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Childhood diabetes: Clinical and educational program at King Chulalongkorn Memorial Hospital

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Background : *Childhood diabetes is a chronic disease and needs multidisciplinary approach team to improve the metabolic derangement and decrease the complication. Accordingly, a combined clinical and educational program on childhood diabetes has been established at the Department of Pediatrics, King Chulalongkorn Memorial Hospital since 2000.*

Objective : *To compare the metabolic control in children with IDDM who regularly attended the program for one year.*

Research design : *Retrospective study*

Patients and method : *Twenty-one children with IDDM (13 girls, 8 boys) who attended the diabetes clinic and education program every 3 months for a period of one year were retrospectively studied. During each visit, the diabetes education team would educate the patients and their parents in various topics regarding diabetes self-management for a period of one hour. The metabolic control including FBS, cholesterol, triglyceride and HbA1c were compared at 0, 6, 12 months after attending the clinic.*

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Results : *The mean age of our patients was 11.8 ± 4.2 years. HbA1c was significantly decreased from 11.2 ± 2.7 % to 9.3 ± 3.2 % at 6 months (p= 0.01) and to 9.5 ± 2.5 % at 12 months (p = 0.001). However, FBS, cholesterol and triglyceride were not significantly changed.*

Conclusion : *The multidisciplinary team on diabetes can improve HbA1c in our diabetic children but not other metabolic control. However, a longer period of study may result into a better metabolic control.*

Keywords : *Diabetes mellitus, Diabetes education, Multidisciplinary team, Glycated hemoglobin.*

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ปัญหา : *เบาหวานในเด็กเป็นโรคเรื้อรังที่ต้องอาศัยทีมบุคลากรสหสาขาวิชาชีพทางการแพทย์ในการดูแลรักษาและควบคุมโรค ดังนั้นในปี พศ.2543 ทางหน่วยต่อมไร้ท่อ ฝ่ายกุมารเวชศาสตร์ โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย ได้จัดทำโครงการให้ความรู้เกี่ยวกับโรคเบาหวาน ในเด็กและวัยรุ่น*

เป้าหมาย : *ศึกษาผลการเปลี่ยนแปลงทางเมตาบอลิคในกลุ่มผู้ป่วยเบาหวานในเด็กที่มารับการรักษาที่โรงพยาบาลจุฬาลงกรณ์ สภากาชาดไทย ในระยะเวลา 1 ปี*

รูปแบบการวิจัย : *การศึกษาแบบย้อนหลัง*

วิธีการศึกษา : *ผู้ป่วยเด็กเบาหวาน 21 คน ที่มารับการรักษาที่ รพ.จุฬาฯ (หญิง 13,ชาย 8) จะได้รับการตรวจรักษาและความรู้เกี่ยวกับเบาหวาน เพื่อให้ผู้ป่วยดูแลตนเองได้ตามโปรแกรมในโครงการให้ความรู้เกี่ยวกับโรคเบาหวานทุก 3 เดือน เป็นระยะเวลา 1 ปี ผู้ป่วยเด็กทุกคนจะได้รับการตรวจ FBS, cholesterol, triglyceride และ HbA1c ที่เวลา 0,6,12 เดือนของการเข้าร่วมโครงการนี้*

ผลการศึกษา : *อายุเฉลี่ยของผู้ป่วยเด็กที่ศึกษาคือ 11.8 $\pm$ 4.2 ปี หลังจากเข้าร่วมโครงการ พบว่า ค่า HbA1c ที่ 6,12 เดือนลดลงกว่าก่อนการเข้าร่วมโครงการอย่างมีนัยสำคัญ คือจาก 11.2 $\pm$ 2.7 % ก่อนเข้าร่วมโครงการเป็น 9.3 $\pm$ 3.2 % ที่ 6 เดือน ($p = 0.01$) และ9.5 $\pm$ 2.5 % ที่12 เดือน ($p = 0.001$) แต่ค่า FBS, cholesterol, triglyceride ไม่แตกต่างจากก่อนการเข้าร่วมโครงการ*

สรุป : *การดูแลรักษาควบคุมโรคในผู้ป่วยเบาหวานในเด็กโดยทีมบุคลากรสหสาขาวิชาชีพทางการแพทย์สามารถลดค่า HbA1c ได้อย่างมีนัยสำคัญ แต่ไม่สามารถลดค่า FBS, cholesterol,triglyceride ได้ อย่างไรก็ดีการติดตามผลในระยะยาวของโครงการนี้น่าจะแสดงผลต่อการเปลี่ยนแปลงทางเมตาบอลิคที่ดีขึ้น*

คำสำคัญ : *เบาหวาน, ความรู้เกี่ยวกับโรคเบาหวาน, ทีมสหสาขาวิชาชีพ, HbA1c*

Childhood diabetes is a chronic illness resulting from absolute or relative insulin deficiency. It can cause metabolic derangement of carbohydrate, fat and protein. The aim of treatment is to normalize blood sugar and bring the metabolic derangement to normal as much as possible. Diabetes Control and Complication Trial (DCCT) in the United States showed that strict control of diabetes in childhood could delay late complications: nephropathy, retinopathy, and neuropathy.[1,2] However, this may cause a high incidence of hypoglycemic attack. To reach the best diabetes control, multidisciplinary team is needed. The Endocrine Unit, Department of Pediatrics, King Chulalongkorn Memorial Hospital has established a clinical and educational program for childhood diabetes since 2000. Accordingly, the aim of this study was to study the metabolic control in children with diabetes who were attending the diabetes clinic at the Department of Pediatrics, King Chulalongkorn Memorial Hospital during 2000 and 2001.

