Section A -Research paper

New Trend in Diabetic Management for Children

Ebtsam Mostafa Ibrahim Ahmed*[1], Hyam Refaat Tantawi[2], Safaa Salah Ismail[3]

Article History: **Received:** 11.03.2023 **Revised:** 13.04.2023 **Accepted:** 25.04.2023

ABSTRACT

Background: The children with diabetes must follow certain self-care practices to achieve optimal glycemic control and prevent complications. Self-care in diabetes has been defined as a set of behaviors practiced by children with or at risk of diabetes for successful management of the disease on their own. These behaviors are well established; they involve regular physical activity, appropriate dietary regimen, daily foot care, and compliance with treatment. The first steps taught to the patient in diabetes self-management are the tasks of blood glucose monitoring and insulin injection. Nonetheless, many diabetic patients fail to practice self-care.

Objective: To highlight the knowledge and practice of the children and their parents about diabetes.

Methods: PubMed, Google scholar and Egyptian Knowledge Bank were searched using the following keywords: [Diabetes mellitus, Children, Lifestyle, and Diabetic management]. The authors also screened references from the relevant literature, including all the identified studies and reviews, only the most recent or complete study was included between January 2010 and November 2021. Documents in a language apart from English have been excluded as sources for interpretation was not found. Papers apart from main scientific studies had been excluded: documents unavailable as total written text, conversation, conference abstract papers and dissertations.

Conclusion: Diabetes mellitus is a serious complication in today life. The lifestyle and day today circumstances are play major role in occurring this type of serious complications. Educational program was prevent diabetic complications among children suffering from diabetes mellitus.

Keywords: Diabetes mellitus, Children, Lifestyle, Diabetic management.

[1]Technical Institute of Nursing, Faculty of Nursing -Beni-Suef University, Egypt
[2]Professor of Pediatric Nursing, Faculty of Nursing, Ain-Shams University, Egypt
[3]Professor of Pediatric Nursing, Faculty of Nursing, Helwan University, Egypt
***Corresponding author:** Ebtsam Mostafa Ibrahim,
E-mail: ebtsammostafa@nursing.helwan.edu.eg

DOI: 10.48047/ecb/2023.12.8.49

INTRODUCTION

Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels. Several pathogenic processes are involved in the development of diabetes. These range from autoimmune destruction of the beta cells of the pancreas with consequent insulin deficiency to abnormalities that result in resistance to insulin action [(1)].

Egypt prevalence of diabetes has reached epidemic proportions. Egyptian statistics showed that diabetes which is the eleventh most important cause of premature mortality and is the sixth most important cause of disability burden in Egypt by the year 2030, it will affect at least 8.6 million adults, which are responsible for 2.4% of all years of life lost [(2)].

Symptoms of marked hyperglycemia include polyuria, polydepsia, weight loss, sometimes with polyphagia, and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany chronic hyperglycemia. Acute, life-threatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the nonketotic hyperosmolar syndrome [(3)].

Guidelines for improving the care of diabetic children by American Diabetes Association (2019) stated that diabetic children must change their life styles including eating habits and self-care along with taking diabetes medicine to have a regular and balanced blood sugar level. The nurse as a member of the health care team must be involved in self-management of diabetic children. Diabetes is largely a self-managed disease and the patients' role is complex and demanding. Education is the key to the successful management of diabetes and is central to clinical management [(4)]

Achieving a balance between insulin levels, food intake and energy expenditure are cornerstones of clinical management. Diabetes requires extensive self-management and frequent high quality educational input and support [(5)]. Diabetes self- care education is a critical element of care for all people with diabetes and is necessary in order to improve patient outcomes**.** Adherence to an individualized prescribed nutrition plan improves glycosylated hemoglobin levels in adults and has repeatedly been identified as the single behavior most positively correlated with good blood glucose control in children[(6)].

Frequency of regular physical activity is a major factor in children with diabetes mellitus influencing the control of glycemia without increasing the risk for severe hypoglycemia [(7)]. Children and adolescents can be taught to perform the components of diabetes management and care: insulin medication, diet, exercise, self-monitoring of blood glucose and above all balancing these self-care activities . Patient education of self-care and the enhancement of the role of nurses in diabetes care lead to improvements in patient outcomes and the process of care [(8)].

Classification:

Diabetes can be classified into the following general categories: Type 1 diabetes (due to b-cell destruction, usually leading to absolute insulin deficiency) . Type 2 diabetes (due to a progressive insulin secretory defect on the background of insulin resistance) . Gestational diabetes mellitus (GDM) (diabetes diagnosed in the second or third trimester of pregnancy that is not clearly overt diabetes) [(9)].

Specific types of diabetes due to other causes, e.g., monogenic diabetes syndromes (such as neonatal diabetes and maturity-onset diabetes of the young (MODY), diseases of the exocrine pancreas (such as cystic fibrosis), and drug- or chemical-induced diabetes (such as in the treatment of HIV/AIDS or after organ transplantation) [(9)].

Epidemiology and Etiology of Type 1 Diabetes (IDDM)

Type 1 diabetes represents around 10% of all cases of diabetes, affecting approximately 20 million people worldwide [(9)]. Although type 1 diabetes affects all age groups, the majority of individuals are diagnosed either at around the age of 4 to 5 years, or in their teens and early adulthood The incidence of type 1 diabetes is rising. Across Europe, the average annual increase in the incidence in children under 15 years is 3.4% [(10)], with the steepest rise in those under 5 years old [(11)].

