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Original Research Article

Evaluation of Glycemic Control Indices in Children with Type 1 Diabetes Being Treated

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ABSTRACT

Differences in glycemic control of patients in conventional and Basal & Bolus methods can be an influential factor in deciding on the treatment method of choice for a particular patient with a specific background. And has been based on the calculation of carbohydrate content in the diet and multiple injections. In this cross-sectional study, 146 children with type 1 diabetes (conventional methods (n=70) and Basal & Bolus (n=76)) were included in the study during the years 2018 to 2020. Demographic indices, body mass index, duration of diabetes, fasting blood sugar during the last month and also the amount of HbA1c in the last three periods were measured and compared between the groups. Statistical results showed no significant difference between the two treatments. The average fasting sugar during the last month for the conventional group was 96.81 ± 10.25 and for the Basal & Bolus was 95.59 ± 9.19 ($P=0.551$). The average fasting sugar two hours after eating during the last month for the conventional group was 115.48 ± 15.59 for Basal & Bolus equals 118.41 ± 11.29 . ($P=0.489$). The difference in the results of studies comparing the conventional and basal&Bollus methods and analog and homologous insulins is not fully interpretable. However, it can be said with certainty that the type of nutrition appropriate to the method and level of patient education and acceptance of treatment by the patient can affect the outcome of glycemic control and the occurrence of complications in a treatment method.

Keyword: diabetes, Insulin, Children, conventional, basal&Bollus

Introduction

Type 1 diabetes is the most common metabolic disease in children and adolescents. Of the 230 million people with diabetes, 4.9 million have type 1 diabetes, and type 1 diabetes is the most common chronic disease in children in developed countries(1). Every year, 70,000 children under the age of 15 develop type 1 diabetes, and the incidence increases by 3 to 5 percent each year. Therefore, the optimal treatment of these patients is one of the research concerns in the field of endocrine diseases(2). Treatment of type 1 diabetes is a set of drugs (insulin), nutrition, blood sugar control, and it is obvious that educating the patient for the correct use of each component of treatment is an important and integral part of treatment(3). Nowadays, with the production of analog insulins, it is possible to closely imitate the physiology of blood sugar regulation, as a result of which better glycemic control of patients with type 1 diabetes is possible, and on the other hand, it is possible for patients to have a more flexible diet. In many developed countries, the treatment regimen for children before and after school has been changed by the Basal & Bolus method, including the use of insulin pumps and the repeated use of analog insulin injections(4). Doctors in developing countries, including Iran, face different challenges in deciding on the type of insulin to use and the use of homologous and analog insulins, and the conventional and basal & bolus regimens(5). One of the most important challenges is the difference in the financial capacity of the family in using different types of treatment methods and the difference in the type of nutrition of children, especially young children, and the level of literacy and learning ability of parents or caregivers. It is clear that each of the common methods of insulin therapy requires a different type of diet and education of the patient and his caregivers with the goal of understanding how selective insulin works and its pharmacodynamics (6, 7). Differences in glycemic control of patients in conventional and Basal & Bolus methods can be an effective factor in deciding on the treatment method of choice for a particular patient with a specific background. It has been treated with Lantus and Novo rapid and based on the calculation of carbohydrate content in the diet and multiple injections.

Methods

In this study, which was performed by cross sectional method; Children with type 1 diabetes from 2018 to the end of 2020 to refer to the endocrinology clinic of the Children's Hospital

(Tabriz-Iran) to control the disease and more than a year has passed since the onset of their diabetes or based on the results of registered sugars and Their insulin intake is definitely over during their diabetic honeymoon; Were included in the study. Based on the opinion of the treating physician, the above patients due to young age, family economic status or the ability to be educated to get acquainted with the advanced method of nutrition, including carbohydrate counting and calculating insulin levels before treatment with one of the two conventional methods (n = 70) and Basal & Bolus (n = 76). Were located. It should be noted that the educational needs related to the style of treatment in each group were performed by a joint physician specializing in pediatric endocrinology and there was no difference in terms of training and training was done in each group according to the type of treatment and in frequent clinic visits. Was re-emphasized. The designed questionnaire was completed with the help of information collected from patients' records and patients themselves. Data collected included age, sex, height, weight, body mass index, duration of diabetes in children, mean fasting sugars in a child Recent Month, Mean Post Prandial Blood Glucose in a Recent Month, Mean HbA1c in the Last Three Periods (Nine Months), Number of Hypoglycemic Attacks in a Recent Month, Number of DKA Attacks in a Recent Year, and Other Autoimmune Diseases Patients were excluded from the study if autoimmune disease affecting glycemic control such as celiac disease and thyroid problems was present. The children's weight was recorded by a stadiometer using a seca and height scales by a specific person. Body mass index for all children was calculated based on the body mass index index formula. Z Score was calculated for all variables based on age and sex proportional curves. Mean fasting glucose in a child in a recent month, mean Post Prandial blood glucose in a recent month, mean HbA1c in the last three periods (nine months) as selective indicators of pediatric glycemic control status and frequency of hypoglycemic attacks and diabetic ketoacidosis as Short-term complications of diabetes were used to compare the two treatments. For descriptive analysis of quantitative data, mean, standard deviation, minimum, maximum, first quarter, middle and third quarter and for descriptive analysis of qualitative data, number and percentage were reported. Spearman correlation test or Pearson correlation test were used to examine the linear relationship between the variables. T-test or Mann-Whitney non-parametric test depending on the distribution of variables and comparison of continuous variables between the two groups are used. To examine the relationship between nominal variables, Chi-square test or Fisher's exact test was used depending on the data status. SPSS 20

statistical software was used to analyze the data and all tests were considered two-way and a significance level of 0.05.

