مستويات الكيتون. تعد مستويات الكيتون المرتفعة مصدر قلق للسلامة قبل التمرين.

يوصى بقياس نسبة الكيتون في الدم ، عند توفرها ، على قياس نسبة الكيتون في البول.

من خلال قياس الكيتونات في الدم ، يمكن اكتشاف التغيرات في الكيتونات بشكل أسرع. تقيس أجهزة مراقبة كيتون الدم الكيتون السائد ذي الصلة السريرية.

يجب معالجة ارتفاع كيتون الدم بين 0.6 و 1.4 ملي مول / لتر قبل النشاط البدني.

في حالة وجود ارتفاع في نسبة الكيتونات في الدم (≥1.5 مليمول / لتر) أو كيتونات البول (2+ أو 4.0 مليمول / لتر) يمنع استخدام التمارين عند الأطفال.

من المحتمل أن تكون التمارين عالية الكثافة خطيرة ويجب تجنبها إذا كانت مستويات الجلوكوز في الدم قبل التمرين مرتفعة> 14 مليمول / لتر (250 مجم / ديسيلتر) مع وجود أي دليل على ارتفاع مستويات الكيتون (بيلة كيتونية صغيرة أو أكثر / كيتون الدم (> 0.5 ملي مول / لتر) في حالة ارتفاع مستويات الجلوكوز والكيتون ، يجب إعطاء جرعة أنسولين باستخدام نصف عامل التصحيح المعتاد (أو 0.05 وحدة / كجم).

من الناحية المثالية ، يجب تأجيل التمرين حتى يتم إزالة دليل الكيتون في الدم.

نقص السكر في الدم في الآونة الأخيرة

نقص السكر في الدم الشديد (يُعرَّف هنا على أنه جلوكوز الدم 2.8 مليمول / لتر [50 مجم / ديسيلتر]) أو حدث يتضمن ضعفًا إدراكيًا يتطلب مساعدة خارجية للتعافي خلال الـ 24 ساعة الماضية هو موانع للنشاط البدني.

يعتبر نقص السكر في الدم الكبير (الذي يُعرف بأنه نسبة السكر في الدم أقل من 3.0 مليمول / لتر [<54 ملجم / ديسيلتر]) مهمًا من الناحية السريرية ويتطلب اهتمامًا فوريًا. سيؤدي ذلك إلى تدهور لاحق في التنظيم المضاد الهرموني أثناء النشاط البدني ، مما يؤدي بدوره إلى زيادة خطر نقص السكر في الدم المتكرر.

يمكن أن يؤدي نقص السكر في الدم غير الحاد (الذي يُعرَّف على أنه نسبة الجلوكوز في الدم 3.0-3.9 ملايمول / لتر [52-70 مجم / ديسيلتر]) والذي حدث مؤخرًا نسبيًا قبل التمرين المخطط له إلى التدهور اللاحق في التنظيم المضاد الهرموني أثناء النشاط البدني ، مما يؤدي بدوره إلى حدوث زيادة خطر الإصابة بنقص السكر في الدم المتكرر.

في جميع حالات نقص السكر في الدم الموثق قبل النشاط البدني ، نوصي باليقظة فيما يتعلق بمراقبة الجلوكوز. يجب تجنب النشاط البدني إذا كان مرتبطًا بمخاطر عالية للإصابة / الحوادث (مثل التزلج على جبال الألب وتسلق الصخور والسباحة والغوص).

الوصول إلى المراقبة الفعالة

يجب نصح الأطفال والمراهقين بأنهم أفضل استعدادًا لممارسة الرياضة عندما تكون أجهزة قياس السكر في الدم وشرائط الاختبار متاحة بسهولة ، خاصةً إذا كانوا لا يستخدمون أجهزة مراقبة الجلوكوز.

يجب تشجيع الأطفال والمراهقين على قياس مستوى الجلوكوز في الدم قبل التمرين وأثناءه وبعده أو ، بدلًا من ذلك ، للتحقق من قيم الجلوكوز المستندة إلى المستشعر على أساس منتظم وتفعيل التنبيهات التنبؤية وإنذارات انخفاض الجلوكوز للمساعدة في منع أو تقليل مخاطر الإصابة ارتفاع السكر في الدم.

الحصول على الكربوهيدرات

يجب أن تكون الوجبات الخفيفة عالية المؤشر الجلايسيمي متاحة بسهولة أثناء أي شكل من أشكال النشاط البدني.

يجب أن تكون الوجبات الخفيفة عالية المؤشر الجلايسيمي وعلاجات ارتفاع السكر في الدم متاحة دائمًا في المدرسة.

التواصل والأمان

يجب تقديم المشورة بشأن السلامة ؛ يجب تشجيع الأطفال والمراهقين على ارتداء أو حمل معرف السكري عند إجراء التمرين في غياب شخص بالغ مسؤول. يجب أن تشمل الاستشارة النظر في الوصول إلى طريقة اتصال متنقلة أو بديلة في حالة الحاجة إلى مساعدة عاجلة.

جرعة الأنسولين لإدارة جلوكوز الدم

- **تعديلات الأنسولين قبل وأثناء التمرين**

يجب أن يكون نظام الأنسولين مخصصًا للنشاط.

من المحتمل أن تتطلب معظم الأنشطة التي تستغرق أكثر من 30 دقيقة تقليل توصيل الأنسولين ، أو بعض التعديل على تناول الكربوهيدرات لخدمة زيادة سكر الدم.

عندما يتم التخطيط لممارسة الرياضة في وقت ذروة عمل الأنسولين ، عادةً بعد تناول وجبة مع جرعة الأنسولين سريعة المفعول ، يجب إجراء تخفيض ملحوظ في جرعة الأنسولين.

بالنسبة لمستخدمي التسريب المستمر للأنسولين تحت الجلد (CSII) ، قد يتم فصل المضخة أو تعليقها ، أو يتم تنفيذ انخفاض مؤقت في معدل ضخ الأنسولين الأساسي قبل 90 دقيقة على الأقل من بدء التمرين لإعطاء تأثير أساسي منخفض أثناء النشاط.

لا ينبغي حقن الأنسولين في مكان يكون له دور كبير في النشاط العضلي.

يمكن معالجة ارتفاع مستوى الجلوكوز في الدم أثناء أو بعد ممارسة التمارين الرياضية المكثفة عن طريق إعطاء جرعة إضافية صغيرة من الأنسولين سريع المفعول - على سبيل المثال ، 50٪ من جرعة التصحيح المعتادة عندما تكون المستويات> 14 ملي مول / لتر (252 مجم / ديسيلتر) ، أو عن طريق الانخراط في ممارسة منخفضة الشدة إلى معتدلة.

• تعديلات الأنسولين في فترة ما بعد الظهر أو في وقت متأخر من المساء بعد التمرين

يزداد خطر الإصابة بنقص سكر الدم الليلي بعد ممارسة التمارين بعد الظهر. وبالمثل ، تميل التمارين الصباحية إلى خفض احتياجات الأنسولين في وقت مبكر من بعد الظهر. جلستان أو أكثر من جلسات النشاط في يوم واحد (المعسكرات ، والبطولات ، والتدريب المكثف) تزيد من خطر الإصابة بنقص السكر في الدم ، وخاصة نقص السكر في الدم الليلي.

في علاج التسريب المستمر للأنسولين تحت الجلد ، يساعد التخفيض الأساسي المؤقت بنسبة 20٪ تقريبًا في وقت النوم لمدة 6 ساعات على تقليل مخاطر نقص السكر في الدم الليلي.

تناول الكربوهيدرات لإدارة جلوكوز الدم

• تناول الكربوهيدرات قبل وأثناء التمرين:

يجب تخصيص نوع وكمية الكربوهيدرات المطلوبة لأنشطة محددة.

قد لا تكون هناك حاجة لتناول الكربوهيدرات قبل ممارسة تمارين الشدة المعتدلة إذا كانت قصيرة المدة (أقل من 30 دقيقة).

عندما تكون مستويات الأنسولين المتداولة عالية ولا يتم تقليل جرعات الأنسولين قبل التمرين ، يوصى باستخدام ما يصل إلى 1.5 جرام من الكربوهيدرات لكل كيلوغرام من كتلة الجسم لكل ساعة من التمارين الشاقة أو طويلة الأمد.

إذا كان الأنسولين المنتشر عند المستوى الأساسي أو أقل منه (يُعرّف هنا على أنه مستوى الأنسولين حيث لا يلزم وجود كربوهيدرات خارجية للحفاظ على استقرار نسبة الجلوكوز في الدم أثناء الراحة) ، فقد تكون هناك حاجة إلى القليل (أي 0.25 جم / كجم / ساعة) أو عدم تناول الكربوهيدرات ، حسب مدة التمرين وشدته.

بالنسبة للتمارين الهوائية منخفضة إلى متوسطة الشدة لمدة تزيد عن 30 دقيقة في ظل ظروف الأنسولين القاعدية ، قد يلزم 0.2 إلى 0.5 جم / كجم / ساعة للحفاظ على نسبة السكر في الدم ، ولكن في بعض الظروف ، أو لتحقيق الأداء الأمثل ، قد يكون 1 جم / كجم / ساعة مطلوب لتجنب ارتفاع السكر في الدم. في ظل ظروف فرط الأنسولين حيث يظل الأنسولين النشط قبل التمرين نشطًا أو في ذروته ، نوصي 1 إلى 1.5 جم / كجم / ساعة.