Type 1 diabetes is the result of an autoimmune reaction to proteins of the islets cells of the pancreas. There is a strong association between IDDM and other endocrine autoimmunity (for example,

Addison disease) and an increased incidence of autoimmune diseases among family members of IDDM patients [(12)].

The three types of autoantibodies known are: Islet cell cytoplasmic antibodies (ICCA), the primary antibodies found in 90% of type 1 diabetics. The presence of islet cell cytoplasmic antibodies is highly accurate predictor of future development of IDDM. Islet cell surface antibodies (ICSA): Autoantibodies directed against islets cell surface antigens (ICSA) have also been described in as many as 80% of type 1 diabetics. Some patients with type 2 diabetes have been identified, as islet cell surface antibodies positive [(13)].

Specific antigenic targets of islet cells: Antibodies to glutamic acid decarboxylase (GAD) have been identified in over 80% of patients newly diagnosed with IDDM [(12)]. The presence of anti glutamic acid decarboxylase antibodies is a strong predictor of the future development of IDDM in high risk populations. Anti insulin antibodies (IAAs) have been identified in IDDM patients and in relatives at risk to developing IDDM. These anti insulin antibodies are detectable even before the onset of insulin therapy in type 1 diabetics. Anti insulin antibodies is detectable in around 40% of young children with IDDM[(13)].

Diabetes Mellitus Complications :

Short-term Complications of DM:

Diabetic ketoacidosis (DKA)

Diabetic ketoacidosis (DKA) is an acute metabolic complication of diabetes characterized by hyperglycemia, hyperketonemia, and metabolic acidosis. Hyperglycemia causes an osmotic diuresis with significant fluid and electrolyte loss. DKA occurs mostly in type 1 diabetes mellitus. It causes nausea, vomiting, and abdominal pain and can progress to cerebral edema, coma, and death. DKA is diagnosed by detection of hyperketonemia and anion gap metabolic acidosis in the presence of hyperglycemia. Treatment involves volume expansion, insulin replacement, and prevention of hypokalemia [(14)].

Diabetic ketoacidosis (DKA) is most common among patients with type 1 diabetes mellitus and develops when insulin levels are insufficient to meet the body's basic metabolic requirements. DKA is the first manifestation of type 1 diabetes in a minority of patients. Insulin deficiency can be absolute (eg, during lapses in the administration of exogenous insulin) or relative (eg, when usual insulin doses do not meet metabolic needs during physiologic stress) [(15)].

Hypoglycemia

Hypoglycemia is best considered an adverse effect of insulin therapy (and potentially sulfonylurea therapy as well) instead of a complication of diabetes. Hypoglycemia can cause a myriad of symptoms and signs that are generally divided into neurogenic/autonomic and neuroglycopenic.

Neurogenic symptoms are the result of low blood glucose triggering an autonomic response with adrenergic and cholinergic symptoms including shakiness or tremor, diaphoresis, tachycardia or palpitations, hunger or irritability. Neuroglycopenic symptoms are the result of reduced availability of glucose to the brain and include sleepiness or lethargy, confusion, loss of consciousness, seizure, coma and even death [(16)].

Mild hypoglycemia is generally defined as hypoglycemia which the patient recognizes because of neurogenic/autonomic symptoms and self-treats with recovery before neuroglycopenic signs or symptoms. Mild hypoglycemia is largely unavoidable in well-managed insulin-treated patients with T1D using currently available treatment modalities[(17)].

Severe hypoglycemia, generally defined using the Diabetes Control and Complications Trial criteria as hypoglycemia resulting in neuroglycopenic symptoms or signs that render the patient unable to treat themself, represents a more significant concern. Severe hypoglycemia can result in injury (to self or others), seizure, coma or death. In addition,

severe hypoglycemia, especially in young children, may contribute to subsequent neurocognitive deficits and altered regional brain anatomy[17].

Long-term Complications of DM

The long-term complications of diabetes are generally divided into microvascular and macrovascular, such as life-threatening pathologies including peripheral neuropathy. Cardiac complications, renal failure, and vision impairment are other well-reported complications of DM[18].

Microvascular complications:

The microvascular complications include diabetic retinopathy (DR), diabetic nephropathy, and diabetic neuropathy.

Retinopathy

Vision impairment in type 2 diabetes mellitus patients is mainly due to diabetic retinopathy. The high blood glucose condition observed in type 2 diabetes mellitus patients results in microvascular damage to the retina that ultimately impacts on the vision of affected patients. Biochemical factors such as sorbitol accumulation, oxidative stress resulting in tissue damage, protein kinase C activation, and dysfunction of the renin-angiotensin-aldosterone system collectively contribute towards vision impairment. The retinal vessels are also damaged by inflammation. Thus, early diagnosis of type 2 diabetes mellitus in children is imperative to prevent adverse complications of vision impairment [19].

Nephropathy

The renal complications associated with type 2 diabetes mellitus are also frequently recorded and are mainly the result of poor flow of blood towards kidneys; a condition medically termed chronic kidney disease [20]. The condition of hyperglycemia results in damage of masangial cells that ultimately blocks kidney function. This function blockage of the kidneys leads to albuminuria[21].