Results

In this study, 146 children with type 1 diabetes were divided into two treatment groups, including 70 people by conventional method (NPH and Regular homologous insulin therapy) and 76 people by Basal & Bolus method (NovoRapid & Lantus analog insulin therapy). The mean age of the conventional group was 2.81 ± 6.659 years and the mean age of the Basal & Bolus group was 9.01 ± 2.14 years. The mean age of the two groups was significantly different ($P = 0.021$). The mean total daily dose in the conventional group was 1.04 ± 0.18 unit / kg / day in Basal & Bolus group equal to 1.15 ± 0.22 unit / kg / day which was statistically significant ($P = 0.315$). Growth indices of patients including weight, height and measured and body mass index of patients were calculated and ZScore height, weight and body mass index were compared in the two groups. The result of this comparison indicates a significant difference in ZScore height ($P=0.035$) and Z score weight ($P=0.039$) in the two groups treated with NPH and Regular (Conventional Vansulin Lantus) and NovoRapid (Basal & Bolus). ZScore was significantly higher in children in the Basal & Bolus group than in the Conventional group. However, there was no significant difference in body mass index Z Score between the two groups. [ZScore BMI ($P = 0.098$)]. To evaluate glycemic control, mean fasting glucose during the last month, mean glucose two hours after a meal during the last month and mean hemoglobin A1C for three periods (nine months) were used ($P = 0.359$). Statistical results showed no significant difference between the two treatments. The average fasting sugar during the last month for the conventional group was 96.81 ± 10.25 and for the Basal & Bolus was 95.59 ± 9.19 ($P = 0.551$). The average fasting sugar two hours after eating during the last month for the conventional group was 115.48 ± 15.59 for Basal & Bolus equals 118.41 ± 11.29 . ($P = 0.489$). Analysis of the number of diabetic ketoacidosis attacks in the last year (no cases were reported in the two groups) showed that there was no statistically significant difference between the two groups.

Discussion

Type 1 diabetes is the most common metabolic disease in children and adolescents. Despite all the research done to improve treatment, the treatment of type 1 diabetes is still insulin dependent and despite significant progress and production of multiple analog insulins and the use of injection pumps Continuous insulin to provide conditions that closely mimic the body's physiology in regulating blood sugar; Blood sugar control is also highly volatile in type 1 diabetes and disease control is far from ideal. By producing very fast and long-acting insulins, changing the pattern of insulin therapy with conventional method, which is mainly performed with NPH and regular insulins, with Basal & Bollus methods, using very fast and long-acting insulins such as Aspart and Glargine, and using pumps (7 , 8). Continuous insulin injections try to mimic the body's physiology in controlling blood sugar. At present, the use of Basal & Bollus methods with very fast and long-acting insulins and gold standard insulin pump is the treatment in children and adolescents with type 1 diabetes(9). It should be noted that these new methods are associated with challenges in patient admission in Iran. For example, due to the age of accepting repeated injections or spending a significant amount of insulin pump may not be acceptable by the patient or his family. In low economic conditions, sometimes even the difference between the cost of analog and homologous insulins can be significant for families. Have hyperglycemic conditions and want to do it, otherwise using this method may not be an advantage. Diabetes has proven effects on the psychological development of children and adolescents, which emphasizes the need for psychological support of the patient and patients' families(10). Acceptance of the type of treatment by the patient can play an important role in improving the patient's psychological condition (11). Considering the limitations of age, economic status and educability of patients and the degree of cooperation or resistance that Iranian patients and families have for continuous carbohydrate counting and frequent injections; Patients referred to the Endocrine Center of Children's Hospital (Tabriz-Iran) are treated with one of the conventional methods or Basal & Bollus(12). Considering that the Basal & Bollus method, if properly performed, mimics closer to the secretion of insulin to control blood sugar in the body, and the report of severe hypoglycemia with it is much lower; Patients may be more inclined to use this method, regardless of their characteristics (13).

The difference between the results of the studies is not fully explained, but clarifying and determining the control goal in diabetes, the patient's education method and contact with the diabetes team, and the patient's ability to count carbohydrates and calculate insulin based on carbohydrate intake and acceptance can be somewhat different (14). Another study emphasizes the development of specific diabetes control programs according to the patient's culture and even the preparation of specialized books to facilitate the counting of carbohydrates in local and traditional foods in different cultures. In Iranian patients, the need to study carbohydrate counting is felt according to the style of specific Iranian foods, and the degree of acceptance of the two methods in patients depending on culture, level of education and individual psychological differences in accepting methods based on carbohydrate counting and repeated injections leads to It is understood that not all Iranian patients benefit from this method to the same extent and treatment planning for each patient should be done according to his individual characteristics and family (15).

Conclusion

The difference in the results of studies comparing the conventional and basal & Bollus methods and analog and homologous insulins is not fully interpretable. However, it can be said with certainty that the type of nutrition appropriate to the method and level of patient education and acceptance of treatment by the patient can affect the outcome of glycemic control and the occurrence of complications in a treatment method. Therefore, in Iranian patients, the choice of treatment method in each patient is recommended according to individual, family and psychological characteristics, and the choice of insulin multi-injection method is not necessarily superior to the conventional method in all patients.

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