Original Article

Diabetic Care Provision

Diabetic Care Provision and Glycemic Control in a Pediatrics Diabetic Clinic: An Audit

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ABSTRACT

Objective: To study the glycemic control and factors associated with glycemic control of children with type 1 diabetes mellitus attending the diabetic clinic of pediatric department of Khyber teaching hospital.
Study Design: Retrospective / observational study.
Place and Duration of Study: This study was conducted at the Diabetic Clinic of Pediatric Department, Khyber Teaching Hospital, Peshawar from January 2015 till December 2017.
Materials and Methods: An audit of all the diagnosed diabeticpatients attending the diabetic clinic for at least one year of pediatric department of Khyber teaching hospital. Every scheduled follow up visit was recorded by a resident doctor on a Performa. The self-monitored blood glucose record, insulin dose, injection site, technique and site rotation were checked. Dietary compliance was checked and 24 hour dietary record taken. Any change in dose needed was planned and a follow-up date was given. All these follow up Performa were studied and data was extracted from them.
Results: The number of patients that completed the study were 54(27 males and 27 females). The mean age of patients in this study was 8.5 years. Mean duration of diabetes was 1.89 SD 0.6. The mean HbA1c at the beginning of the study was 10% and at the end of study was 8.5%. The number of patients with good glycemic control were18 and with intermediate were 14 and poor were 22.
Conclusion: Good glycemic control was significantly associated with parent being literate, frequent home blood glucose monitoring, regular follow up visits and good dietary compliance.
Key Words: Diabetes mellitus, Children, Glycosylated hemoglobin

Citation of articles: Amir S, Muhammad J, Munir A, Rahim T. Diabetic Care Provision and Glycemic Control in a Pediatrics Diabetic Clinic: An Audit. Med Forum 2018;29(4):41-45.

INTRODUCTION

Diabetes mellitus is a common, chronic, metabolic syndrome characterized by hyperglycemia as a cardinal biochemical feature[1]. Type 1 diabetes is caused by deficiency of insulin secretion by damage to the beta cells of pancreas[1].

American Diabetic Association target values for HbA1c in relation to age are as follows: 7. 5% to 8.5% at age <6 years, <8.0% at age 6 to 12 years, <7.5% at age 13 to 18 years and<7.0%at 19 years and above. Individuals who met the ADA target were classified as good control; those with HbA1c > 9.5% regardless of age were classified as poor control. The value between poor and good are classified as intermediate control.[2]

The glycemic control is monitored by glycosylated hemoglobin (HbA1c), which provides a retrospective insight of blood glucose over the past 2 to 3 months[1], weighed toward the most recent 4 weeks. However the most recent week glycation is reversible and not included.[3]

Better quality of life and reduced or delayed development of macro and micro vascular complications in the long term is dependent on better glycemic control in diabetic children and adolescents[4,5]. The long term complications are monitored by micro albumin in urine and retinal examination of children. Improved glycemic control is also essential for reducing potentially serious acute complications such as ketoacidosis and hypoglycemic episodes[5,6].

The management of type 1 diabetes involve a complex interaction between life style modification, dietary compliance, insulin, management of comorbidities and input of care takers(parents, guardians) and healthcare professionals in an attempt to lower the blood glucose level to normal values[7,8]. The provision of a motivated multidisciplinary team of diabetic specialist is thought to be vital in attaining optimal glycemic control. Majority of studies continue to report HbA1c level above the targets desirable for reduction of complications[9,10,11]. The various factors (demographic factors of patient, disease related factors, care takers and health provider) associated with glycemic control are studied[12,13]and need to be studied further[14].

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Received: December, 2017; Accepted: February, 2018

The goals of this audit were to find the mean glycemic control of patients provided with separate care than with general outpatient department patients and to study the demographic and disease related factors associated with glycemic control.

MATERIALS AND METHODS

This retrospective study was carried out at the pediatric diabetic clinic of Khyber Teaching Hospital Peshawar. Patients were classified into good, intermediate and poor glycemic control according to ADA target level of HbA1c for each specific age group.

