



# Nonpharmacological management and psychosocial support for children and adolescents with type 1 diabetes

Jae Ho Yoo, M.D.

Department of Pediatrics, Dong-A University College of Medicine, Busan, Korea

Compared to that in the Caucasian population, type 1 diabetes mellitus (T1DM) incidence rates are very low in Koreans. Therefore, compared to the recent development of pharmacological therapy applicable to Korean children with T1DM, interest in nonpharmacological therapy and psychosocial support systems remains low, as is the development of Korean-style T1DM education programs for therapeutic application. Children who have been newly diagnosed with diabetes are placed in completely new environments for treatment. For appropriate control of diabetes, patients have to self-monitor blood glucose levels and inject insulin several times a day and must use extreme self-control when they eat foods to avoid increases in blood glucose levels. Blood glucose excursions resulting from impaired pancreatic  $\beta$  cell functions cause mental stress due to vague fears of chronic complications of diabetes. In addition, children with diabetes cannot be excluded from the substantial amount of studies required of Korean adolescents, and the absolute shortage of time for ideal control of diabetes adds to their mental stress. Many of these patients are psychologically isolated in school where they spend most of their time, and they are not appropriately considered or supported with respect to blood glucose control in many cases. In this respect, this author will introduce some of the newest views on nonpharmacological therapy and psychosocial support systems that account for important parts of T1DM management and seek measures to apply them in conformity with the social characteristics of Korea.

**Key words:** Type 1 diabetes mellitus, Exercise therapy, Nutritional support, Psychosocial support systems, Child, Adolescent

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Corresponding author: Jae Ho Yoo, M.D.  
Department of Pediatrics, Dong-A University Medical Center,  
1, 3-Ga, Dongdaesin-dong, Seo-gu, Busan 602-715, Korea  
Tel: +82.51-240-2883, Fax: +82.51-242-2765  
E-mail: pedendo@dau.ac.kr

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## Introduction

Type 1 diabetes mellitus (T1DM) is caused by immune-mediated mechanisms or direct destruction of insulin-secreting  $\beta$  cells of the islets of Langerhans. Globally, it generally occurs in childhood through adolescence, but its incidence is quite diverse among different ethnic groups. In Caucasian individuals younger than 14 years of age, the incidence rates of T1DM are roughly 20–30 cases/year/100,000 individuals, but the incidence rates of T1DM are very low in Asia including Korea<sup>1,2</sup>. From 1995 to 2000, the incidence rates of T1DM in children and adolescents younger than 15 years of age in Korea were reported as 1.36 cases/year/100,000 individuals on average. The ages at which T1DM occurred most frequently were 10 years in boys and 12 years in girls, and T1DM occurred most frequently in those aged 10–15 years. That is, the highest incidence rates were shown in peripubertal school-age children<sup>3</sup>.

Children who have been newly diagnosed with diabetes are placed in completely new environments to manage their diabetes. For appropriate control of diabetes, they must self-monitor the blood glucose levels and inject insulin several times a day, and must use extreme self-control when eating foods to avoid increases in blood glucose levels. In addition, these patients require more exercise than other children in the same age groups. Blood glucose excursions resulting from impaired pancreatic  $\beta$ -cell functions cause mental stress due to vague fears of chronic complications of diabetes. In addition, children with diabetes cannot be exempted from the substantial amount of studies required of Korean adolescents, and the absolute shortage of time for ideal control of diabetes increases their mental stress. In particular, as children with T1DM in Korea are rare to the extent that there is only 1 per school, many of them are psychologically isolated in school where they spend most of the time, and they are not appropriately considered or supported with respect to blood glucose control in many cases.

In Korea, insulin lispro, insulin aspart, insulin glargine, and insulin detemir were individually introduced more than 10 years ago and accordingly, conventional NPH-based insulin therapy has been replaced by multiple daily insulin injection regimens in an increasing number of cases<sup>4,5</sup>. Compared to recent developments in pharmacological therapy applicable to Korean children with T1DM, interest in nonpharmacological therapy and psychosocial support systems remains low, as is the development of Korean-style T1DM education programs for therapeutic application. In this respect, this author will introduce some of the newest views on nonpharmacological therapy and psychosocial support systems that account for important parts of T1DM management and seek measures to apply them in conformity with the social characteristics of Korea.

## Nutritional support

Nutritional therapy is a core component of T1DM treatment. However, better clinical outcomes can be expected only when nutritional therapy is harmonized with insulin treatment and exercise<sup>6</sup>. Therefore, dietitians should consider the planning, contents, and timing of snacks/meals so that nutritional therapy can be applied in conformity with individuals' insulin action profiles and lifestyles<sup>7,8</sup>. Therefore, dietitians should periodically evaluate nutritional management together with diabetes care teams and families including children.