- **تناول الكربوهيدرات بعد التمرين**

يجب تناول الوجبات التي تحتوي على نسبة مناسبة من الكربوهيدرات والبروتين في غضون ساعة إلى ساعتين من التمرين ، مع الاستفادة من فترة حساسية الأنسولين المتزايدة للمساعدة في تجديد مخازن الجليكوجين والحد من مخاطر نقص السكر في الدم بعد التمرين. قد تكون هناك حاجة لتخفيض جرعة البلعة بعد ممارسة التمارين الهوائية لفترات طويلة إذا حدث نقص السكر في الدم بعد التمرين. قد تكون هناك حاجة لجرعة تصحيحية مخفضة بنسبة 50٪ في حالة ارتفاع السكر في الدم بعد التمرين.

يمنع استهلاك الكحول تكوين الجلوكوز وبالتالي يزيد من خطر نقص السكر في الدم لدى الصائمين. لهذا السبب ، يجب تجنب استهلاك الكحول. بعد التمرين ، إذا كنت تريد تناول الكحول ، فيجب دمجه مع وجبة كربوهيدراتية ذات مؤشر نسبة السكر في الدم (GI).

يُعد الجفاف المرتبط بالتمارين الرياضية خطرًا ما لم يتم أيضًا استهلاك الماء أو السوائل الخالية من السكر أثناء التمرين وبعده.

الوقاية من نقص السكر في الدم بعد التمرين

يمكن توقع حدوث نقص السكر في الدم أثناء التمرين أو بعده بفترة وجيزة ، ولكنه من الممكن أيضًا لمدة تصل إلى 24 ساعة بعد ذلك بسبب زيادة حساسية الأنسولين.

خطر حدوث نقص سكر الدم الليلي بعد التمرين مرتفع ، ويجب توخي الحذر إذا كان مستوى السكر في الدم قبل النوم أقل من 7.0 ملي مول / لتر (125 مجم / ديسيلتر). ومع ذلك ، لا توجد قيمة محددة للجلوكوز قبل النوم تضمن تجنب نقص السكر في الدم الليلي.

قد يكون الكربوهيدرات الزائدة بعد النشاط هو الخيار الأفضل لمنع نقص السكر في الدم بعد التمرين عندما يتم إجراء الأنشطة اللاهوائية عالية الكثافة والمدة القصيرة في ظل ظروف فرط الأنسولين ولكن من غير المرجح أن تمنع نقص السكر في الدم الليلي المتأخر دون تعديل الأنسولين المناسب.

يمكن أن تقلل سباقات السرعة القصيرة التي تضاف إلى التمارين الهوائية من خطر الإصابة بنقص السكر في الدم في وقت مبكر بعد التمرين إذا كان الشخص يعاني من فرط الأنسولين بشكل طفيف (أقل من ساعتين).

استخدام التكنولوجيا المتقدمة لإدارة جلوكوز الدم

قد يكون استخدام التكنولوجيا المتقدمة لإدارة جلوكوز الدم دور في المساعدة على تجنب نقص السكر في الدم أثناء وبعد التمرين. لا يزال هناك نقص في الأدلة فيما يتعلق بالآثار المفيدة لاستخدام CGM.

من المحتمل أن تكون تقنيات المضخات الجديدة مثل التعليق المنخفض للجلوكوز والتعليق التنبئي للجلوكوز المنخفض وتوصيل الأنسولين الآلي الهجين ذي الحلقة المغلقة مفيدة على الرغم من أن التمرين لا يزال يمثل تحديًا حتى بالنسبة لهذه التقنيات.

يجب إبلاغ جميع مستخدمي التكنولوجيا الحالية وأفراد أسرهم أو القائمين على رعايتهم بأن هذه التقنية قد تميل إلى المبالغة في تقدير مستوى الجلوكوز في الدم في ظل الظروف التي ينخفض فيها مستوى الجلوكوز في الدم بسرعة مثل الاستجابة للتمرين الذي يتم إجراؤه في ظل ظروف فرط الأنسولين. لا يزال من الممكن التوصية بالقياسات باستخدام أجهزة قياس جلوكوز الدم للإرشاد أثناء التغييرات السريعة لقيم الغلوكوز بالمستشعر أو عندما لا تتطابق القيم الحالية مع الأعراض.

الحاجة إلى التدريب المستمر للمهنيين

يجب أن ينتهز المحترفون الفرصة لحضور معسكرات للأطفال المصابين بداء السكري لفهم التحديات التي يواجهونها بشكل أفضل.

يبدو أن العديد من الحواجز مرتبطة بالمناقشة المنتظمة للتمارين الرياضية لدى الشباب المصابين بداء السكري. وتشمل هذه المعرفة والتعليم غير الكافي من جانب كل من المرضى ومقدمي الرعاية.

يجب تشجيع طرق تحسين وتيرة وجودة التثقيف بالتمارين الرياضية في عيادة مرض السكري.

من المهم التأكد من أن جميع المهنيين (على سبيل المثال ، الممرضات ومعلمي مرض السكري وأخصائيي التغذية والأطباء) على اطلاع دائم بأحدث الإرشادات القائمة على الأدلة في إدارة جلوكوز الدم.

الجزء الرابع من برنامج الدراسة

أهداف التحكم في نسبة السكر في الدم ومراقبة الجلوكوز للأطفال والمراهقين والشباب المصابين بداء السكري

الملخص التنفيذي والتوصيات

يجب تقييم التحكم في نسبة السكر في الدم لدى الأطفال والمراهقين من خلال الهيموغلوبين A1c ربع السنوي (السكر التراكمي) ومراقبة الجلوكوز المنزلية المنتظمة. هذه تسمح بتحقيق الصحة المثلى من خلال:

• التحديد بدقة ودقة التحكم في نسبة السكر في الدم للفرد ، بما في ذلك تقييم محددات نسبة السكر في الدم لكل فرد.

• الحد من مخاطر مضاعفات الأمراض الحادة والمزمنة.

• التقليل من آثار نقص السكر في الدم وارتفاع السكر في الدم على نمو الدماغ والوظيفة الإدراكية والمزاج. وتحسين جودة الحياة.

التوصيات:

• تعد المراقبة الذاتية المنتظمة للجلوكوز (باستخدام قياسات دقيقة لجلوكوز الدم ، مع أو بدون مراقبة مستمرة للجلوكوز او الممسوحة ضوئيًا بشكل متقطع) ، أمرًا ضروريًا لإدارة مرض السكري لجميع الأطفال والمراهقين المصابين بداء السكري.

○ يجب أن يحصل كل طفل على التكنولوجيا والمواد اللازمة للمراقبة الذاتية لقياسات الجلوكوز لاختبار ما يكفي لتحسين رعاية مرضى السكري.

○ يجب على العاملين في مركز السكري أن يدافعوا عن ممولي الرعاية الصحية للتأكد من أن الأطفال والمراهقين المصابين بالسكري لديهم إمدادات كافية لمراقبة الجلوكوز.

○ عند استخدام فحص الإصبع للسكري ، قد يلزم إجراء الاختبار من 6 إلى 10 مرات يوميًا لتحسين التحكم المكثف. يجب إجراء مراجعة منتظمة لقيم نسبة السكر في الدم هذه مع إجراء تعديلات على العلاجات الدوائية / الغذائية لتحسين التحكم.

تفيد بيانات المراقبة المستمرة للسكري في الوقت الحقيقي بشكل خاص الأطفال الذين لا يستطيعون التعبير عن أعراض نقص السكر في الدم أو ارتفاع السكر في الدم وأولئك الذين يعانون من عدم الوعي بنقص سكر الدم.

• بالنسبة للأطفال والمراهقين والشباب البالغين 25 عامًا الذين يحصلون على رعاية شاملة ، يوصى باستخدام مستهدف السكر التراكمي أقل من 53 مليمول / مول (7.0٪).

○ هدف السكر التراكمي أعلى (في معظم الحالات <58 مللي مول / مول [7.5٪]) مناسب في السياقات التالية: عدم القدرة على التعبير عن أعراض نقص السكر في الدم ، نقص السكر في الدم ، عدم الوعي / تاريخ نقص السكر في الدم ، نقص حاد في الوصول إلى الأنسولين التناظري ، الأنسولين المتقدم تقنية التوصيل ، والقدرة على فحص سكر الدم بانتظام ، والأفراد الذين يعانون من "نسبة عالية من السكر" ، حيث يعكس السكر التراكمي المستهدف متوسط جلوكوز أقل بكثير من 8.6 ملمول / لتر (155 مجم / ديسيلتر).

قد يكون الهدف الأدنى (6.5٪) أو 47.5 مليمول / مول مناسبًا إذا أمكن تحقيقه بدون نقص السكر في الدم المفرط ، وضعف جودة الحياة ، وعبء رعاية غير ضروري.