All the diagnosed children with type1 diabetes on insulin, attending the diabetic clinic, under 18 years of age and at least one year since diagnosis were included. At enrollment demographic data (age, gender, date of birth, weight, height, address, education of care taker, contact number) and disease related factors (date of diagnosis of diabetes, age of onset of disease, type and dose of insulin, injection technique, site, site rotation, diabetic knowledge, follow up visits regularity) were noted. Investigations (HbA1c, urine for micro albumin, blood count, thyroid function test and coeliac screen) were ordered. The follow-up visit of each patient is recorded and conducted by the same team of medical officer and consultant. A structured follow up visit proforma was completed noting date, height, weight, insulin dose, checking technique, site rotation and injection site, self-monitored blood glucose value, dietary compliance and further plan. HbA1c, eye examination and urine micro albumin value is checked every three months.

Statistical Analysis: The data was recorded and analyzed using spss version 20. The continuous variables were presented as mean and standard deviation and categorical variables as percentages. Pearson Chi-square test was used to study the relation of variables with glycemic control. Predictors of good glycemic control were compared with poor glycemic control using multinomial logistic regression. For all the analysis p value of <.05 was considered as significant.

RESULTS

The patients included in the study were 54;27 were male and 27 females; 1:1 ratio. The mean age was 8.29(SD 4), HbA1c at enrollment 10.1(SD 2.6), HbA1c at the end of study 8.7(SD 2.4). Out of the 54 patients 18(33.3%) had good glycemic control, 4(25.9%) had intermediate and 22(40.7%) had poor glycemic control. Demographic characteristics of these patients are shown in table number 1.

Table No.1. Demographic data of the patients.

Number of patients	54
Gender	27 males, 27 females
Mean age	8.2
Parents education	33 literate (61.1%) 21 illiterate (38.9%)

There were equal number of males and females. There were 16 (29.6%) patients with age range of 0-5years, 29(53.7%) in 6-12years and 9(13.7%) in 13-18years age range. Their glycemic control is shown in table 2.

Amongst the demographic factor parental education was associated with good glycemic control as compared to poor. The rest of the factors were not significant. Disease related factors along with their number and percentages are shown in table 3.

The comparison of glycemic control of disease related factors which has a p value of <.05 is shown in table 4.

Table No.2: Distribution of glycemic control of diabetic patients by demographic characters.

Variables	Glycemic control			Total (n=54)	*P*
	Good (n=18)(%)	Intermediate (n=14)(%)	Poor (n=22)(%)		
Age range 0-5 % within glycemic control	5(31.2), 27.8%	5(31.2) 35.7%	6(37.5) 27.3%	16(29.6%)	0.98
6-12% within glycemic control	10(34.5) 55.6%	7(24.1) 50%	12(41.4) 54.5%	29(53.7%)	
13-18% within glycemic control	3(33.3) 16.7%	2(22.2) 14.3%	4(44.4) 18.2%	9(16.7%)	
Gender					0.24
Male % within glycemic control	7(25.9) (38.9)	6(22.2) (42.9)	14(51.9) (63.6)	27(50%)	
Female %within glycemic control	11(40.7) (61.1)	8(29.6) (57.1)	8(29.6) (36.4)	27(50%)	
Parents/education					0.047
Literate % within glycemic control	15(45.5) 83.3%	8(24.2) 57.1%	10(30.3) 45.5%	33	
Illiterate % within glycemic control	3(14.3) 16.7	6(28.6) 42.9	12(57.1) 54.5	21	

Table No.3: disease associated factors in patients with diabetes

Variables		N	%
glycemic control	Good	18	33.3%
	Intermediate	14	25.9%
	Poor	22	40.7%
time since diagnosis	<1 year	14	25.9%
	1-5 years	32	59.3%
	6-10years	8	14.8%
insulin regimen	Premix	42	77.8%
	MDI	12	22.2%
injection technique	Good	40	74.1%
	Poor	14	25.9%
injection given by	Parent	31	57.4%
	under supervision	3	5.6%
	Self	19	35.2%
	Sibling	1	1.9%
dietary compliance	Poor	21	38.9%
	Fair	13	24.1%
	Good	20	37.0%
follow-up visits	Regular	18	34%
	Irregular	36	66%
diabetic knowledge	Poor	18	33.3%
	Fair	21	38.9%
	Good	13	24.1%
	Excellent	2	3.7%
Total		54	100.0%

Frequent blood glucose monitoring, good dietary compliance and regular follow up visits were associated with good glycemic control as compared to poor. There was no significant difference in glycemic control of patients on premix insulin and multidose injection of insulin using intermediate acting and three short acting insulin. Similarly other factors like injection site, technique, rotation of injection site and disease duration were found to be insignificant.