Children who have been newly diagnosed with diabetes or those who poorly control diabetes sometimes exhibit excessive appetite and unnecessarily large energy intake because catabolic states have been prolonged. When blood glucose has been stabilized and decreases in body weight have been recovered, energy intake should be reduced. However, children and adolescents with T1DM require sufficient energy intake for optimal growth and maintenance of ideal body weight. In particular, as adolescents exhibit rapid increases in energy intake and nutritional demands, along with insulin dosage adjustment, changes in nutritional therapy should be pursued.

It is recommended that carbohydrates should account for 50–55% of the total daily energy intake. This recommendation is shared by healthy children during growth periods and children and adolescents with T1DM for optimal growth<sup>9–11</sup>. However, it is recommended that they consume rough rice, which is a healthy carbohydrate food. Fat intake is recommended to be 30–35% of the total daily energy intake<sup>10–12</sup>. Saturated fat and trans-fatty acid intake is recommended to be maintained within 10%<sup>6</sup>. It is recommended to increase the intake of lean meats, fish, and low-fat dairy products and the use of olive and sesame oils to increase the intake of monounsaturated fatty acids and polyunsaturated fatty acids. Protein intake is recommended to be 10–15% of the total daily energy intake<sup>13</sup>. The recommended consumption amount is 0.8–1 g/(kg · day), and the demand will be reduced as people age. The consumption of vegetable-derived proteins such as Tofu is recommended, as is the consumption of proteins through fish, lean meats, and low-fat dairy products<sup>8</sup>. Fiber intake is recommended to be “age in years + 5 = grams of fiber per day” for children aged 2 years or more<sup>11</sup>. That is, the consumption of 15 g of fiber per day is recommended for 10-year-old children. The consumption of foods with large amounts of fibers such as fruits, vegetables, and wholegrain cereals is recommended, and because these foods increase satiety and suppress the intake of foods with higher calories, it is necessary to encourage children to consume these foods sufficiently. Children and adolescents with diabetes are not recommended to supplement their intake of vitamins, minerals,

antioxidants, and trace elements but are recommended to consume fresh fruits and vegetables in sufficient quantities equivalent to those required by other healthy children.

Dietary recommendations for children and adolescents with T1DM are basic healthy eating habits that should be applied to all children and adults<sup>9,13</sup>. Therefore, these dietary recommendations can be applied to all members of families with children with T1DM, and if all family members change their dietary habits together, this will improve the effectiveness of nutritional therapy<sup>14</sup>.

### Exercise therapy

In T1DM treatment, the importance of exercise has long been emphasized. However, children and adolescents with T1DM exhibit quite diverse blood glucose responses to exercise. Blood glucose responses to exercise not only are different among different individuals depending on insulin sensitivity but also appear diversely in each individual, and thus it is important to exercise without inducing hyperglycemia or hypoglycemia<sup>15</sup>. If nondiabetic individuals exercise, their insulin secretion will decrease, and glucose-counterregulatory hormones will increase to maintain constant blood glucose levels. However, those with T1DM have disorders in glucose-counterregulatory hormone secretion and rely on parentally administered insulin<sup>16</sup>. Therefore, individuals with T1DM are likely to have low blood glucose levels during or after exercise<sup>17</sup>. In particular, those who use insulin excessively at ordinary times easily encounter low blood glucose states with low-intensity or short-duration exercise and thus tend to avoid exercise altogether. In fact, any form of exercise continued for longer than 30 minutes can induce low blood glucose levels and thus requires appropriate insulin control and food supply<sup>18</sup>. Therefore, when exercising, the duration and intensity of exercise and blood glucose levels before exercise should be considered. However, competitive exercise may increase blood glucose due to the action of psychological stress, and anaerobic exercise may increase blood glucose levels due to adrenal responses<sup>15</sup>. Excessive carbohydrate consumption during exercise frequently increases blood glucose levels. If exercise is performed in hypoinsulinemic states, hyperglycemia or ketosis might be induced after exercise. However, if the timing of exercise, amount of insulin, and preexercise food consumption are maintained within certain limits, intermittent aerobic exercise for 30–60 minutes will not drastically alter blood glucose levels. In particular, exercise performed after meals can help to minimize postprandial glycemic excursions.