Neuropathy

Diabetic neuropathy can be manifest as peripheral neuropathy or autonomic neuropathy. Peripheral neuropathy most frequently presents with symptoms and findings in the feet, but can occur in any area of the body. Peripheral diabetic neuropathy is most often manifest with symptoms of numbness, tingling or burning and signs of reduced or absent reflexes and vibratory or temperature perception [22].

Macrovascular Complications:

Complications affecting the larger blood vessels, macrovascular complications. Important cardiac alterations included cardiomyocyte-altered metabolism, changes in cardiac insulin signaling, general calcium control and the stimulation of vascular as well as cardiac fibrosis [23].

Fibrotic build up along with overworking of cardiac muscles is also common among type 2 diabetes mellitus patients [19]. These complications lead to other well-known complications of cardiac pathology including hyperlipidemia, hypertension and diabetic cardiomyopathy, coronary artery disease resulting in myocardial infarction, cerebrovascular disease resulting in stroke and peripheral vascular disease causing poor limb circulation resulting in claudication, infection or gangrene and amputation [24].

Growth and gonadal/puberty problems:

Reasonable glucose control it is now rare to have major growth problems or abnormalities of puberty. However, in individual patients where glucose control is particularly problematic or in parts of the world where glucose control remains elusive, such problems may be frequent. Reasons for poor growth [25], delayed puberty and menometrorrhagia should be investigated since other causes may also exist related or unrelated to diabetes. Thyroid disorders and celiac disease are especially important because of their increased frequency in type 1 diabetes patients and because both can be specifically treated with our current understanding of their pathophysiology [26].

Osteopenia

Osteopenia prevalence, incidence and frequency in childhood and adolescent type 1 diabetes are unknown. Conflicting research studies have been published describing abnormalities in vitamin D and its metabolites as well as parathyroid hormone but there is documentation of increased urinary losses of calcium in those with type 1 diabetes [(27)]. Known decreases in type 1 diabetes related to IGF-1 levels may also be contributing factors for osteopenia and lower bone density measurements [(27)]. There is no increase in incidence of fractures in youngsters with diabetes whether or not they are in adequate or inadequate glucose control [(26)].

Diagnostic Tests for Diabetes:

Diabetes may be diagnosed based on A1C criteria or plasma glucose criteria, either the fasting plasma glucose (FPG) or the 2-h plasma glucose (2-h PG) value after a 75-g oral glucose tolerance test (OGTT) .The same tests are used to both screen for and diagnose diabetes [(9)].

The same tests will also detect individuals with prediabetes. . The A1C has several advantages to the FPG and OGTT, including greater convenience (fasting not required), greater preanalytical stability, and less day-to-day perturbations during stress and illness. These advantages must be balanced by greater cost, the limited availability of A1C testing in certain regions of the developing world, and the incomplete correlation between A1C and average glucose in certain individuals. It is important to take age, race/ ethnicity, and anemia/hemoglobinopathies into consideration when using the A1C to diagnose diabetes [(28)].

New Trend in Managements of Diabetes in children:

The treatment is to overcome the precipitating cause and to give high doses of regular insulin. The insulin requirement comes back to normal once the condition has been controlled [65] the aims of management of diabetes mellitus can be achieved by:

1. To restore the disturbed metabolism of the diabetic as nearly to normal as is consistent with comfort and safety.
2. To prevent or delay progression of the short and long term hazards of the disease.
3. To provide the patient with knowledge, motivation and means to undertake this own enlightened care.

Types of Therapy Involved in Diabetes Mellitus in children:

Stem cell therapy

Researchers have shown that monocytes/ macrophages may be main players which contribute to these chronic inflammations and insulin resistance in diabetic children [(29)]. Stem cell educator therapy, a novel technology, is designed to control or reverse immune dysfunctions. The procedure includes: collection of patients' blood circulating through a closed-loop system, purification of lymphocytes from the whole blood, co-culture of them with adherent cord blood-derived multi-potent stem cells (CB-SCs) in vitro and administration of the educated lymphocytes (but not the CB-SCs) to the patient's circulation [(30)].

Stepwise to Prevent Diabetic Complications:

Glycemic Control:

Current standards for diabetes management reflect the need to lower glucose as safely as possible. This should be done with stepwise goals. Special consideration should be given to the unique risks of hypoglycemia in young children (aged ,6 years), as they are often unable to recognize, articulate, and/or manage their hypoglycemic symptoms. This "hypoglycemia unawareness" should be considered when establishing individualized glycemic targets [(31)].

Newer Insulin Delivery Devices :

A number of innovations have been made to improve ease and accuracy of insulin administration as well as to achieve tight glycaemia control. These are insulin syringes, pen devices, inhaled insulin, insulin pumps, implantable pumps, other routes of insulin delivery [(30)].

Technology

Diabetes technologies, such as insulin pumps and CGMs, are evolving tools for diabetes management, and use of these technologies in young children has significantly increased in recent years [(32)]. Recent data from the T1D Exchange indicate that CGM use in children less than 6 years old has increased over 40% from 2011 to 2016, and insulin pump use nearly doubled, with the highest rates of use in the youngest patients [(33)].