Material and method

We retrospectively reviewed the twenty-one children who were insulin dependent diabetes mellitus (IDDM) and attended the diabetes clinic regularly every 3 months for a period of 1 year. All children had a number of blood tests performed for metabolic control which included fasting blood sugar, cholesterol, triglyceride, and HbA1c in early mornings before the insulin injection and breakfast. During each visit, the patients and their parents were educated by diabetic education teams which consisted of pediatric endocrinologist, scientist, dietitian, diabetic health educator, physical therapist and diabetic nurse for a period of 1 hour. The teaching topics included, namely: 1) What is diabetes? 2) Diabetic diet; 3) Self monitoring of blood glucose; 4) Exercise and diabetes, and; 5) Complications of diabetes. The results of metabolic control were compared between the beginning of the study and at 6 months and 1 year after attending the program. The statistical analysis employed in this study was Pair T-test.

Fasting blood sugar

Plasma glucose was determined by enzymatic assay of Roche Diagnostic GmbH, Germany. The enzymatic assay was hexokinase method which the plasma was added Tris buffer 100 mmol/L pH 7.8, NADP 1.0 mmol/L, HEPES buffer 30 mmol/L pH 7.0 and hexokinase 8.3 U/ml which hexokinase catalyzes the phosphorylation of glucose to glucose-6-phosphate. After that it was oxidized to gluconate-6-phosphate by the rate of NADPH formation during the reaction which is directly proportional to the glucose concentration and can be measured photometrically.

Cholesterol

Serum cholesterol was determined by enzymatic colorimetric test of Roche Diagnostic GmbH, Germany. The serum was added PIPES buffer 75 mmol/L pH 6.8, cholesterol esterase 0.5 U/ml, cholesterol oxidase 0.15 U/ml and horseradish peroxide 0.25 U/ml. The color intensity was directly proportional to the concentration of cholesterol and could be measured photometrically.

Triglyceride

Serum triglyceride was determined by enzymatic colorimetric test of Roche Diagnostic GmbH, Germany. The serum was added PIPES buffer

50 mmol/L pH 6.8, lipoprotein lipase 5.0 U/ml, 4-chlorophenol 4.7 mmol/L, glycerokinase 0.19 U/ml, glycerol phosphate oxidase 2.5 U/ml and horseradish peroxidase 0.10 U/ml. The color intensity was directly proportional to the concentration of triglyceride and could be measured photometrically.

HbA1c

Plasma HbA1c was determined by TINIA (Turbidimetric inhibition immunoassay) of Roche Diagnostic GmbH, Germany. The plasma was added MES buffer 0.025 mol/L, Tris buffer 0.015 mol/L pH 6.2, HbA1c antibody 0.5 mg/ml after that adding MES buffer 0.025mol/L Tris buffer 0.015 mol/L pH 6.2, HbA1c polyhapten 8 μg/ml. The polyhaptens react with excess anti-HbA1c antibodies to form insoluble antibody-polyhapten complex which could be measured turbidimetrically.

Results

Twenty-one children with IDDM, 13 girls and 8 boys, had a mean chronological age of 11.8 ± 4.2 years at the time they attended the program. After education, HbA1c significantly decreased from 11.2 ± 2.7 % to 9.3 ± 3.2 % at 6 months, and to 9.5 ± 2.5 % at 1 year. However, all other metabolic indexes were not significantly changed. (Table1)

Discussion

A multidisciplinary team approach for the take care of diabetes children is crucial for the control the chronic illness.[3,4] The team consisted of pediatric endocrinologist, scientist, dietitian, diabetic nurse and health educators. In addition, time for children and their parents to share their experience is very important to support each other. A tight control of diabetes can prevent long-term complications; however, hypoglycemic symptoms might frequently occur. Diabetes Control and Complication Trial (DCCT) demonstrated that there was threefold increase in the incidence of hypoglycemic attack.[5] The measurement of HbA1c is widely used in clinical practice as the blood level of HbA1c reflects the integrated blood glucose concentration over a period of six to eight weeks.[6] The advantages of this measurement as a test of diabetes control are, namely: it is objective, independent of the patient's co-operation and independent of the time of the last meal. Since diabetes education program in our unit has begun in 2000, HbA1c has improved gradually. HbA1c is a good index of diabetes control and the level of less than 8 % is acceptable.[7] Nevertheless, a one-year follow-up is too short to evaluate other parameters of metabolic control as seen in cholesterol and triglyceride levels.

Table 1. The metabolic changes at 0, 6, 12 months after attending diabetic clinic and education.

Month	0	6	12
BMI (kg/m2)	20.8 ± 5.8	21.1 ± 5.8	20.9 ± 5.9
Fasting blood sugar (mg/dL)	203 ± 105	184 ± 94	190 ± 113
Cholesterol (mg/dL)	195 ± 45	202 ± 45	218 ± 44
Triglyceride (mg/dL)	115 ± 76	103 ± 81	123 ± 112
HbA1c (%)	11.2 ± 2.7	9.3 ± 3.2 *	9.5 ± 2.5 **
Insulin dose (unit/kg)	0.7 ± 0.3	0.8 ± 0.3	0.8 ± 0.2

* p= 0.01 , ** p = 0.001

Education is key to diabetic care. In addition, clinical management and successful intensification of teaching reduce microvascular complications. Frequent educational input and continuing support can help patients and their parents to achieve self-management. It is accepted that diabetes education should be a continuous and repetitive process in order to be effective. A similar study at Siriraj Hospital also demonstrated that the multidisciplinary management team could reduce the length of admission and readmission rate within one year after diagnosis.[8]

In conclusion, the multidisciplinary team of caregivers for diabetic child is very important to attain a better diabetes control as demonstrated by the lowering of glycated hemoglobin. However, a longer period of study might improve other metabolic parameters and reduce the chronic complications.

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