Although some studies reported that lower HbA1c levels were maintained when the frequency of regular physical activity was higher<sup>19,20</sup>, some studies could not prove a direct relationship

between exercise and HbA1c levels<sup>21,22</sup>. Although a few studies did not produce evidence of the assumption that continued aerobic exercise would prevent chronic complications of diabetes<sup>23</sup>, many studies revealed the possibility that aerobic exercise could prevent cardiovascular or other chronic complications<sup>24-26</sup>. We know that exercise is beneficial to everyone in not only controlling body weight and remarkably reducing cardiovascular risks but also in increasing vitality in daily life, and thus regular exercise is essential to improving health. Therefore, it is believed that opportunities for diverse exercise should be provided to children and adolescents with T1DM to prevent them from losing interest in exercising.

### Diabetes self-management education systems

For the successful control of diabetes, diabetes self-management education is essential. For effective implementation of this education, guidelines such as “National Standards for Diabetes Self-management Education”<sup>27</sup>, “Position Statement on Individualization of Diabetes Self-management Education”<sup>28</sup>, and “Management of Children with Diabetes in the School Setting”<sup>29</sup> are provided. In Korea, national unified education guidelines for children and adolescents with T1DM are not provided at this point. Several hospitals that operate type 1 diabetes care centers are implementing diabetes self-management education programs.

Diabetes self-management education programs should include the following components. First, it should define what diabetes is. In particular, the characteristics of type 1 diabetes should be explained and its differences from type 2 diabetes regarding pathogenesis, clinical characteristics, treatment regimens, and nutritional therapy should be explained. The patients should be taught practical skills such as how to perform insulin injection, glucagon injection, blood glucose testing, and urine ketone testing, and the rationale for these practices should be known and explained. The patients should receive nutritional education through nutritionists. The importance of exercise in the treatment of type 1 diabetes and measures to respond to changes in blood glucose levels during exercise should be explained. The patients should be educated on hypoglycemia and hyperglycemia and appropriate measures to respond to the occurrence of either must be explained. Methods to set targeted blood glucose levels and achieve treatment goals should be explained. Methods to control blood glucose levels on special days such as days when they are sick or travelling should be taught. Important matters in relation to diabetes control in school should be sufficiently explained, and homeroom teachers, school nurses, and school exercise trainers should be provided with opportunities for education on important matters when they care for children with T1DM. Through gatherings of

families of children with T1DM and peer groups, opportunities to share information helpful to diabetes control should be provided<sup>30</sup>. All educational courses should progress step-by-step in conformity with age groups for easy understanding. Education on diabetes should be continuously reevaluated to ensure continual education on insufficient management<sup>31</sup>. I hope that in the near future, the operation of diabetes self-management education programs for children and adolescents with T1DM will be systematically evaluated and lead to discussions on effective education programs that are suited to the characteristics of the Korean society.

## Psychosocial Support Systems

Adolescents with chronic diseases such as T1DM have been considered as dangerous groups with high probability of the occurrence of psychological problems<sup>32</sup>. In particular, adolescent patients with type 1 diabetes must unceasingly overcome instinctive desires including those for comfort and appetite to control their diabetes, and the fear of chronic complications imposes more uncertainty on them as adolescents, resulting in significant psychological stress. It has been already confirmed in studies conducted on adults that depression was more than 2-fold more frequent in patients with diabetes than in the normal population, and there were reports indicating that diabetes combined with depression caused more serious disorders in social functions, creating greater difficulties in school or family life and even diabetes control<sup>33</sup>. It is also known that depression affects HbA1c levels and diabetic chronic complications, resulting in increased national health management costs and diabetes-related mortalities<sup>34</sup>.

The most basic unit of psychosocial support systems is the patient's family. In a study conducted on Korean children and adolescents<sup>35</sup>, glycemic control and depressive symptoms had close relationships, and the results of an analysis of parenting behaviors showed that there were fewer depression symptoms when parents knew more about the overall life of their children such as school life and friendships and when parents demonstrated parenting behaviors to consistently persuade their children with clear and reasonable criteria. Sociodemographic characteristics also existed such as the fact that high HbA1c levels were observed in low-income and single-parent families. Families with high scores in family cohesion, achievement orientation, agreement about diabetes management responsibilities, supportive behaviors, and collaborative problem-solving demonstrated smooth glycemic control. Families with high scores in conflicts and diffusion of responsibilities demonstrated poor glycemic control. Family-based behavior therapeutic approaches include goal setting, self-monitoring, positive reinforcement, behavioral contracts, supportive parental communication, and appropriately

shared responsibility for diabetes management, and these strategies improve glycemic control<sup>36-38</sup>. In addition, parent-adolescent relationships were improved while implementing these approaches. When therapeutic approaches focusing on families were attempted, the participation of family members in treatment could be increased without decreasing the quality of life of the adolescents or causing family conflicts, and the deterioration of glycemic control could be prevented<sup>39</sup>. In Korea, it appears that institutions that educate children and adolescents on diabetes are rarely active in the operation of psychosocial support systems. I hope that many family-based behavior therapeutic approaches that are suitable to the characteristics of Korean families will be attempted so that excellent models can be presented.

