

Diabetic Nurse Educator and the Emerging Technologies: Architects in Management of Children with T1DM

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Summary

Type 1 diabetes mellitus (T1DM) is one of the chronic diseases seen in children. Due to the chronic and complex nature of the disease and its management, it affects both the child and their family and their day-to-day quality of life. The researcher has tried to explore the role of technology and a specialised educator in making a shift from traditional care to child-centred one. With new approach, the treatment is directed towards self-management tailored according to the needs and preferences of the child without compromising optimal growth and development and quality of life and promoting shared decision-making and incorporating the technology in the management of children with T1 DM.

Key words: : Diabetes mellitus, Diabetes nurse educator, Glycaemic control

Type 1 Diabetes Mellitus (T1DM) is one of the chronic diseases seen in children. The disease may be diagnosed in the emergency department when a child comes with an acute complication of the disease, mainly diabetic ketoacidosis (DKA). India is the second largest country with T1DM with an estimated prevalence of 10.2 cases/ 100,000 children (Lohiya et al, 2021; Kumar et al, 2008). Some hospital-based studies done in different parts of the country suggest that children with T1DM are around 1-4 percent of the total diabetic population (Kumar et al, 2008; Mayer-Davis et al, 2017; Kalra et al, 2017). T1DM is a quite complex and challenging disease requiring daily regular monitoring of blood glucose concentrations, intake of calculated carbohydrates, administration of insulin and regulating the dose of insulin according to the diet taken, management of hypoglycaemia, physical activity and special care during sickness (Kumar et al, 2008).

Due to the chronic and complex nature of the disease and its management, it affects both the child and their family and their day-to-day quality of life. T1DM patients often have acute complications such as hypoglycaemia and diabetic ketoacidosis. These children also carry the risk of long-term micro- and macro-vascular complications affecting various body organs. Compliance with the recommended intensive treatment regimens

is stressful for T1DM children and adolescents and their caregivers (Kumar 2015). Any acute illness like fever, mental stress due to academic activities, mental and emotional stress due to peer group influence and normal physiological changes such as growth spurt, and menstrual cycles may adversely affect glycaemic control and render the patient susceptible to both acute and chronic complications. Thus, T1DM patients often require continued medical supervision for effective glycaemic control.

Background

T1DM occurs mainly due to the inability of the child's body to produce insulin resulting in high blood glucose levels. Some exogenous factors like stress, non-compliance with insulin and diet, and inadequate physical activity can further aggravate blood sugar levels. The foundation of diabetes management lies in nutritional intake. Earlier it was thought to be a physician-prescribed, calorie-restricted exchange diet. Now with better insulin preparations, there has been a paradigm shift in the nutritional management of T1DM. It is possible to plan a patient's diet individually considering his likes and dislikes and cultural background. Self-blood glucose monitoring and the physical activity of the child are recognised as anchors to glycaemic management along with dietary control. There has been a shift from traditional care to child-centred, in which the treatment is directed towards self-management

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tailored according to the needs and preferences of the child without compromising optimal growth and development and quality of life and promoting shared decision-making (Sharma et al, 2019; Heise et al, 2019).

Need for Specialised Person

Education is an integral component of the self-management of any chronic illness like T1DM. The appropriate dissemination of information from the health care team to a patient with T1DM represents the beginning of a lifelong process resulting in successful self-care. Motivating a child and their parents to take control of T1DM requires a unique set of skills on the part of the diabetic nurse educator (DNE). The child as well as the parents are empowered and encouraged to be active participants in the care of the child. Diabetes self-management education (DSME) plays a key role in overcoming the knowledge gaps between children and their parents in the management of T1DM. It is an intensive, collaborative and ongoing process initiated by the health care team, where a specialised nurse liaises between the Endocrinologist and the child and their parents.

The DNE is the central pillar of the healthcare team. She is given the responsibility of interacting with T1DM children and their parents and preparing them for the care of the child. The DNEs can subserve a crucial role in a developing country like India for the management of T1DM. The DNE provides care to improve the quality of life and ensures optimal metabolic control of the child and helps in reducing the stress of the family members because of her proximity and easy availability. The behavioural change in the child and their parents are brought about by the DNE through assessment, goal setting, planning, implementation, evaluation and documentation of the care received. The interventions by the DNE help identify and address the barriers to compliance with the treatment regimen. Children and their parents can practice the skills required for the management of T1DM like self-administration of insulin and glucose monitoring. The DNE also helps in dispelling the myths related to dietary restrictions, side effects of insulin, considering a child with T1DM as a sick child, inability to marry and have children etc. As the child enters the adolescent phase, one has to face many challenges in one's life. This is a period of risk-taking behaviour. Adolescents with T1DM may try experimenting with drugs, alcohol or smoking under peer group influence, which may adversely affect their general well-being. So, counselling by the DNE on safe sexual practices, avoidance of harmful substances, and handling stress during exams and job searches may be of paramount importance.

