FACTORS ASSOCIATED WITH INSULIN ADHERENCE IN TYPE 1 DIABETIC CHILDREN ATTENDING DR JAMAL AHMED RASHID PAEDIATRIC TEACHING HOSPITAL IN SULAIMANI CITY

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ABSTRACT

Background

Type 1 diabetes mellitus is a chronic condition in the paediatric age group. Its treatment is always challenging for the affected child, the whole family, and the health care system. Reasonable control is usually the aim because it will prevent or delay the complications of diabetes. Adherence to insulin therapy is among the essential factors in the control of the disease.

Objectives

To identify factors that influence insulin adherence in children with Type 1 diabetes mellitus.

Patients and Methods

A cross-section study was done among type 1 diabetic children who have been registered in the diabetic centre in Dr Jamal Ahmed Rashid Paediatric Teaching Hospital from April 1st to September 30th, 2018.

All the affected 104 cases were below 16 years of age. Caretakers of the patient were interviewed using pretested questionnaires to provide information on socio-demographic characteristics. Insulin adherence was measured by the 8-Item Morisky Medication Adherence Scale (MMAS); furthermore, injection-related barriers to insulin injection were assessed.

Results

The mean age (±SD) of the 104 affected diabetic children was 7.07 ± 3.36 years. The male-to-female ratio was 1.04:1 (53 males and 51 females). Good adherence was found in 72.1% of the cases, 19.2% had an average adherence, with 8.7% were poorly adherent to therapy.

Conclusion

Most type 1 diabetic children had good adherence to insulin therapy with fair 1-2 blood glucose test monitoring per day. Family supervision of the insulin injections and blood sugar monitoring were the two significant factors in insulin adherence.

Keywords: *Type I Diabetes Mellitus; Blood glucose monitoring; Insulin adherence therapy; Sulaimani; Diabetic ketoacidosis.*

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INTRODUCTION

Diabetes mellitus is a common chronic metabolic syndrome characterized by hyperglycemia as a cardinal biochemical feature. Type 1 diabetes mellitus accounts for about 10% of all diabetes [1]. Type 1 diabetes mellitus (T1DM) is an autoimmune disease in which there is a failure by pancreatic islet β-cells to produce insulin [2].

Blood sugar monitoring is an essential component of treating diabetes. Unfortunately, family conflict, denial, and feelings of anxiety find non-adherence to instructions regarding nutritional and insulin therapy and noncompliance with self-monitoring [1]. High-income countries report an annual increase of between 3% and 4% in the incidence of T1DM in childhood [3].

The lowest rate of T1DM incidence is reported in developing countries like China and Venezuela, and the highest rate is in Finland. However, according to the review carried out by Mansour (2015), in Iraq, there was an increase from 5% in 1978 to 19.7% in 2012 [4].

There are unique challenges in caring for children and adolescents with diabetes that differentiate paediatric from adult care. These include the apparent differences in the body built of the patients, developmental issues such as the unpredictability of a toddler's dietary intake and activity level and inability to communicate symptoms of hypoglycemia, and medical issues such as the increased risk of hypoglycemia and diabetic ketoacidosis (DKA) [5].

However, medications are effective only when taken according to the recommendations of health care providers, and unfortunately, poor adherence among patients with diabetes remains a common problem. Furthermore, despite the crucial role of adherence to insulin for achieving therapeutic goals, few studies have evaluated adherence to insulin and its associated factors. Therefore, identification of the underlying factors which predispose patients to poor adherence is necessary for better glycaemic control [6].

Professionals need to understand the importance of involving adults in the child's diabetes management. Young children, including school-aged children, cannot provide their diabetes care, and middle school and high school students should not be expected to independently provide all of their diabetes management care [7].

Adherence to therapies is a primary determinant of treatment success. Poor adherence reduces optimum clinical benefits and therefore decreases the overall effectiveness of health systems. Unfortunately, however, only 50% of patients who suffer from chronic diseases adhere to treatment recommendations [8].