Household sociodemographic factors have significant impacts on access and consistent use of diabetes devices . Families with private insurance are more likely to use a CGMs, and young children with a longer T1D duration, an annual household income of >$75,000, a parent with college education, and using a CGM are more likely to use a pump [(34)].

Research has demonstrated that diabetes technologies improve glycemic levels and may reduce the burden of diabetes management in young children and their parents. Several studies have shown that children using a CGM have fewer sleep disturbances [(35)].

Further, Burckhardt and colleagues found that CGM use may provide a greater sense of freedom for children and their parents (e.g., being able to spend time away from home) and improve communication between parents and other caregivers (e.g., teachers) [(36)].

Similarly, parents of young children using hybrid closed loop systems reported spending less time performing diabetes activities, resulting in feeling reassured and perceived improvements in their child's quality of life . While there is increased use and identified benefits of CGMs and pumps, challenges still arise for young children and their parents [(35)].

Children have reported that CGMs and pumps were painful to insert and wear, specifically reporting skin adhesive difficulties and extra discomfort when wearing both devices. Other burdens reported by parents include incomplete glycemic data due to connectivity issues, financial barriers to ongoing use (e.g., insurance stopped covering, too expensive), and battery performance [(36)].

Medical Nutrition Therapy:

For many individuals with diabetes, the most challenging part of the treatment plan is determining what to eat. The American Diabetes Association also recognizes the integral role of nutrition therapy in overall diabetes management and recommends that each person with diabetes be actively engaged in self-management, education, and treatment planning with his or her health care provider, which includes the collaborative development of an individualized eating plan [(37)].

Dietary management should be individualized: family habits, food preferences, religious or cultural needs, finances, schedules, physical activity, and the patient's and family's abilities in numeracy, literacy, and self-management should be considered. Visits with a registered dietitian nutritionist should include assessment for changes in food preferences over time, access to food, growth and development, weight status, cardiovascular risk, and potential for eating disorders [(38)].

Weight Loss

Intensive lifestyle programs with frequent follow-up are required to achieve significant reductions in excess body weight and improve clinical indicators. Weight loss of 2–8 kg may provide clinical benefits in those with type 2 diabetes, especially early in the disease process [(39)]. The most consistently identified changes in cardiovascular risk factors were an increase in HDL cholesterol, decrease in triglycerides and decrease in blood pressure[(40)].

Physical Activity and Exercise

Exercise positively affects insulin sensitivity, physical fitness, strength building, weight management, social interaction, mood, self-esteem building, and creation of healthful habits for adulthood, but it also has the

potential to cause both hypoglycemia and hyperglycemia[41]. Overall, it is recommended that youth with type 1 diabetes participate in 60 min of moderate (e.g., brisk walking, dancing) to vigorous (e.g., running, jumping rope) intensity aerobic activity daily, including resistance and flexibility training[15].

School and Child Care

As a large portion of a child's day is spent at school, close communication and cooperation of school or day care personnel are essential for optimal diabetes management, safety, and maximal academic opportunities [42].

Psychosocial Issues

Rapid and dynamic cognitive, developmental, and emotional changes occur during childhood, adolescence, and emerging adulthood. Diabetes management during childhood and adolescence places substantial burdens on the youth and family, necessitating ongoing assessment of psychosocial status and diabetes distress in the patient and the caregiver during routine diabetes visits [43].

Lifestyle Modification:

Treatment of youth-onset type 2 diabetes should include lifestyle management, diabetes self-management education, and pharmacologic treatment. Initial treatment of youth with obesity and diabetes must take into account that diabetes type is often uncertain in the first few weeks of treatment, due to overlap in presentation, and that a substantial percentage of youth with type 2 diabetes will present with clinically significant ketoacidosis[44].

Therefore, initial therapy should address the hyperglycemia and associated metabolic derangements irrespective of ultimate diabetes type, with adjustment of therapy once metabolic compensation has been established and subsequent information, such as islet autoantibody results, becomes available. Glycemic targets should be individualized, taking into consideration long term health benefits of more stringent targets and risk for adverse effects, such as hypoglycemia [45].

Diabetes Self-Management Education and Support:

Diabetes self-management education and diabetes self-management support are the ongoing processes of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes. The overall objectives of diabetes self-management education and diabetes self-management support are to support informed decision making, self-care behaviors, problem solving, and active collaboration with the health care team to improve clinical outcomes, health status, and quality of life in a cost-effective manner [46].

Diabetes self-management education and diabetes self-management support are essential elements of diabetes care [47], and the current national standards for diabetes self-management education and diabetes self-management support are based on evidence of their benefits. Education helps people with diabetes to initiate effective self-management and cope with diabetes when they are first diagnosed [46].

Family involvement is a vital component of optimal diabetes management throughout childhood and adolescence. Health care providers in the diabetes care team must be capable of evaluating the educational, behavioral, emotional, and psychosocial factors that impact implementation of a treatment plan and must work with the individual and family to overcome barriers or redefine goals as appropriate [48].

Hypoglycemia Prevention

Hypoglycemia prevention is a critical component of diabetes management. Patients should understand situations that increase their risk of hypoglycemia, such as fasting for tests or procedures, during or after intense exercise, and during sleep. Hypoglycemia may increase the risk of harm to self or others, such as with driving. Teaching people with diabetes to balance insulin use and

carbohydrate intake and exercise are necessary, but these strategies are not always sufficient for prevention [49].