Intensive insulin therapy is the standard of care for the management of type 1 diabetes for ensuring glycaemic control (DCCTRG, 1994). These children are also at risk of severe hypoglycaemia, which may be manifested as seizures that can be life-threatening leading to coma or death unless managed promptly. According to the American Diabetes Association (ADA), the recommended glycosylated haemoglobin (HbA1c) for children like adults should be less than 7 percent to decrease the risk of both macro-vascular and micro-vascular complications (Heise et al, 2019). To achieve the recommended targets, children must be monitored meticulously with multiple blood glucose testing (5-6 times a day), closely, often called self-monitoring of blood glucose (SMBG).

The DNE teaches the child and the parents about the technique of blood glucose monitoring, carbohydrate counting and its importance in the management of T1DM and also helps the child and the parents with carbohydrate counting in meal planning. The DNE considers various physiological factors such as physical activity, illness of the child or stress while planning meals and insulin dose titration. The DNE for effective counselling has to continuously update her/ his knowledge about the continuous glucose monitoring system (CGMS), and flash glucose monitoring system (FGMS). The DNE should also be well-versed with insulin pumps, I-port devices, various software programmes etc.

Use of Technology

Recent advancements in the management of children with T1DM like CGMS and FGMS, which measure the interstitial glucose and estimate the plasma glucose levels every 5 to 15 minutes (based on the device used) have brought a significant change in the management. Both are externally applied devices useful in analysing glycaemic patterns and assist the health care team in therapeutic decision-making. A CGMS is the most recent technological development seen in the management of T1DM. The use of the technology intends to improve measurement accuracy and overall glycaemic control in children with uncontrolled blood glucose levels. The CGMS does the interstitial glucose monitoring to display glucose concentrations throughout the day, minimising the barriers to self-glucose monitoring and disease complications and also leading to improved quality of life. The glucose trends provide immediate feedback and are useful in identifying the problems and providing early interventions to children with T1DM. A strong correlation has been observed between the frequency of glucose monitoring and the lower HbA1c concentrations. Moreover, CGMS use reportedly decreased the

overall stress and psychological burden of the child and his parents and the worry about the child's wellbeing. Nowadays, there are office and home-based CGMS devices available for managing children with T1DM. These devices can help fine-tune insulin doses depending upon the glucose variability and are also useful in documenting hypoglycaemia unawareness among children and their parents, and treating them timely and appropriately.

Insulin Pump Technology (IPT) has occupied a special position in paediatric diabetes management in recent years. Insulin pump technology necessitates having a diabetic nurse educator in the health care team. The decision of starting the insulin pump therapy by the physician is highly individualised, based on the child's blood glucose variability, the preference of the parents, the need for flexibility in insulin dosing due to the child's activity levels, and overall attention to self-care. A systematic review and meta-analysis of 25 randomised controlled trials comparing the glycaemic control between multiple daily insulin injections (MDIs) and continuous subcutaneous insulin infusion (CSII) were found to cause a statistically significant reduction in HbA1c in children using CSII (Beck et al, 2017). One of the advantages of using the IPT is that it automatically adjusts insulin delivery based on the blood glucose value obtained from the CGMS.

Combining Expertise and Technology

Rapid-acting insulin analogues like Aspart, Lispro, Glulisine etc. and ultra-rapid-acting insulin such as fast-acting aspart insulin (FIASP), provide greater flexibility to children with T1DM. The dose of these insulin analogues can be easily adjusted according to the number of carbohydrates ingested (Hirsch, 2005).