○ بالنسبة للمرضى الذين لديهم ارتفاع في نسبة السكر التراكمي ، يُنصح باتباع نهج تدريجي لتحسين التحكم في نسبة السكر في الدم بما في ذلك الاهتمام الفردي بما يلي: تعديل الجرعة ، والعوامل الشخصية التي تحد من تحقيق الهدف ، وتقييم التأثير النفسي لتحديد الهدف على الفرد ، ودمج التكنولوجيا المتاحة لتحسين مراقبة الجلوكوز وطرق توصيل الأنسولين.

• يجب أن يتوفر قياس السكر التراكمي في جميع مراكز رعاية مرضى السكري.

يجب إجراء قياسات السكر التراكمي كل 3 أشهر على الأقل.

○ يمكن أن يساعد فحص الاختلافات في السكر التراكمي بين المراكز في تقييم الرعاية المقدمة من قبل مراكز الرعاية الصحية بما في ذلك الامتثال للمعايير المتفق عليها لتحسين العلاجات وتقديم رعاية مرضى السكري للأطفال.

المبادئ العامة لتحديد أهداف نسبة السكر في الدم

يعكس السكر التراكمي متوسط نسبة السكر في الدم خلال الأشهر الثلاثة إلى الأربعة السابقة وهو حاليًا مقياس التحكم في نسبة السكر في الدم على المدى الطويل الوحيد الذي يحتوي على بيانات نتائج قوية. أظهرت دراسات متعددة أجريت على مجموعات سكانية متنوعة أن ارتفاع قيم السكر التراكمي يرتبط بالمضاعفات المزمنة لمرض السكري.

ترتبط الإدارة المكثفة التي تؤدي إلى انخفاض تركيزات السكر التراكمي بتطور أقل وتأخر في مضاعفات الأوعية الدموية الدقيقة والأوعية الدموية الكبيرة. بالإضافة إلى ذلك ، يرتبط انخفاض السكر التراكمي بعد التشخيص بفترة وجيزة بانخفاض خطر حدوث مضاعفات لاحقة. تشير بيانات المتابعة من تجربة التحكم في مرض السكري ومضاعفاته إلى أن 5 إلى 7 سنوات من تحسين التحكم في نسبة السكر في الدم ، بما في ذلك خلال فترة المراهقة وصغار البلوغ ، قلل من خطر الإصابة بمضاعفات الأوعية الدموية الدقيقة والأوعية الدموية الكبيرة والوفيات في السنوات اللاحقة.

لفرط سكر الدم المزمن آثار ضارة على الوظيفة الإدراكية العصبية وبنية الدماغ وتطوره لدى الأطفال والمراهقين المصابين بداء السكري. يؤثر ارتفاع السكر في الدم المزمن وتقلبات الجلوكوز الواسعة خلال سنوات النمو السريع للدماغ على بنية الدماغ وتطوره . تثير هذه الملاحظات التساؤل عن الممارسة السائدة المتمثلة في تحمل بعض ارتفاع السكر في الدم لتقليل مخاطر نقص السكر في الدم لدى الأطفال الصغار المصابين بالنوع الأول من السكري. يعتبر نقص السكر في الدم أيضًا خطرًا كبيرًا للأطفال والمراهقين المصابين بداء السكري.

لمراجعة شاملة لتأثيرات نقص السكر في الدم ، انظر تقييم وإدارة نقص السكر في الدم لدى الأطفال والمراهقين المصابين بداء السكري. تاريخيًا ، ارتبطت قيم السكر التراكمي المنخفضة بنوبات حادة أكثر تواترًا من نقص السكر في الدم الشديد ، لكن الدراسات القائمة على الملاحظة الحديثة في عصر الحقن اليومية المتعددة والمضخات ومراقبة الجلوكوز الأكثر كثافة ، بما في ذلك استخدام السيطرة المستمرة لسكر الدم ، تشير إلى أن هذا ليس خطرًا كبيرًا. الأهم من ذلك ، تشير البيانات الحديثة إلى أن خفض أهداف السكر التراكمي يرتبط بانخفاض متوسط السكر التراكمي على مستوى السكان والأفراد دون زيادة تواتر نقص السكر في الدم الشديد ، حتى في الأطفال الذين يحققون مستويات السكر التراكمي <53 مللي مول / مول (7.0٪).

تعد قياسات السكر التراكمي مفيدة لتقييم مخاطر حدوث مضاعفات طويلة الأجل وكأداة في الوقت الفعلي لتحسين التحكم في نسبة السكر في الدم. يتم دمج السكر التراكمي بشكل روتيني سريريًا في عملية صنع القرار بشأن النظم الطبية ، جنبًا إلى جنب مع البيانات المتعلقة بنقص السكر في الدم وفرط سكر الدم الموثق والمتغيرات الأخرى الخاصة بالشخص مثل العمر ، ومعرفة مقدم الرعاية ، وتناول الكربوهيدرات ، والمرض / الإجهاد ، وأنماط التمرين. بشكل عام ، يجب تجنب الفترات الطويلة من ارتفاع السكر في الدم ونوبات الحماض الكيتوني السكري (DKA).

على الرغم من أن السكر التراكمي لا يزال أفضل مقياس لنسبة السكر في الدم على المدى الطويل داخل وبين السكان ، فقد أظهرت العديد من الدراسات أن السكر التراكمي له قيود كبيرة عند استخدامه بشكل منفصل لتقييم التحكم في نسبة السكر في الدم لدى الفرد. على الرغم من أنه بالنسبة للسكان ، يرتبط متوسط سكر الدم ارتباطًا وثيقًا بـ السكر التراكمي عند فحص البيانات على المستوى الفردي ، غالبًا ما توجد فروق ذات دلالة إحصائية بين قيم الجلوكوز المقاسة (سواء عن طريق عصا الإصبع BG أو CGM) وقيم السكر التراكمي المرصودة . في بعض الأحيان تكون هذه الاختلافات ناتجة عن الحالات التي تغير العمر

الافتراضي لخلايا الدم الحمراء أو تغيرات في نسبة السكر في الهيموجلوبين ، مثل مرض فقر الدم المنجلي أو فقر الدم. بالإضافة إلى ذلك ، توجد أيضًا اختلافات وراثية في نسبة الجلوكوز في الهيموجلوبين. 0.4٪) أعلى من البيض لنفس متوسط تركيز الجلوكوز المحدد باستخدام .CGM، قد يكون العرق علامة بديلة للعوامل الوراثية التي تحدد العلاقة بين متوسط سكر الدم و السكر التراكمي.

أظهرت العديد من الدراسات فروقًا ذات دلالة إحصائية بين السكر التراكمي وقيم الجلوكوز المرصودة ذاتيًا بين الأفراد دون وجود اختلافات بيولوجية طبية أو عرقية / عرقية واضحة. -الكروماتوغرافيا عالية الأداء للتبادل الأيوني المسامي) نطاقات واسعة من السكر التراكمي لتركيزات الجلوكوز المتوسطة المماثلة بين الخلايا. على سبيل المثال ، بالنسبة لـ السكر التراكمي البالغ 64 ملي مول / مول (8.0٪) ، تراوحت فترة الثقة 95٪ لمتوسط الجلوكوز من 8.6 ملي مول / لتر (155 مجم / ديسيلتر) إلى 12.1 ملي مول / لتر (218 مجم / ديسيلتر) .33 هذه البيانات اقتراح تقدير متوسط تركيزات الجلوكوز للأفراد من قيم السكر التراكمي المقاسة يجب أن يتم بحذر. ومع ذلك ، فإن علاقة السكر التراكمي بمتوسط الجلوكوز ثابتة داخل الفرد في حالة عدم وجود تغييرات في الصحة.

لم يُعرف بعد ما إذا كان معدل السكر التراكمي أو التعرض المفرط لنسبة السكر في الدم بالنسبة للفرد علامة أفضل لخطر حدوث مضاعفات. نظرًا لأن إرشادات التحكم في نسبة السكر في الدم أصبحت أكثر صرامة ، فمن المهم ، عندما يكون ذلك ممكنًا ، تحديد العلاقة بين معدل السكر في الدم لدى المريض مع السكر التراكمي ، لمعرفة ما إذا كان الفرد "مرتفعًا أو منخفضًا من الجلوكوز." العلاج على أساس ان السكر التراكمي قد يزيد من خطر نقص السكر في الدم علاجي المنشأ. بالنسبة لارتفاع نسبة السكر في الدم ، يجب مراعاة مقاييس الجلوكوز الإضافية مثل مقاييس نقص السكر في الدم.

مراقبة التحكم في نسبة السكر في الدم

المراقبة الذاتية للجلوكوز بالمنزل:

- يتتبع المستويات الفورية واليومية للتحكم في الجلوكوز.
- يساعد على تحديد متطلبات الأنسولين الأساسية والجارية الفورية ؛
- يكتشف نقص السكر في الدم ويساعد في إدارته.
- يساعد في التدبير المناسب لفرط سكر الدم.
- يساعد في توجيه تعديلات الأنسولين لتقليل تقلبات الجلوكوز.