Self-monitoring of Blood Glucose (SMBG):

Self-monitoring of blood glucose is thus an integral component of effective therapy [14]. Self-monitoring of blood glucose allows patients to evaluate their individual response to therapy and assess whether glycemic targets are being achieved. Integrating self-monitoring of blood glucose results into diabetes management can be a useful tool for guiding medical nutrition therapy and physical activity, preventing hypoglycemia, and adjusting medications (particularly prandial insulin doses) [50].

The children specific needs and goals should dictate self-monitoring of blood glucose frequency and timing. Optimization self-monitoring of blood glucose accuracy is dependent on the instrument and user [51], so it is important to evaluate each patient's monitoring technique, both initially and at regular intervals thereafter. Optimal use of self-monitoring of blood glucose requires proper review and interpretation of the data, both by the patient and provider. Among patients who check their blood glucose at least once daily, many report taking no action when results are high or low [52].

Children should be taught how to use self-monitoring of blood glucose data to adjust food intake, exercise, or pharmacological therapy to achieve specific goals. The ongoing need for and frequency of self-monitoring of blood glucose should be reevaluated at each routine visit. self-monitoring of blood glucose is especially important for insulin-treated children to monitor for and prevent asymptomatic hypoglycemia and hyperglycemia [52].

Foot Care

Foot ulceration, which are consequences of diabetic neuropathy are common and represent major causes of morbidity and disability in children with diabetes. . Early recognition and management of risk factors can prevent or delay adverse outcomes. A general inspection of skin integrity and musculoskeletal deformities should be done in a well-lit room [53].

Vascular assessment would include inspection and assessment of pedal pulses. Initial screening should include a history for claudication and an assessment of the pedal pulses. Patients with diabetes and high-risk foot conditions should be educated about their risk factors and appropriate management [9].

Children at risk should understand the importance of foot monitoring on a daily basis; the proper care of the foot, including nail and skin care; and the selection of appropriate footwear. Patients' understanding of these issues and their physical ability to conduct proper foot surveillance and care should be assessed. Children with visual difficulties, physical constraints preventing movement, or cognitive problems that impair their ability to assess the condition of the foot and to institute appropriate responses will need other people, such as family members, to assist in their care [9].

Immunization

As for the general population, all children and adults with diabetes should receive routine vaccinations [54]. Influenza and pneumonia are common, preventable infectious diseases associated with high mortality and morbidity in vulnerable populations, such as the young and the elderly, and in children with chronic diseases. Although there are limited studies reporting the morbidity and mortality of influenza and pneumococcal pneumonia specifically in people with diabetes, observational studies of patients with a variety of chronic illnesses, including diabetes, show that these conditions are associated with an increase in hospitalizations for influenza and its complications [55].

Transition from Pediatric to Adult Care

The developmental stage of emerging adulthood is characterized by competing educational, social, vocational, and financial priorities . During this phase, youth experience decreasing parental support and

become fully responsible for their diabetes care, which may trigger a decline in medication-taking behavior and difficulty achieving blood glucose targets [(56)].

Consequently, young adults with type 1 diabetes are at risk for acute diabetes complications, chronic macrovascular and microvascular complications, psychosocial challenges, and early mortality. An ineffective transition from pediatric to adult diabetes care may contribute to fragmentation of health care and increased risk for adverse outcomes. Prior research has highlighted challenges in the transition process, including gaps between pediatric and adult care [(57)], suboptimal transition preparation [(57)], deterioration of glycemic control and increased hospitalizations [(58)].

Current Issues

Recently, studies have described the experience of managing diabetes in children during the COVID-19 pandemic [(59)]. Our team followed a cohort of parents of children (n=100) who were diagnosed with T1D at a young age (1–6 years, pre-pandemic) who had completed a behavioral trial more than 6 months prior (enrolled between 2015–2019), and obtained data for 2 additional follow-up times points during the pandemic (Summer 2020, Winter 2021 [(52)].

During Summer, 2020, parents of children with T1D (M age=6.74 years) who reported experiencing more pandemic-related life disruptions during the initial months of the pandemic also reported more negative diabetes-specific experiences as well as COVID-19-specifc distress. Further, parents of young children with T1D who had higher social support pre-pandemic reported fewer depressive symptoms during summer, 2020[(52)].

CONCLUSION

Diabetes mellitus is a serious complication in today life. The lifestyle and day today circumstances are play major role in occurring this type of serious complications. Educational program was prevent diabetic complications among children suffering from diabetes mellitus.

Disclosure statement: No author has any financial interest or received any financial benefit from this research.

Conflict of interest: The authors state no conflict of interest.