DISCUSSION

In this study, the mean HbA1c at the beginning was 9.7 and at the end of the study was 8.5 better than the studies conducted in Egypt and Saudi Arabia and is comparable to a study by Deborah A buttler.[9,15,16]

In this study amongst the demographic factors parent education was found to be a significant factor for glycemic control.In the disease related factors frequent home blood glucose monitoring, dietary compliance and regular follow up was associated with a better glycemic control.

Children who had literate parents had a better good glycemic control.Similar results are found in a number of studies.[17,18]In one of these studies significant difference was found in HbA1c of children with educated parents especially if father is educated with professional degree[17]. Good glycemic control was found in another study with educated mothers taking care of diabetic children[18].The reason of a better glycemic control of childrenwith educated parents may because of good record keeping and diabetic knowledge.

Table No.4: Distribution of glycemic control of diabetic patients by significant diseaseassociated factors.

Variables	Glycemic control		Total (n=54)		*P*
	Good (n=18) (%)	Inter-mediate (n=14) (%)	Poor (n=22) (%)		
Blood glucose monitoring frequent % within glycemic control	 12(44.4) 66.7%	 6(22.2) 42.9%	 9(33.3) 42.9%	 27(100) 50.9%	.04
Infrequent % within glycemic control	5(33.3) 27.8%	2(13.3) 14.3%	8(53.3) 38.1%	15(100) 28.3%	
None % within glycemic control	1(9.1) 5.6%	6(54.5) 42.9%	4(36.4) 19.1%	11(100) 20.8%	
Dietary compliance. Good					0.02
% within glycemic control	11(55) 61.1	3(15) 21.4	6(30) 27.3	20 37%	
Fair - %within glycemic control Poor - %within glycemic control	2(15.4) 11.1% 5(23.8) 27.8%	3(23.1) 31.4% 8(38.1) 57.1%	8(61.5) 36.4% 8(38.1) 36.4%	13 24.1% 21 38.9%	
Follow up visit					0.047
Regular %within glycemic control	10(52.6) 55.6%	4(21.1) 28.6%	5(26.3) 22.7%	19 35.2%	
Irregular % within glycemic control	8(22.9) 44.4%	10(28.6) 71.4%	17(48.6) 77.3%	35 64.8%	

At present the safest recommendation for improving glycemic control generally in all children is to achieve the lowest HbA1c that can sustain without disabling or severe hypoglycemia while avoiding prolonged periods of hyperglycemia and episodes of DKA. Frequent glucose monitoring is necessary for these goals to be achieved.[19]The children who had frequent and daily self-monitoring of blood glucose had a lower HbA1c levels similar results were observed in a study reporting that parents monitoring blood glucose frequently and regularly in children had good glycemic control[20].

The nutritional care of patient with diabetes is complex. Diabetes management requires an understanding of the relationship between treatment regimens and changing physiological requirements, including growth, varying nutritional requirement and physical activity. Evidence suggest that it is possible to improve diabetes outcomes through attention to nutritional management and an individualized approach in education[21].Adherence to dietary compliance was associated with lower HbA1c level in this study and by other studies.[21, 22, 23]

The American Diabetes Association proposed guidelines recommending regular visits with a health care provider and glycosylated hemoglobin (HbA1c) testing for good glycemic control and that close monitoring improves management and reduces complications[2]. Consistent with prior studies this study also support that regular follow-up visits were associated with good glycemic control[24,25]. Other studies showed that irregular visits were associated with poor glycemic control[26,27,28].. It is likely that patients with less frequent visits may miss opportunities to receive knowledge and skills needed to perform diabetes self-care, manage crises and to make lifestyle changes to successfully manage the disease[29].

CONCLUSION

This study concluded that parent's education level, regular follow up, dietary compliance, and self-monitoring of blood glucose is associated with better glycemic control in patients with diabetes. Pediatrician need to be aware of factors associated with better glycemic control in children with type 1 diabetes, so that more effective measures can be taken to achieve and maintain control.

Acknowledgement: The author acknowleges the contribution of Associate Professor Dr. Jan Muhammad Afridi for data analysis and Assistant Professor Dr. Arshia Munir in looking into the hospital record of the patients and Prof Dr. Fazlur Rahim for helping in litrature search. There is no conflict of interest and no finential report.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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