قياسات عصا الاصبع

يرتبط التكرار الأكبر لمراقبة الجلوكوز باستخدام عصا الإصبع بانخفاض نسبة السكر التراكمي لدى الأشخاص المصابين بداء السكري من النوع 1. ترجع تحسينات السكر التراكمي مع قياسات الجلوكوز الأكثر تكرارًا إلى جرعات الأنسولين الأفضل للكربوهيدرات المستهلكة والقدرة المحسّنة على تصحيح قيم الجلوكوز خارج النطاق المستهدف بسرعة. بالإضافة إلى ذلك ، فإن الاكتشاف المبكر لقيم الجلوكوز المتناقصة قبل حدوث نقص السكر في الدم المصحوب بأعراض يسمح بتصحيح أكثر دقة مع انخفاض خطر التصحيح المفرط وارتفاع السكر في الدم الناتج. كما تتيح المراقبة الذاتية للجلوكوز حول التمرين تحسين إدارة الأنسولين وتقليل خطر الإصابة بنقص السكر في الدم أثناء التمرين وبعده.

اجهزة قياس نسبة الغلوكوز في الدم

هناك أنواع عديدة من أجهزة قياس نسبة الغلوكوز في الدم ؛ ومع ذلك ، قد تنشأ عدم دقة كبيرة من الأخطاء المتعلقة بالمشغل. يجب على المتخصصين في الرعاية الصحية أن يختاروا ويقدموا المشورة بشأن الأنواع القوية والدقيقة والمألوفة بالنسبة لهم وكذلك بأسعار معقولة لمرضى السكري.

قد تكون الأجهزة التي لا تتطلب المعايرة / الترميز أسهل في الاستخدام. الأجهزة منخفضة الجودة ، التي تُعرض أحيانًا لتقليل التكلفة ، قد تعرض السلامة للخطر بسبب نقص الدقة. يجب أن تدعم الهيئات التنظيمية معايير الصناعة العالية ، بما في ذلك الدقة والقدرة على تنزيل البيانات وتحليلها. تنص معايير الصناعة على أن 95٪ من القراءات يجب أن تكون في حدود 15٪ من القيمة المرجعية.حيث توصي الجمعية الدولية لأمراض السكري لدى الأطفال والمراهقين بالاستخدام الحصري لمقاييس الجلوكوز التي تحقق هذا المعيار.

من الأفضل قياس توقيت المراقبة الذاتية للجلوكوز في الدم:

• أثناء النهار ، قبل الوجبات والوجبات الخفيفة.

• في أوقات أخرى (على سبيل المثال ، 2-3 ساعات بعد تناول الطعام) لتحديد جرعات الأنسولين المناسبة للوجبات وإظهار مستويات سكر الدم استجابةً لملامح عمل الأنسولين (عند الذروة والأحواض المتوقعة لعمل الأنسولين).

• بالاقتران مع التمارين القوية (قبل وأثناء وبعد عدة ساعات) بحيث يمكن إجراء تغييرات في إدارة نسبة السكر في الدم

• في وقت النوم وأثناء الليل وعند الاستيقاظ لاكتشاف ومنع نقص السكر في الدم الليلي وارتفاع السكر في الدم وكذلك تحسين الأنسولين القاعدي ؛

• قبل قيادة السيارة أو تشغيل الآلات الخطرة ؛

• لتأكيد نقص السكر في الدم ومراقبة الشفاء ؛ و

• أثناء المرض الحالي للوقاية من أزمات ارتفاع السكر في الدم.

يجب أن يكون عدد وانتظام قياسات سكر الدم باستخدام عصا الإصبع فرديًا اعتمادًا على:

• توافر المعدات.

• نوع نظام الأنسولين. و

• قدرة الطفل على تحديد نقص السكر في الدم.

تتطلب إدارة مرض السكري الناجحة والمكثفة مراقبة ذاتية للجلوكوز على الأقل من 6 إلى 10 مرات في اليوم ومراجعة منتظمة ومتكررة للنتائج لتحديد الأنماط التي تتطلب تعديلًا لخطة علاج مرض السكري. بالإضافة إلى استشارة فريق رعاية مرضى السكري.

يجب أن تتوافق أهداف الجلوكوز على مدار اليوم مع أهداف السكر التراكمي الفردية. هناك حاجة إلى بيانات تجريبية في طب الأطفال يمكن أن تستند إليها أهداف الجلوكوز وكيفية ارتباط ذلك بـ السكر التراكمي. في حالة عدم وجود مثل هذه البيانات ، فإننا ندعو إلى تخصيص أهداف الجلوكوز المذكورة أعلاه لتحقيق نسبة السكر التراكمي أقل من 53 مليمول / مول (7.0٪). تعتبر الأهداف المتسقة والتواصل والعمل الجماعي مهمة في تحسين السكر

Appendix B

B.1 Demographic Data Questionnaire (English Version)

Date: …… **Participant Code Number:** ……

Demographic Data Questionnaire

- Who is answering the general questions of this questionnaire?

☐ The Participant ☐ His Father ☐ His Mother ☐ Other (Please specify)

- Please answer each question as accurately as possible by circling the correctanswer or filling in the space provided.

1. What is your age? _____

2. What is your gender? ☐ Female ☐ Male

3. Are you currently a student? ☐ Yes ☐ No

- If (Yes), what is your grade? _____

4. Parents marital status: ☐ Married ☐ Divorced

5. Do you live with both of them? ☐ Yes ☐ No

- If (No), what is the reason? ☐Death ☐Divorced ☐Father's travel abroad

6. What is the highest level of education your father has completed?

☐ Less than high school degree
☐ High school degree or equivalent
☐ College degree
☐ Bachelor degree
☐ Master degree
☐ Doctoral degree

7. What is the highest level of education your mother has completed?

☐ Less than high school degree

☐ High school degree or equivalent

☐ College degree

☐ Bachelor degree

☐ Master degree

☐ Doctoral degree

8. What is your father employment status?

☐ Unemployed

☐ Part-time

☐ Full-time

9. What is your mother employment status?

☐ Unemployed

☐ Part-time

☐ Full-time

10. For how long you have been diagnosed with diabetes?

☐1 - <2 years ☐2 - <3 years ☐3 - <4 years ☐4 - <5 years ☐5 years or more

11. Age at diagnosis: _____

12. Has any of your family members diagnosed with diabetes? ☐ Yes ☐ No

- If yes, who:

☐ Father ☐ Mother ☐ Brother ☐ Sister

13. What other medical conditions or diseases do you have other than type 1diabetes?

☐ Cystic fibrosis

☐ Asthma

☐ Cardiovascular disease

☐ Kidney diseases

☐ Autoimmune disease (Please specify .....)

☐ Eating disorder

☐ Depression

☐ Other (Please specify.....)

☐ Don't know

14. What is your height?_____cm

15. What is your weight?_____kg

16. What is the mode of insulin delivery? ☐ Daily insulin injections ☐ Insulin pump

- If on Daily injections, number of injections per day _____
- How often is your blood sugar measured per day? _____

17. Do you have health insurance coverage? ☐ Yes ☐ No

18. How many times have you been hospitalized due to diabetes last year? _____

19. How many episodes of hypoglycemia have you reported last month? _____

Thank you for completing this personal profile

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IRB Approval Date: 26/01/2023

B.2 Demographic Data Questionnaire (Arabic Version)

إستبيان المعلومات الشخصية

- **من يجيب على الأسئلة العامة لهذا الاستبيان؟**

☐ المشارك ☐ الأب ☐ الأم ☐ أحد أخر (الرجاء التحديد .....)

- **يرجى الإجابة على كل سؤال بأكبر قدر ممكن من الدقة عن طريق إختيار الإجابة الصحيحة أو ملء المساحة المتوفرة.**

1. **العمر** ..... سنة

2. **الجنس** ☐ ذكر ☐ أنثى

3. **هل أنت ملتحق بالمدرسة حاليا؟** ☐ نعم ☐ لا

♦ إذا كانت الإجابة ب (**نعم**), الرجاء تحديد مستى الصف الدراسي .....

4. **الحالة الإجتماعية للأبوين:** ☐ متزوجيين ☐ مطلقين

5. **هل تعيش مع كليهما:** ☐ نعم ☐ لا

♦ إذا كانت الإجابة ب (لا), فما هو السبب؟ ☐ الطلاق ☐ الوفاة ☐ سفر الأب الى الخارج

6. **ما هو المستوى التعليمي للأب؟**

☐ أقل من الثانوية العامة

☐ الثانوية العامة أو ما يعادلها ☐

دبلوم كلّية

☐ درجة جامعية- بكالوريوس ☐

درجة جامعية- ماجستير ☐

درجة جامعية- دكتوراة

7. **ما هي طبيعة عمل الأب؟**

☐ بدون عمل

☐ وظيفة بدوام جزيء

☐ وظيفة بدوام كامل

8. **ما هو المستوى التعليمي للأم؟**

☐ أقل من الثانوية العامة

☐ الثانوية العامة أو ما يعادلها ☐

دبلوم كلّية

☐ درجة جامعية- بكالوريوس ☐

درجة جامعية- ماجستير ☐

درجة جامعية- دكتوراة

9. **ما هي طبيعة عمل الأم؟**

☐ بدون عمل

☐ وظيفة بدوام جزيء

☐ وظيفة بدوام كامل

10. **منذ متى تم تشخيصك بمرض السكري؟**

☐ سنة إلى أقل من سنتين

☐ سنتين إلى أقل من 3 سنوات

☐ 3 سنوات إلى أقل من 4 سنوات

☐ 4 سنوات إلى أقل من 5 سنوات

☐ 5 سنوات أو أكثر

11. العمر عند التشخيص: ..... سنة

12. هل هناك أحد من أفراد عائلتك مصاب بالسكري؟ ☐ نعم ☐ لا

- إذا كانت الإجابة ب (نعم), الرجاء الإشارة ب (√) على الشخص:

☐ الأب ☐ الأم ☐ الأخ ☐ الأخت

13. هل تعاني من أي من الأمراض التالية بالإضافه لمرض السكري؟

☐ التليّف الكيسي ☐

الربو

☐ أمراض القلب و الشرايين ☐

أمراض الكلى

☐ أمراض المناعة (الرجاء التحديد.....)