REFERENCES

1. **Alberti, K.G, & Zimmet, P. (2020):** Definition, Diagnosis And Classification Of Diabetes Mellitus And Its Complications. Part 1: Diagnosis And Classification Of Diabetes Mellitus Provisional Report Of A WHO Consultation. Diabetesmed; 15: 539-53.
2. **Arafa, N.A.S., & Amin, G.E.E. (2019):**The Epidemiology Of DiabetesMellitus In Egypt. The Egyptian Journal Of Community Medicine; 28(3): 34-45.
3. **Carpenter, M.W., & Coustan, D.R. (2019):** Criteria For Screening Tests For Gestational Diabetes. Am J Obstet Gynecol 144:768–773.
4. **Silverstein, J., Klingensmith, G., Copeland, K., Plotnick, L., Kaufman, F., & Laffel. L., . (2020):** Care Of Children And Adolescents With Type 1 Diabetes. Diabetes Care. 28(1):186 – 212.
5. **Saudek, C., Derr, R., & Kalyani, R. (2021):** Assessing Glycemia In Diabetes Using Self-Monitoring Blood Glucose And Hemoglobin A1c. JAMA, 295:1688-97.
6. **Delahanty, M. L., Nathan, M.D., & Lachin, M., .(2019):** Association Of Diet With Glycated Hemoglobin During Intensive Treatment Of Type 1 Diabetes In The Diabetes Control And Complications Trial. Am J Clin Nutr, 89:518–24 Journal Of Education And Practice Www.Iiste.Org ISSN 2222-1735 (Paper) ISSN 2222-288X (Online) Vol.5, No.11, 2018 63.

7. **Herbst, A., Bachran, R., Kapellen, T., & Holl, R. (2020):** Effects Of Regular Physical Activity On Control Of Glycemia In Pediatric Patients With Type 1 Diabetes Mellitus. Arch Pediatr Adolesc Med., 160(6):573-7. Higher Hemoglobin A1C And Atherogenic Higher Hemoglobin A1C And Atherogenic Lipoprotein Profiles In Children And Adolescents With Type 2 Diabetes Mellitus. J Clin Transl Endocrinol. Mar;15:30-34.
8. **Renders, C., Valk G., Griffin S., Wagner E., Eijk V., & Assendelft, W.(2021):** Interventions To Improve The Management Of Diabetes In Primary Care, Outpatient, And Community Settings. Diabetic Care, 24(10): 1821 – 1833
9. **American Diabetes Association. (2019) :** Diagnosis And Classification Of Diabetes Mellitus. Diabetes Care;37(Suppl. 1):S81–S90 American Diabetes Association. (2020) Standards Of Medical Care In Diabetes—. Diabetes Care.; 37(Supplement 1):S14–S80. [Pubmed: 24357209] And Lethal Than Type 1 Diabetes. Diabetes Care 36: 3863-3869.
10. **Eurodiab Ace Study Group (2019):** Variation And Trends In Incidence Of Childhood Diabetes In Europe, Lancet. 335:873-876.
11. **Karvonen, M., Pitkaniemi, J., & Tuomilehto, J .(2020):** The Onset Age Of Type 1 Diabetes In Finnish Children Has Become Younger. The Finnish Childhood Diabetes Registry Group. Diabetes Care. 22:1066-1070.
12. **Holt, G. I. (2020):** Diagnosis, Epidemiology And Pathogenesis Of Diabetes Mellitus An Update For Psychiatrists. Br. J. Psychiatry. 184:S55-S63.
13. **Colagiuri S (2010):** Diabesity: therapeutic options. Diabetes Obes Metab. 12: 463–73.
14. **Diabetes Control And Complications Trial Research Group. (2019):** The Effect Of Intensive Treatment Of Diabetes On The Development And Progression Of Long-Term Complications In Insulin-Dependent Diabetes Mellitus. N Eng J Med. ; 329(14):977–986.
15. **U.S. Department Of Health And Human Services. (2019):** Physical Activity Guidelines For Americans: Index. Accessed 29October 2019. Availablefromhttps://Health.Gov/Paguidelines/Guidelines/ Default.Aspx,
16. **Ly, T.T., Maahs, D.M., Rewers, A., Dunger, D., Oduwole, A., & Jones, T.W. ISPAD Guidelines (2019):** Assessment And Management Of Hypoglycemia. Pediatric Diabetes.; 15(Suppl. 20):180–192.
17. **Elizabeth, R., Seaquist, J., Anderson, B., Childs, P., Cryer, S., Dagogo, L., Simon, R., Heller, H. (2019):** Hypoglycemia And Diabetes: A Report Of A Workgroup Of The American Diabetes Association And The Endocrine Society. Diabetes Care.; 36:1384–1395. [Pubmed: 23589542[Epidemiol Infect;119:335–341.
18. **Song, S.H. (2020):** Complication Characteristics Between Young-Onset Type 2 Versus Type 1 Diabetes In A UK Population. BMJ Open Diabetes Res Care 3: E000044, 2020.
19. **Cheung, B.M., & Li, C. (2021):** Diabetes And Hypertension: Is There A Common Metabolic Pathway? Curr Atheroscler Rep 14: 160-166.
20. **Min, T.Z., Stephens, M.W., Kumar, P., & Chudleigh, R.A. (2020):** Renal Complications Of Diabetes. Br Med Bull 104: 113-127.
21. **Carroll, E.W., Scott, J.A., & Curtis, R . (2019):** Disorders Of Visual Function.In: Pathophysiology: Concepts Of Altered Health States. Wolters Kluwer Health/Lippincott Williams & Wilkins, Philadelphia, PA, Pp1388-1426.

22. **Chiarelli, F., Verrotti, A., & Morgese, G. (2020):** Glomerular Hyperfiltration Increases The Risk Of Developing Microalbuminuria In Diabetic Children. Pediatric Nephrol.; 9(2):154–158.