The DNE teaches the currently available insulin delivery modalities including multiple daily injections using either an insulin syringe or pen and the insulin pump. A new smart pen technology pairs the pen with a patient's smartphone, helps patients easily calculate and keep a record of insulin administration. The record can be used by the treating team to decide the adjustment of the insulin regimen. An insulin pump helps in delivering a continuous infusion of insulin via a plastic cannula placed in the subcutaneous tissues. The advantage of this technology is that it keeps track of insulin and adjusts its calculated doses. Both the pump and the MDI result in similar levels of glycaemic control in children (DCCTRG, 1994). However, pump therapy obviates the need for multiple daily injections of insulin. Another new technology is the automated insulin delivery

(AID) device also known as the artificial or bionic pancreas. It uses the real-time measurement of glucose fed in a control algorithm. The device after reading the real-time glucose value adjusts the rate of subcutaneous delivery through an insulin pump. A threshold is set in the device that automatically suspends the delivery of insulin if the glucose value is below the threshold value. So the duration of a hypoglycaemic event can be shortened and timely measures can be taken to make the patient stable (El Khatib et al, 2017). The use of the technology and the DNE work hand in hand help the Endocrinologists in synthesising the information about the child and planning the adjustment with insulin therapy. The DNE can be a ray of hope for all children with T1DM and their parents. Her words of guidance can play a very crucial role in shaping the future of these children helping them in the attainment of their highest potential.

Strength of the article

A diabetic nurse in her day to day practice provides a crucial element of interaction to children with T1DM and their parents/ caregivers, who can make them feel at ease in managing a chronic disease. The present article will motivate nurses to take up the specialised role, a move towards shaping up the role of a nurse practitioner. A specialised nurse would be able to handle the problems of growing children with T1DM in an effective manner. She would further bring awareness among the children with T1DM and their caregivers about the available new upcoming technologies and the nursing experts' knowledge.

Conclusion

Enforcement of diabetes technology by the DNE promises a better future for children with T1DM patients by decreasing the burden of the disease among the patients and their families. However, more research evidence is required in future to explore the long-term benefits of these devices on the quality of life of these children and glycaemic control.

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कैंसर से फेफड़ों की हिफाजत कैसे करें

हमारे शरीर में असंख्य कोशिकाओं यानी सैल्स का जाल है। जान लें, ये कोशिकाओं निरंतर विभाजित होती रहती हैं। किसी कारणवश अंगविशेष की कोशिकाएं बेतहाशा बढ़नी लगें तो कैंसर हो जाता है। हालांकि खानपान की आदतें, कम हरकत वाली जीवनशैली और कुछ दवाएं भी कैंसर बनने में योगदान देती हैं, किंतु इस विषय में पूरी जानकारी अभी नहीं है। अतः इस बीमारी का पता चलने पर रोगी और परिजन चिंतित हो जाते हैं।

कैंसर के 200 से अधिक प्रकारों में व्यापकता और गंभीरता की दृष्टि से प्रमुख हैं: ब्लड कैंसर, फेफड़ों का (लंग) कैंसर, चर्म (स्किन) कैंसर, स्तन (ब्रेस्ट) कैंसर, मस्तिष्क (ब्रेन) कैंसर। जिस गति से कैंसरग्रस्त कोशिकाओं में बढ़त होती है, उसी अनुपात में गांठ बन जाती है। उपचार जल्द न किए जाने से यह पूरे शरीर में फैल जाता है। कैंसर शरीर में रोग प्रतिरोधी क्षमता यानी इम्यून सिस्टम को क्षीण कर देता है। वर्ष 2020 में लंग कैंसर से 18 लाख मौतें हुईं। लंग कैंसर के उपचार में सर्वाधिक बाधाएं रोग की देर से पहचान और ठीक से जांच न हो पाना है। अतः आरंभिक लक्षण दिखने पर कोताही नहीं बरती जानी चाहिए। एक्सपर्ट बताते हैं, प्रतिदिन बहुत सिगरेटें पीने वाले या उनके गिर्द रहने वाले बीमारी के जोखिम में होते हैं।

लंग कैंसर से पीड़ित व्यक्ति के सामान्य लक्षण हैं: भूख खत्म हो जाना, भारी कमजोरी और थकान, सांस लेने में कठिनाई, बलगम जमने की शिकायत, जोड़ों और हड्डियों अत्यधिक पीड़ा। लंग कैंसर के लिए विशेषकर धूम्रपान, द्वितीयक धूम्रपान यानी ऐसे वातावरण में रहना, वायु प्रदूषण, एस्बेस्टस या अन्य कैंसरजन्य पदार्थों से निकटता, पेयजल में आर्सेनिक की मौजूदगी, तथा रेडिएशन को जिम्मेदार माना गया है। लंग कैंसर के प्रति जागरूकता उत्पन्न और संचर्धित करने की दृष्टि से प्रतिवर्ष पहली अगस्त का दिन विशेषकर सोशल मीडिया के जरिए आयोजित किया जाता है।