## School-based support systems

In the United States, federal laws that protect children with diabetes include Section 504 of the Rehabilitation Act of 1973, Individuals with Disabilities Education Act of 1991, and Americans with Disabilities Act. Owing to these acts, children with diabetes can be provided with various types of approaches necessary for appropriate diabetes control<sup>40</sup>. However, in Korea, where people's perceptions of T1DM are insufficient, children with diabetes and their families should first make efforts to control diabetes well in school. Then, with the help of the members of diabetes care teams, they should sufficiently explain the needs of children with diabetes to their children's homeroom teachers in school, school exercise trainers, and school nurses sufficiently through basic education on T1DM.

Children with type 1 diabetes should be allowed to bring tools for blood glucose tests and the use of insulin to school. They should be allowed to freely test their blood glucose levels anywhere in school. They should be allowed to eat snacks freely for preventing and responding to hypoglycemia. They should be allowed to meet school nurses freely any time and receive immediate and effective treatment against hyperglycemia and hypoglycemia. They should be allowed to go to the toilet freely, even during class hours. They should be allowed to drink water freely. They should be allowed to participate not only in gymnastics but also in all field trips and extracurricular activities. School exercise trainers should be able to respond to hypoglycemia immediately and appropriately. The children should be sufficiently considered so that they are not disadvantaged because of hospitalizations or clinic visits.

Currently, in Korea, depending on the policies of local education offices, welfare policies for children with diabetes are made on a case-by-case basis. Opportunities for Internet lectures in cases where children must miss school are increasing, and opportunities to attend

schools close to students' houses are being provided. I hope these policies will be spread throughout the country, and legal support to guarantee an environment where children with diabetes can appropriately control diabetes in school will be provided. To this end, I believe the efforts of the Korean Pediatric Society and Korean Pediatric Endocrine Society will be needed.

### Diabetes Camp

In Korea, a camp for 12 patients with childhood diabetes operated by Jeonnam National University Hospital that opened in 1981 is recorded as the first camp. In 1986, a Seoul-based childhood diabetes camp began, and childhood diabetes camps were opened in the Busan-Gyeongnam region in 1991 and in the Daegu-Gyeongbuk region in 1992. Recently, a childhood diabetes camp was opened in the Honam region, and thus camps based in 4 regions are now being operated in Korea, with approximately 200 patients with childhood diabetes attending a camp each year. Doctors, nutritionists, nurses, psychotherapists, exercise trainers, social workers, and diverse expert groups participate in these childhood diabetes camps. Children with diabetes will be provided opportunities to obtain knowledge necessary for diabetes self-management through these camps. To some children, the camps can become an opportunity to develop a spirit of independence by living apart from their parents. Diabetes camps help to alleviate a sense of isolation through communication between peer groups with diabetes. Sharing diabetes-related problems and finding clues to solve these problems are also important purposes of the camp. However, not all programs of childhood diabetes camps can consist of education for diabetes control because most of the children participating in the camps expect that enjoyable activities are included in these camps<sup>41</sup>. Even if children participating in the camp cannot achieve all of the purposes mentioned above at once, they can be provided with opportunities to selectively obtain what they need most urgently.

Although it has been nearly 30 years since childhood diabetes camps were introduced in Korea, no campsite or staff operates childhood diabetes camps professionally. In particular, no single foundation supports these camps, and consequently, there are difficulties each year because stable financial support cannot be secured. It is thought that the childhood diabetes camps have continued for almost 30 years because of the sacrifices of the doctors, nurses, nutritionists, social workers, and numerous other volunteers. For the childhood diabetes camps in Korea to develop further, along with those who have been leading the childhood diabetes camps, more social groups should participate in the camps and find ways to help children with diabetes live healthy lives.

### Conclusion

A diverse array of approaches are required of diabetes care teams to provide strategies for effective diabetes control to children newly diagnosed with T1DM, who must adopt drastically different lifestyles. Although there should be no objection to the fact that an insulin supply is indispensable to maintain the lives of children, it is thought that for children with type 1 diabetes to grow into healthy adults with diabetes, nonpharmacological therapy and psychosocial support systems should be activated further. In addition, efforts to develop diabetes education programs suitable to the Korean society should be continued.

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