☐ إضطرابات الأكل

☐ الأكتئاب

☐ أمراض أخرى (الرجاء التحديد.....)

☐ لا أعرف

14. الطول: ..... سم

15. الوزن: ..... كغم

16. ما هي الكيفية التي تتناول بها جرعة الأنسولين؟

☐ حُقن الإنسولين اليومية (الحقن تحت الجلد)

☐ جهاز مضخة الأنسولين

- إذا كانت الإجابة ب (حُقن الإنسولين اليومية), كم هو عدد الحُقن يومياً.....
- كم مرة يتم قياس نسبة السكر في الدم يومياً؟ .....
-

17. هل لديك تأمين صحي؟ ☐ نعم ☐ لا

18. كم هي عدد المرات التي كنت قد أدخلت بها المستشفى بسبب مرض السكري في العام الماضي؟ .....

19. كم هي عدد الحالات التي عانيت فيها من نقص السكر في الدم الشهر الماضي؟ .....

IRB Number: NEU/2023/110-1681

IRB Approval Date: 26/01/2023

B.3 Informed Consent – (English Version)

Date: …… Participant Code Number: ……

Patient consent form for conducting scientific research

Patient Name: …… MRN #.....

Name of the Researcher: ……Phone # ……

Study Title: ……

Before I agreed to participate in the research I was informed by the researcher with the following:

1. Approval by the concerned authorities in the hospital for conducting the study
2. Study objectives and procedures
3. Any potential and foreseeable risks and any inconvenience or benefits arising from the study
4. Any alternative or potential procedures or treatments
5. Unexpected risk potential
6. Any compensation or insured medical treatment in the event of harm or damage as a result of the study
7. Duration of the study
8. Data confidentiality procedure
9. Cases that may prompt the researcher to stop me from participating in the study
10. Any additional effort I could make for the study.
11. What happens if I decide to withdraw from the study?
12. When should I be informed of new conclusions that may affect my determination to participate in the study

If you have questions about your rights as a participant in this study or what you should do if you are harmed, you can call at any time:

Name:……..Phone……

Your participation in this study is voluntary and optional. You will not be penalized or lose any benefits if you decide not to participate or withdraw from the study at any time. Once you sign this document you acknowledge that you agree to voluntarily participate in this study and that the above information is fully explained.

Date	Name of the Participant	Signature
Date	First Witness	Signature

----------	----------	----------
Date ----------	Second Witness ----------	Signature ----------
Date ----------	Name of the Researcher ----------	Signature ----------

Important Note: A copy of this form must be saved in the patient's medical file

IRB Number:

IRB Approval Date:

B.4 Informed Consent – (Arabic Version)

استمارة موافقة المريض على اجراء بحث علمي

التاريخ: .....

رقم كود المشارك: .....

اسم المريض: .....

اسم الباحث: .....

رقم الهاتف .....

عنوان الدراسة: تأثير نموذج التمكين المرتكز على الأسرة على جودة الحياة والكفاءة الذاتية ومستويات السكر التراكمي، لدى المراهقين المصابين بداء السكري من النوع الأول في عمان ، الأردن.

قبل أن أوافق على المشاركة في البحث ، أبلغني الباحث بما يلي:

1. موافقة الجهات المختصة بالمستشفى على إجراء الدراسة.

2. أهداف الدراسة وإجراءاتها.

3. أي مخاطر محتملة ومتوقعة وأي إزعاج أو فوائد تنشأ عن الدراسة. 4.

أي إجراءات أو علاجات بديلة أو محتملة.

5. مخاطر محتملة غير متوقعة.

6. أي تعويض أو علاج طبي مؤمن عليه في حالة حدوث ضرر أو ضرر نتيجة الدراسة. 7. مدة الدراسة.

8. إجراءات سرية البيانات.

9. الحالات التي قد تدفع الباحث إلى منعي من المشاركة في الدراسة. 10. أي جهد إضافي يمكن أن أبذله للدراسة.

11. ماذا يحدث إذا قررت الانسحاب من الدراسة.

12. متى يجب إعلامي بالاستنتاجات الجديدة التي قد تؤثر على قراري للمشاركة في الدراسة.

- **إذا كانت لديك أسئلة حول حقوقك كمشارك في هذه الدراسة أو ما يجب عليك فعله إذا تعرضت للأذى ، فيمكنك الاتصال في أي وقت:**

الاسم: .....

الهاتف .....

- **مشاركتك في هذه الدراسة طوعية واختيارية. لن يتم معاقبتك أو فقدان أي مزايا إذا قررت عدم المشاركة أو الانسحاب من الدراسة في أي وقت.**
- **بمجرد التوقيع على هذه الوثيقة ، فإنك تقر بموافقتك على المشاركة طواعية في هذه الدراسة وأن المعلومات الواردة أعلاه موضحة بالكامل.**

التاريخ:	**اسم المشارك:**	**توقيعه:** .....
التاريخ:	**اسم الشاهد الاول:**	**توقيعه:** .....
التاريخ:	**اسم الشاهد الثاني:**	**توقيعه:** .....
التاريخ:	**اسم المشرف على البحث:**	**توقيعه:** .....

ملاحظة هامة: يجب حفظ نسخة من هذا النموذج في الملف الطبي للمشارك.

IRB Number:

IRB Approval Date:

Appendix C

C.1 The Pediatric Quality of Life Inventory 3.0 Diabetes Module – (English Version)

PedsQL ™

Diabetes Module

Version 3.0

TEEN REPORT (ages **13-18**)

DIRECTIONS

Teens with diabetes sometimes have special problems. Please tell us **how much of a problem** each one has been for you during the **past ONE month** by circling:

0 if it is **never** a problem
1 if it is **almost never** a problem
2 if it is **sometimes** a problem
3 if it is **often** a problem
4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

UTHealth The University of Texas Health Science Center at Houston

IRB NUMBER: HSC-SN-17-0852
IRB APPROVAL DATE: 10/10/2017

Date: ..... **Participant Code Number:** .....

PedsQL 2

*In the past **ONE month,** how much of a **problem** has this been for you …*

ABOUT MY DIABETES *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. I feel hungry	0	1	2	3	4
2. I feel thirsty	0	1	2	3	4
3. I have to go to the bathroom too often	0	1	2	3	4
4. I have stomachaches	0	1	2	3	4
5. I have headaches	0	1	2	3	4
6. I go "low"	0	1	2	3	4
7. I feel tired or fatigued	0	1	2	3	4
8. I get shaky	0	1	2	3	4
9. I get sweaty	0	1	2	3	4
10. I have trouble sleeping	0	1	2	3	4
11. I get irritable	0	1	2	3	4

TREATMENT - I *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. It hurts to prick my finger or give insulin shots	0	1	2	3	4
2. I am embarrassed about having diabetes	0	1	2	3	4
3. My parents and I argue about my diabetes care	0	1	2	3	4
4. It is hard for me to stick to my diabetes care plan	0	1	2	3	4

*Whether you do these things **on your own or with the help of your parents**, please answer how hard these things were to do in the past **ONE month**.*

TREATMENT II - *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. It is hard for me to take blood glucose tests	0	1	2	3	4
2. It is hard for me to take insulin shots	0	1	2	3	4
3. It is hard for me to exercise	0	1	2	3	4
4. It is hard for me to keep track of carbohydrates or exchanges	0	1	2	3	4
5. It is hard for me to wear my id bracelet	0	1	2	3	4
6. It is hard for me to carry a fast-acting carbohydrate	0	1	2	3	4
7. It is hard for me to eat snacks	0	1	2	3	4

WORRY *(problems with…)*	Never	Almost Never	Some-times	Often	Almost Always
1. I worry about "going low"	0	1	2	3	4
2. I worry about whether or not my medical treatments are working	0	1	2	3	4
3. I worry about long-term complications from diabetes	0	1	2	3	4

Date: ..... **Participant Code Number:** .....