23. **Mandavia, C.H., Aroor, A.R., Demarco, V.G & Sowers, J.R (2021):** Molecular And Metabolic Mechanisms Of Cardiac Dysfunction In Diabetes. Life Sci 92: 601-608.

24. **Jørgenrud, B., Jalanko, M., Heliö T, Jääskeläinen, P., Laine, M., Hilvo, M., Nieminen, M.S., Laakso, M., Hyötyläinen, T., & Orešič, M. (2021):** The Metabolome In Finnish Carriers Of The MYBPC3-Q1061X Mutation For Hypertrophic Cardiomyopathy. Plos One 10: E0134184.

25. **Rosenbloom, AL. (2019):** Skeletal And Joint Manifestation Of Childhood Diabetes. Pediatr Clin North Am;31:569-489.

26. **Becker, D.J. (2019):** Complications Of IDDM In Childhood And Adolescence. In: Lifshitz F. Pediatric Endocrinology. Third Edition. New York: Marcel Dekker;,P.585.

27. **Yakar, S., Rosen, C.J., Beamer, W.G., Ackert-Bicknell, C.L., Wu, Y., Liu, J.L, Ooi, G., Setse, J. (2019):** Circulating Levels Of IGF-1 Directly Regulate Gone Growth And Density. J Clin Invest; 110:771-781.

28. **Garc´ia , L., Gonzalez, M., & Albaladejo, M.D., (2019):** Hemoglobin A1c For Diagnosis Of Diabetes Mellitus And Other Changes In Carbohydrate Metabolism In Women With Recent Gestational Diabetes Mellitus] Endocrinal Nutr;59: 362–366.

29. **Kadiki OA, Reddy MR, Marzouk AA (2021)**;. Incidence of insulin-dependent diabetes(IDDM) and non-insulin dependent diabetes (NIDDM) (0-34 years at onset) in Benghazi, Libya, Diabetes Res Clin Pract. ; 32:165- 173.

30. **Shaw J, Zimmet P, de Courten M, Dowse G, Chitson P, Gareeboo H (2021):** Impaired fasting glucose or impaired glucose tolerance, Diabetes Care. (2021); 22:399-402.

31. **Mayer, A.S., Davis, E.J., Lawrence, J.M., & Dabelea, D. (2019):** SEARCH For Diabetes In Youth Study. Incidence Trends Of Type 1 And Type 2 Diabetes Among Youths,–. N Engl J Med; 376:1419–1429.

32. **Desrochers HR, Schultz AT, Lafel LM. (2020):** Use of diabetes technology in children: role of structured education for young people with diabetes and families. Endocrinol Metab Clin North Am. 2020;49(1):19–35. https://doi.org/10.1016/j.ecl.2019.11.001.

33. **van den Boom L, Karges B, Auzanneau M, Rami-Merhar B, Lilienthal E, von Sengbusch S, Datz N, Schröder C, Kapellen T, Laimer M, Schmid SM, Müller H, Wolf J, Holl RW**. **(2021)** Temporal trends and contemporary use of insulin pump therapy and glucose monitoring among children, adolescents, and adults with type 1 diabetes between 1995 and 2017. Diabetes Care. (2021);42(11):2050–6. https://doi.org/10.2337/dc19-0345.

34. **Addala A, Auzanneau M, Miller K, Maier W, Foster N, Kapellen T, Walker A, Rosenbauer J, Maahs DM, Holl RW. A (2021**) decade of disparities in diabetes technology use and hba(1c) in pediatric type 1 diabetes: a transatlantic comparison. Diabetes Care.;44(1):133–40. https://doi.org/10.2337/dc20-0257.

35. **Sinisterra M, Hamburger S, Tully C, Hamburger E, Jaser S, Streisand R (2020);.** Young children with type 1 diabetes: sleep, healthrelated quality of life, and continuous glucose monitor use. Diabetes Technol Ther. 22(8):639–42.

36. **Burckhardt MA, Fried L, Bebbington K, Hancock M, Nicholas JA, Roberts A, Abraham MB, Davis EA, Jones TW. (2020);**Use of remote monitoring with

continuous glucose monitoring in young children with type 1 diabetes: the parents' perspective. Diabet Med36(11):1453–9. https://doi.org/10.1111/dme.14061.

37. **Evert, A.B., Boucher, J.L., & Cypress, M. (2019):** Nutrition Therapy Recommendations For The Management Of Patient With Diabetes. Diabetes Care;37(Suppl. 1):S120–S143.
38. **Deakin, T.A., Mcshane, C.E., Cade, J.E., & Williams, R. (2020) :** Group Based Training For Self-Management Strategies In People With Type 2 Diabetes Mellitus. Cochrane Database Syst Rev;2:CD003417.
39. **West, D.S., Dilillo, V., Bursac, Z., Gore, S.A., & Greene, P.G. (2020):** Motivational Interviewing Improves Weight Loss In Women With Type 2 Diabetes. Diabetes Care 30:1081–1087.
40. **Wing, R.R., Bolin, P., & Brancati, F.L. (2020):** Look AHEAD Research Group. Cardiovascular Effects Of Intensive Lifestyle Intervention In Type 2 Diabetes. N Engl J Med 2020;369:145–154.
41. **Robertson, L., Waugh, N., & Robertson, A. (2019):** Protein Restriction For Diabetic Renal Disease. Cochrane Database Syst Rev;4:CD002181.
42. **Siminerio, L.M., Albanese-O'Neill, A., & Chiang, J.L. (2020):** American Diabetes Association. Care Of Young Children With Diabetes In The Child Care Setting: A Position Statement Of The American Diabetes Association. Diabetes Care;37: 2834–2842.
43. **Hood, K.K., Beavers, D.P., & Yi-Frazier J. (2021):** Psychosocial Burden And Glycemic Control During The First 6 Years Of Diabetes: Results From The SEARCH For Diabetes In Youth Study. J Adolesc Health;55:498–504.
44. **Pinhas, O., Dolan, L.M., & Zeitler PS. (2020):** Diabetic Ketoacidosis Among Obese Africanamerican Adolescents With NIDDM. Diabetes Care 2020;20:484–486.
45. **TODAY Study Group. (2021):** Rapid Rise In Hypertension And Nephropathy In Youth With Type 2 Diabetes: The TODAY Clinical Trial. Diabetes Care;36:1735–1741.
46. **Haas, L., Maryniuk, M., & Beck J . (2020):** National Standards For Diabetes Self-Management Education And Support. Diabetes Care;37(Suppl.1):S144–S153 .
47. **Norris, S.L., Lau, J., Smith, S.J., Schmid, C.H., & Engelgau, M.M. (2020):** Self-Management Education For Adults With Type 2 Diabetes: A Meta-Analysis Of The Effect On Glycemic Control. Diabetes Care;25:1159–1171.
48. **Steinsbekk, A., Rygg, L.Ø., Lisulo, M., Rise, M.B., & Fretheim, A. (2020):** Group Based Diabetes Self-Management Education Compared To Routine Treatment For People With Type 2 Diabetes Mellitus. A Systematic Review With Meta-Analysis. BMC Health Serv Res; 12:213**.**
49. **Cryer, P.E. (2020):** Diverse Causes Of Hypoglycemia Associated Autonomic Failure In Diabetes. N Engl J Med;350:2272–2279.
50. **Miller, K.M., Beck, R.W., & Bergenstal, R,M. (2020):** T1D Exchange Clinic Network. Evidence Of A Strong Association Between Frequency Of Self-Monitoring Of Blood Glucose And Hemoglobin A1c Levels In T1D Exchange Clinic Registry Participants. Diabetes Care ;36.
51. **Sacks, D.B., Arnold, M., & Bakris, G.L (2019):** National Academy Of Clinical Biochemistry. Position Statement Executive Summary: Guidelines And Recommendations For Laboratory Analysis In The Diagnosis And Management Of Diabetes Mellitus. Diabetes Care;34:1419–1423.

52. **Wang CH, Hilliard ME, Carreon SA, Jones J, Rooney K, Barber JR, Tully C, Monaghan M, Streisand R. (2021);** Predictors of mood, diabetes-specifc and COVID-19-specifc experiences among parents of early school-age children with type 1 diabetes during initial months of the COVID-19 pandemic. Pediatr Diabetes. 22(7):1071–80.

53. **Gaede, P., Vedel, P., Larsen, N., Jensen, G.V.H., Parving, H.H., & Pedersen, O. (2020):** Multifactorial Intervention And Cardiovascular Disease In Patients With Type 2 Diabetes. N Engl J Med;348: 383–393.

54. **Akinsanya, E.R, & Beysolow. I. (2020):** Advisory Committee on **Al-Ali, M. (2021):** Incidence of type 1diabetes mellitus in Qatari children below age 13. Fifth Pan Arab Congress on Endocrinology and diabetes in Riyadh; p. 93. Ali, Z.. Health knowledge progress among diabetic patients after implementation of a nursing care program based on their profile. J Diabetes Metab, 2 (2):1000121.

55. **Bridges, C.B, Coyne, A.S., & Beasley, T. (2021):** Advisory Committee On Immunization Practices (ACIP); Advisory Committee On Immunization Practices Recommended Immunization Schedule For Adults Aged 19 Years Or Older - United States,. MMWR Morb Mortal Wkly Rep; 63:110– 112.

56. **Arnett, J.J. (2021):** Emerging Adulthood: A Theory Of Development From The Late Teens Through The Twenties**.** Am Psychol;55:469–480.

57. **Garvey, K.C., Markowitz, J.T, & Laffel, L.M.B. (2019):** Transition To Adult Care For Youth With Type 1 Diabetes. Curr Diab Rep; 12:533–541.

58. **Nakhla, M., Daneman, D., To, T., & Paradis, G., Guttmann, A**. **(2019):** Transition To Adult Care For Youths With Diabetes Mellitus: Findings From A Universal Health Care System. Pediatrics 2019;124:E1134– E1141.

59. **d'Annunzio G, Mafeis C, Cherubini V, Rabbone I, Scaramuzza A, Schiafni R, Minuto N, Piccolo G, Maghnie M. (2021);**Caring for children and adolescents with type 1 diabetes mellitus: Italian Society for Pediatric Endocrinology and Diabetology (ISPED) statements during COVID-19 pandemia. Diabetes Res Clin Pract. 2020; 168:108372.