PedsQL 3

*In the past **ONE month,** how much of a **problem** has this been for you …*

COMMUNICATION ***(problems with…)***	**Never**	**Almost Never**	**Some-times**	**Often**	**Almost Always**
1. It is hard for me to tell the doctors and nurses how I feel	0	1	2	3	4
2. It is hard for me to ask the doctors and nurses questions	0	1	2	3	4
3. It is hard for me to explain my illness to other people	0	1	2	3	4

C.2 The Pediatric Quality of Life Inventory 3.0 Diabetes Module – (Arabic Version)

رقم البطاقة الشخصية_____

التاريخ:_____

PedsQL™

استطلاع مرض السكر

Version 3.0 - Arabic (Jordan)

تقرير الأطفال (للأعمار **8-12**)

التوجيهات

في بعض الأحيان، يواجه الأطفال الذين يعانون من مرض السكر مشاكل ذات طابع خاص.

0 إذا كان لا يمثل مشكلة **أبدًا**
1 إذا كان **نادرًا** ما يمثل مشكلة
2 إذا كان **أحيانًا** ما يمثل مشكلة
3 إذا كان **غالبًا** ما يمثل مشكلة
4 إذا كان **دائمًا تقريبًا** ما يمثل مشكلة

ليست هناك إجابات صحيحة أو خاطئة.
إذا كنت لا تفهم/تفهمي سؤالاً، فمن فضلك اطلب/اطلبي المساعدة.

IRB NUMBER: HSC-SN-17-0852
IRB APPROVAL DATE: 10/10/2017
UTHealth The University of Texas
PedsQL – Jordan/Arabic – Version of 11 Jun 12 – MAPI Institute.
ID6710 / PedsQL-3.0-Diabetes-C_AU3.0_ara-JO.doc

PedsQL2

*خلال الـ **4 أسابيع** الماضية، ما مدى **المشكلة** التي كان يمثلها لك ذلك ...*

عن مرض السكر *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. أشعر بالجوع	0	1	2	3	4
2. أشعر بالعطش	0	1	2	3	4
3. يجب أن أذهب إلى الحمام مرات كثيرة جدًا	0	1	2	3	4
4. عندي مغص	0	1	2	3	4
5. عندي صداع	0	1	2	3	4
6. "ينخفض مستوى السكر في دمي"	0	1	2	3	4
7. أشعر بالتعب	0	1	2	3	4
8. أشعر برعشة	0	1	2	3	4
9. أتبلّل من العرق	0	1	2	3	4
10. لا أنام جيدًا	0	1	2	3	4
11. أصبحت أنفعل بسرعة	0	1	2	3	4

العلاج - 1 *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. أتألم عند وخز إصبعي أو إعطاء حقن الإنسولين	0	1	2	3	4
2. أشعر بالحرج من مرض السكر	0	1	2	3	4
3. أتجادل أنا ووالديّ حول الرعاية الخاصة بمرض السكر	0	1	2	3	4
4. من الصعب عليّ أن ألتزم بخطة الرعاية الخاصة بمرض السكر	0	1	2	3	4

*سواء كنت تفعل/تفعلي هذه الأشياء **وحدك أو بمساعدة والديك**، من فضلك قُل/قولي مدى صعوبة قيامك بهذه الأشياء خلال الـ **4 أسابيع** الماضية.*

العلاج - 2 *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. من الصعب عليّ إجراء اختبار السكر في الدم	0	1	2	3	4
2. من الصعب عليّ أخذ حقن الإنسولين	0	1	2	3	4
3. من الصعب عليّ ممارسة الأنشطة البدنية	0	1	2	3	4
4. من الصعب عليّ مراقبة كمية الكربوهيدرات أو البدائل	0	1	2	3	4
5. من الصعب عليّ ارتداء سوار بيانات مرض السكر	0	1	2	3	4
6. من الصعب عليّ حمل كربوهيدرات سريعة المفعول معي	0	1	2	3	4
7. من الصعب عليّ تناول الوجبات الخفيفة	0	1	2	3	4

القلق *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. أقلق أن "ينخفض مستوى السكر في دمي"	0	1	2	3	4
2. أقلق حول ما إذا كانت العلاجات الطبية التي أتلقاها ناجحة أم لا	0	1	2	3	4
3. أقلق من المضاعفات طويلة المدى الناتجة عن مرض السكر	0	1	2	3	4

PedsQL3

*خلال الـ **4 أسابيع** الماضية، ما مدى **المشكلة** التي كان يمثلها لك ذلك ...*

التواصل(مشكلات مع...)	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. من الصعب عليّ أن أقول للأطباء والممرضين ما أشعر به	0	1	2	3	4
2. من الصعب عليّ أن أطرح أسئلة على الأطباء والممرضين	0	1	2	3	4
3. من الصعب عليّ أن أشرح مرضي للآخرين	0	1	2	3	4

رقم البطاقة الشخصية_____

التاريخ:_____

PedsQL™

استطلاع مرض السكر

Version 3.0 - Arabic (Jordan)

تقرير المراهقين (للأعمار **13-18**)

التوجيهات

في بعض الأحيان، يواجه المراهقون الذين يعانون من مرض السكر مشاكل ذات طابع

0 إذا كان لا يمثل مشكلة **أبدًا**
1 إذا كان **نادرًا** ما يمثل مشكلة
2 إذا كان **أحيانًا** ما يمثل مشكلة
3 إذا كان **غالبًا** ما يمثل مشكلة
4 إذا كان **دائمًا تقريبًا** ما يمثل مشكلة

ليست هناك إجابات صحيحة أو خاطئة.
إذا كنت لا تفهم/تفهمي سؤالاً، فمن فضلك اطلب/اطلبي المساعدة.

PedsQL2

*خلال الـ **4** **أسابيع** الماضية، ما مدى **المشكلة** التي كان يمثلها لك ذلك ...*

عن مرض السكر *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. أشعر بالجوع	0	1	2	3	4
2. أشعر بالعطش	0	1	2	3	4
3. يجب أن أذهب إلى الحمام مرات كثيرة جدًا	0	1	2	3	4
4. عندي مغص	0	1	2	3	4
5. عندي صداع	0	1	2	3	4
6. "ينخفض مستوى السكر في دمي"	0	1	2	3	4
7. أشعر بالتعب	0	1	2	3	4
8. أشعر برعشة	0	1	2	3	4
9. أتبلّل من العرق	0	1	2	3	4
10. لا أنام جيدًا	0	1	2	3	4
11. أصبحت أنفعل بسرعة	0	1	2	3	4

العلاج - 1 *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. أتألم عند وخز إصبعي أو إعطاء حقن الإنسولين	0	1	2	3	4
2. أشعر بالحرج من مرض السكر	0	1	2	3	4
3. أتجادل أنا ووالديّ حول الرعاية الخاصة بمرض السكر	0	1	2	3	4
4. من الصعب عليّ أن ألتزم بخطة الرعاية الخاصة بمرض السكر	0	1	2	3	4

*سواء كنت تفعل/تفعلي هذه الأشياء **وحدك أو بمساعدة والديك**، من فضلك قُل/قولي مدى صعوبة قيامك بهذه الأشياء خلال الـ **4** **أسابيع** الماضية.*

العلاج - 2 *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. من الصعب عليّ إجراء اختبار السكر في الدم	0	1	2	3	4
2. من الصعب عليّ أخذ حقن الإنسولين	0	1	2	3	4
3. من الصعب عليّ ممارسة الأنشطة البدنية	0	1	2	3	4
4. من الصعب عليّ مراقبة كمية الكربوهيدرات أو البدائل	0	1	2	3	4
5. من الصعب عليّ ارتداء سوار بيانات مرض السكر	0	1	2	3	4
6. من الصعب عليّ حمل كربوهيدرات سريعة المفعول معي	0	1	2	3	4
7. من الصعب عليّ تناول الوجبات الخفيفة	0	1	2	3	4

القلق *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. أقلق أن "ينخفض مستوى السكر في دمي"	0	1	2	3	4
2. أقلق حول ما إذا كانت العلاجات الطبية التي أتلقاها ناجحة أم لا	0	1	2	3	4
3. أقلق من المضاعفات طويلة المدى الناتجة عن مرض السكر	0	1	2	3	4

PedsQL3

*خلال الـ **4** **أسابيع** الماضية، ما مدى **المشكلة** التي كان يمثلها لك ذلك ...*

التواصل *(مشكلات مع...)*	أبدًا	نادرًا	أحيانًا	غالبًا	دائمًا
1. من الصعب عليّ أن أقول للأطباء والممرضين ما أشعر به	0	1	2	3	4
2. من الصعب عليّ أن أطرح أسئلة على الأطباء والممرضين	0	1	2	3	4
3. من الصعب عليّ أن أشرح مرضي للآخرين	0	1	2	3	4

IRB NUMBER: HSC-SN-17-0852
IRB APPROVAL DATE: 10/10/2017

Appendix D

D.1 Self-Efficacy Questionnaire for Children (SEQ-C) (English Version)

		1 Not at all	2	3	4	5 Very well
1.	How well can you get teachers to help you when you get stuck on schoolwork?					
2.	How well can you express your opinions when other classmates disagree with you?					
3.	How well do you succeed in cheering yourself up when an unpleasant event has happened?					
4.	How well can you study when there are other interesting things to do?					
5.	How well do you succeed in becoming calm again when you are very scared?					
6.	How well can you become friends with other children?					
7.	How well can you study a chapter for a test?					
8.	How well can you have a chat with an unfamiliar person?					
9.	How well can you prevent to become nervous?					
10.	How well do you succeed in finishing all your homework every day?					
11.	How well can you work in harmony					

	with your classmates?					
12.	How well can you control your feelings?					
13.	How well can you pay attention during every class?					
14.	How well can you tell other children that they are doing something that you don't like?					
15.	How well can you give yourself a pep-talk when you feel low?					
16.	How well do you succeed in understanding all subjects in school?					
17.	How well can you tell a funny event to a group of children?					
18.	How well can you tell a friend that you don't feel well?					
19.	How well do you succeed in satisfying your parents with your schoolwork?					
20.	How well do you succeed in staying friends with other children?					
21.	How well do you succeed in suppressing unpleasant thoughts?					
22.	How well do you succeed in passing a test?					
23.	How well do you succeed in preventing quarrels with other children?					
24.	How well do you succeed in not worrying about things that might happen?					

Scoring

A total self-efficacy score can be obtained by summing across all items.
Items 1, 4, 7, 10, 13, 16, 19, and 22 = Academic self-efficacy
Items 2, 6, 8, 11, 14, 17, 20, and 23 = Social self-efficacy
Items 3, 5, 9, 12, 15, 18, 21, and 24 = Emotional self-efficacy

Key references

Muris, P. (2001). A brief questionnaire for measuring self-efficacy in youths. *Journal of Psychopathology and Behavioral Assessment*, *23*, 145-149.

Muris, P. (2002). Relationships between self-efficacy and symptoms of anxiety disorders and depression in a normal adolescent sample. *Personality and Individual Differences*, *32*, 337-348

Note

Three items of this questionnaire were taken from Bandura et al. (1999). See: Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G.V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology*, *76*, 258-269.

D.2 Self-Efficacy Questionnaire for Children (SEQ-C) (Arabic Version)

استبيان الكفاءة الذاتية للأطفال

1. ما مدى جودة مساعدة المعل ين لك عندما تتعثر في العمل المدرسي؟

5	4	3	2	1
ممتاز				**لا على الإطلاق**

2. إلى أي مدى يمكنك التعبير عن آرائك بشكل جيد عندما يختلف معك زملائك في الفصل؟

3. ما مدى نجاحك في ابتهاج نفسك عندما يقع حدث غير سار؟

4. ما مدى جودة المذاكرة عندما تكون هناك أشياء أخرى ممتعة يمكنك القيام بها؟

5. ما مدى نجاحك في أن تصبح هادئًا مرة أخرى عندما تكون خائفًا جدًا؟

6. ما مدى قدرتك على تكوين صداقات مع أطفال آخرين؟

7. ما مدى جودة دراسة فصل للاختبار؟

8. إلى أي مدى يمكنك إجراء محادثة مع شخص غير مألوف؟

9. إلى أي مدى يمكنك منع أن تصبح عصبيًا؟

10. ما مدى نجاحك في إنهاء جميع واجباتك المدرسية كل يوم؟

11. إلى أي مدى يمكنك العمل بانسجام مع زملائك في الفصل؟

12. إلى أي مدى يمكنك التحكم في مشاعرك؟

13. إلى أي مدى يمكنك الانتباه جيدًا خلال كل فصل؟

14. إلى أي مدى يمكنك إخبار الأطفال الآخرين بأنهم يفعلون شيئًا لا تحبه؟

15. إلى أي مدى يمكنك التحدث مع نفسك عندما تشعر بالإحباط؟

16. ما مدى نجاحك في فهم جميع المواد في المدرسة؟

17. إلى أي مدى يمكنك إخبار حدث مضحك لمجموعة من الأطفال؟

18. إلى أي مدى يمكنك إخبار صديق أنك لست على ما يرام؟

19. ما مدى نجاحك في إرضاء والديك بواجباتك المدرسية؟

20. ما مدى نجاحك في البقاء صديقًا للأطفال الآخرين؟

21. ما مدى نجاحك في قمع الأفكار غير السارة؟

22. ما مدى نجاحك في اجتياز الاختبار؟

23. ما مدى نجاحك في منع الخلافات مع الأطفال الآخرين؟

24. ما مدى نجاحك في عدم القلق بشأن الأشياء التي قد تحدث؟

حساب النتيجة

يمكن الحصول على مجموع نقاط الكفاءة الذاتية من خلال جمع جميع العناصر.

البنود 1 و 4 و 7 و 10 و 13 و 16 و 19 و 22 = **الكفاءة الذاتية الأكاديمية**

البنود 2 و 6 و 8 و 11 و 14 و 17 و 20 و 23 = **الكفاءة الذاتية الاجتماعية**

البنود 3 و 5 و 9 و 12 و 15 و 18 و 21 و 24 = **الكفاءة الذاتية العاطفية**

IRB Number: NEU/2023/110-1681 IRB Approval Date: 26/01/2023

Appendix E

E.1 Glycemic Control Measurement (English Version)

HbA1C Data Sheet

Date: …… **Participant Code Number: ……**

HbA1C Data

The last three measurements (taken over 12 months) if available

(*To be filled by the clinic staff*)

No.	**Value %**	**Date of the test**
Average *(To be calculated by the researcher)*		**Signature**

IRB Number: NEU/2023/110-1681

IRB Approval Date: 26/01/202

E.2 Glycemic Control Measurement (Arabic Version)

نموذج بيانات فحص السكر التراكمي

رقم كود المشارك.....التاريخ.....

أخر ثلاث قياسات (تؤخذ خلال 12 شهر)

(يتم تعبئة النموذج من قبل موظف العيادة)

تاريخ الفحص	النسبة المئوية	الرقم
التوقيع		النتيجة تحسب من قبل الباحث

Appendix F F.1 IRB Permission

NEAR EAST UNIVERSITY
SCIENTIFIC RESEARCH ETHICS COMMITTEE

RESEARCH PROJECT EVALUATION REPORT

Meeting date :26.01.2023
Meeting Number :2023/110
Project number :1681

The project entitled **"Effect of familiy centered empowerment model on quality of life self efficacy and glycemic control in adolescents with type 1 diabetes in Amman, Jordan"** (Project no: NEU/2023/110-1681) has been reviewed and approved by the Near East University Scientific Research Ethical Committee.

Prof. Dr. Şanda Çalı
Near East University
Head of Scientific Research Ethics Committee

Committee Member	*Decision*	*Meeting Attendance*
	Approved (✓) / Rejected (X)	*Attended (✓) / Not attended(X)*
Prof. Dr. Tamer Yılmaz	✓	✓
Prof. Dr. Şahan Saygı	✓	✓
Prof. Dr. Mehmet Özmenoğlu	✓	✓
Prof. Dr. İlker Etikan	✓	✓
Doç. Dr. Mehtap Tınazlı	X	X
Doç. Dr. Nilüfer Galip Çelik	✓	✓
Doç. Dr. Dilek Sarpkaya Güder	✓	✓

F.2 Authors Permissions

Permission to use a tool

From Salah Alzwahreh

To peter.muris@maastrichtuniversity.nl · Thu, Dec 22, 2022 at 8:56 PM

Message Body

Dear. Prof. Dr. Muris,

I'm Salah Alzawahreh, PhD Student in Near East University in Cyprus, I'm Studying my thesis and the topic about type 1 Diabetes Mellitus in Children, and so I read the article that published by you, (A Brief Questionnaire for Measuring Self-Efficacy in Youths). and I saw that you developed a tool (self-efficacy questionnaire). My advisor prof, Dr. Candan OZTURK and I would like to have detailed information about a tool, we would be very pleased if you send me detailed information about the tool, and we need your written permission to use the tools developed by you in my thesis.

Your answer is very important and valuable for me.

I'm looking forward to your answer.

Kind regards

From Salah Alzwahreh

To CANDAN ÖZTÜRK · Fri, Dec 23, 2022 at 6:26 AM

Message Body

----- Forwarded message -----

From: "Muris, Peter (PSYCHOLOGY)" <peter.muris@maastrichtuniversity.nl>

To: "Salah Alzwahreh" <salahalzwaherh78@yahoo.com>

Cc:

Show trimmed content

---

2 attachmentsDownload all

- Self-Efficacy Questionnaire for Children copy.docDOC · 75KB
- ATT00001.htmHTM · 3.5KB

Permission to use a tool

From Salah Alzwahreh

To jvarni@tamu.edu · Thu, Dec 8, 2022 at 8:11 AM

Message Body

Dear Dr Varni,

I'm Salah Alzawahreh, PhD Student in Near East University in Cyprus, I'm Studying my thesis and the topic about type 1 Diabetes Mellitus in Children, and I saw that you developed a tool for pediatric quality of life inventory (pedsQoL) My advisor prof, Dr. Candan OZTURK and I would like to have detailed information about a tools, We would be very pleased if you send me detailed information about the tools, and we need your written permission to use the tools developed by you in my thesis.

Your answer is very important and valuable for me.

I'm looking forward to your answer.

Kind regards.

From Salah Alzwahreh

To CANDAN ÖZTÜRK · Thu, Dec 8, 2022 at 6:55 PM

Message Body

Sent from Yahoo Mail on Android

Hide trimmed content

----- Forwarded message -----

From: "Varni, James Walter" <jvarni@arch.tamu.edu>

To: "Salah Alzwahreh" <salahalzwaherh78@yahoo.com>

Cc: "CANDAN ÖZTÜRK" <candan.ozturk@neu.edu.tr>

Sent: Thu, 8 Dec 2022 at 6:35 pm

Subject: RE: Permission to use a tool

Please go to www.pedsql.org and click on Examination Copies. This link will take you to the Mapi Research Trust website, where you can download the PedsQL™ with no license fee for unfunded research and single practice or single clinic use.

https://eprovide.mapi-trust.org/instruments/pediatric-quality-of-life-inventory

The Mapi website contains an email address for questions. Please see the link below.

https://eprovide.mapi-trust.org/faq

I hope this helps.

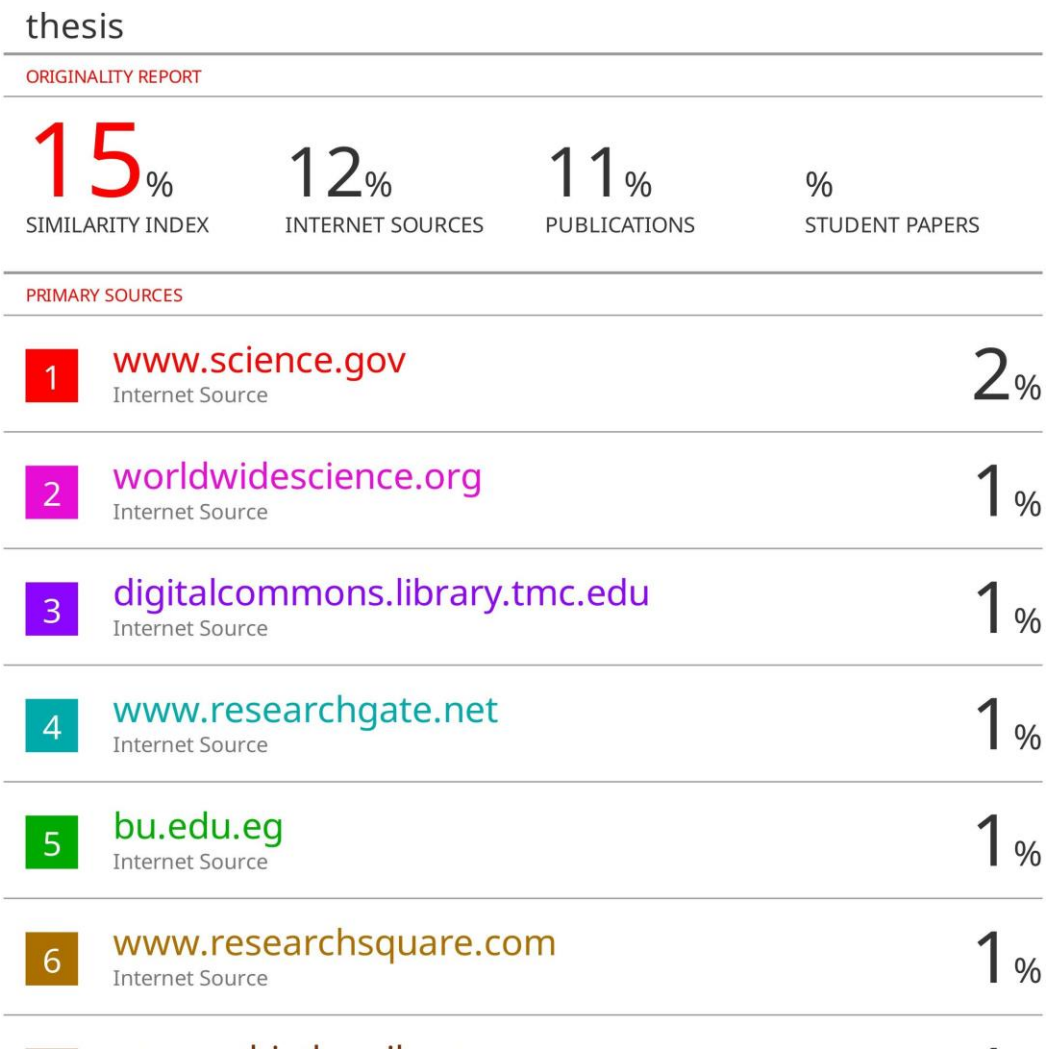
Thank you.

James W. Varni, Ph.D.
Professor Emeritus
Department of Pediatrics, College of Medicine
Department of Landscape Architecture and Urban Planning
College of Architecture
Texas A&M University
3137 TAMU
College Station, Texas 77843-3137
jvarni@tamu.edu

From: Salah Alzwahreh <salahalzwaherh78@yahoo.com>
Sent: Wednesday, December 7, 2022 9:11 PM
To: Varni, James Walter <jvarni@arch.tamu.edu>
Cc: CANDAN ÖZTÜRK <candan.ozturk@neu.edu.tr>
Subject: Permission to use a tool

Appendix G

G.1 Turnitin Report



thesis

ORIGINALITY REPORT

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5	bu.edu.eg Internet Source	1%
6	www.researchsquare.com Internet Source	1%

Appendix G.2

CV

Salah Abdallah Abdulkareem ALZAWAHREH

Personal Info.					
Address	Jordan, Zarqa				
Gender	Male	**DOB**	28th Aug, 1978	**Marital Status**	Married
Nationality	Jordanian				
Mobile	+962 772260125				
E-Mail (Primary)	salahalzwaherh78@yahoo.com				
Education	The General Secondary Education Certificate in Scientific Stream in 1996/Summer. Diploma in OT Scrub Nurse in 1999 from Royal Medical Services College/ Al- Balqa Applied University. BA Degree in nursing from Alzaytona University/ Jordan in 2010 with excellent percentage average (85.7%). MA degree in pediatric nursing from Mutah University\ Jordan with percentage average of (82%) in 2015. Master's thesis title is "Family Needs of Critically Ill Child". I have participated this research in the 8th International Conference of the Royal Medical Service as a presenter, and published in national journal. PHD student in pediatric nursing in Near East University in Cyprus Turkey.				
I have been granted an appreciation certificate from Jordanian Nursing Council for my academic excellence signed by Princess Muna Al-Hussein.					

Experiences **(In Jordan)**	I have worked as a scrub nurse with Royal Medical Services from 1996 to 2016 in different surgical specialties including: General surgery (2 years) Orthopedic surgery (1 years) Pediatric surgery (2 year) E.N.T surgery (1 year) Neurosurgery (6 years) Liver transplant surgery (6years) I have worked as a Coordinating nursing officer in the operation rooms in King Hussein Medical Center for two years. Senior Staff Nurse in Operation Room in Arab Medical Center Since 15/may/2018 until now.
Experiences **(In outside missions)**	Participating in a UN mission in Eritrea (Africa) for six months as a scrub nurse in Jordan Military Hospital Level 2 in 2003. Participating in one of tasks of Jordanian armed forces in Iraq among the R.M.S group for two months in 2004. Participating in one of tasks of Jordanian armed forces in Afghanistan among the R.M.S group for three months in 2005. Participating in a UN mission in Liberia (Africa) for six months as a scrub nurse in Jordan Military Hospital Level 3 in 2007. Participating in one of tasks of Jordanian Army in Palestine among the R.M.S group in the city of Gaza for two months in 2009. Participating with Liver transplant surgery operations team in Istanbul for two months in 2011. Participating in one of tasks of Jordanian armed forces in Benghazi – Libya among the R.M.S group for two months in 2012. I have a very good experience in medical and air evacuation.

Courses	Leadership course in" Regional Disaster Response and Trauma System Management" Asmara, Eritrea, in 2003. English Language Course for 6 months in 2004. Liver transplant surgery operations course, from Florence Nightingale Hospital – Organ Transplantation Center in Istanbul for two months in 2011. Teaching in the Operation Nursing Course, for 6 months, in 2013 Basic Life Support, at American Heart Association/Jordan 2014 Pediatric Advanced Life Support Course (PALS) at American Heart Association/ Jordan in 2014.			
Languages	**English**	Good	**Arabic**	Mother Tongue
Traits	Enthusiastic Open Mindedness Take Responsibility	Proactive Self Confident High Ambitions	Tactful Intelligent Fast	
Computer Skills	Literacy (MS office tools , OS) Very Good Typing Skills.			
References	Raed Shudifat RN, PhD, Assistant Professor, Dean of Princess Muna College of Nursing. Email: raed_shudifat@yahoo.com /Phone No.: 00962776308568 Hala Obeidat RN, PhD, Associate Professor, Assistant Dean of Princess Muna College of Nursing email: obeidathala@yahoo.com /Phone No.: 00962772073335			
Additional Info.	Upon request.			
Info. Update	Last Update On Tuesday, 24 December 2024			