The World Health Organization defines adherence as "the extent to which a patient's behaviour – taking medication, following a prescribed diet, and executing lifestyle changes – corresponds with agreed recommendations from the health care provider". Lack of adherence is common among patients with T1DM ranging from 23 to 77%, with a higher frequency in developing countries. Factors associated with poor adherence in diabetes patients include age, gender, disease duration, social and family factors, physician-related attitudes, regimen complexity, socioeconomic status, psychiatric disorders, and medication side effects [9].

Many non-adherent children are at risk for significant medical complications, including diabetic ketoacidosis, neuropathy, nephropathy, retinopathy, cardiovascular disease, and psychological complications [10, 11].

Most of the studies regarding non-adherence to treatment were done in developed countries, where the health care delivery system is different from developing countries [12].

Adhering to good dietary practices, keeping insulin injection schedules, and regularly monitoring blood glucose have been found very beneficial in improving treatment outcomes in people with diabetes [13].

MATERIALS AND METHODS

A hospital-based cross-sectional study was conducted among patients with type 1 diabetics attending the Endocrinology and Diabetic Clinic in Dr Jamal Ahmed Rashid Paediatric Teaching Hospital, which's located in Sulaimani governorate/ Kurdistan region – Iraq; the study included 104 diabetic children, from April to September 2018.

Inclusion criteria

Diabetic children 16 years old and younger have a primary diagnosis of T1DM according to medical records and a history of T1DM for at least one year.

Exclusion criteria

Patients, who were unwilling to participate in the study, were very ill, and those newly diagnosed (less than one year) with T1DM were not included.

Data was collected using a questionnaire by face-to-face interview with the children and their families on their scheduled visit to the clinic. The questionnaire form included data on socio-demographic information of the children and their families and factors related to adherence to insulin.

Adherence to therapy was measured using the eight-item Morisky Medication Adherence questionnaire reported by Sakthong and colleagues [14].

Scores on the MMAS-8 range from zero to eight. A score below six indicates low (poor) adherence, while a score of six and seven indicates medium (average) adherence and a score of eight indicates high (good) adherence.

Statistical analyses were performed by SPSS (Statistical Package for the Social Sciences) software version 25, Categorical variables expressed as frequency distributions and single percentages, and the comparison between groups has been used Chi-square test. Quantitative variables are expressed as the mean ± standard deviation. For comparison between groups, Student's t-test and ANOVA are used to assess the significant differences between the means of three or more independent (unrelated) groups with regarding 0.05 for Probability value is significance level.

RESULTS

Table 1 shows the background characteristics of the participant 104 cases. Male to female percentages were almost equal to 51% and 49%, respectively. The mean age of the participant diabetic children in years was 10.68 ± 3.493, shown in Figure 1. Based on the eight-item Morisky Medication Adherence questionnaire for the adherence to insulin therapy; the majority of the cases were at good adherence 75 cases (72.1%), average adherence to insulin therapy 20 cases (19.2%), and only 9 cases (8.7%) were poorly adherent to the insulin therapy as shown in Figure 2.

Factors and barriers associated with adherence to insulin therapy were comprehensively studied using the MMAQ. After the analysis, significant associations were found between the level of adherence and family supervision of the injections and the blood glucose monitoring in which 69 cases had optimal supervision of the injection by their families; 51 of them (73.9%) had good adherence to the insulin and this was statistically significant (P-value = 0.016).

Regarding cases in which their blood glucose was optimally monitored by their family, among 58 participants, 43 of them (74.1%) had good adherence to the insulin, which was also statistically significant (P-value = 0.004).

The majority of children above eight years old (56 participants) were more adherent to the insulin therapy; although statistically, it was not significant.

Regimen complexity was also a target in the data study, and it is shown in the table in detail, but it was not statistically significant.

Table1. Background characteristics of the participants.

Characteristics of patients	Number (%)
Patients	104 (100)
Age (year)a	10.68 ±3.49
Age groups (years)	
4- 7	35 (33.7)
8-12	31 (29.8)
13-16	38(36.5)
Age at diabetic diagnosed (years)	7.07 ±3.36 a
	32 (30.8)
≤ 5	52 (50.0)
6-10	20(19.2)
≥ 11	
Sex	
Male	53 (51)
Female	51 (49)

*a Mean ± standard deviation

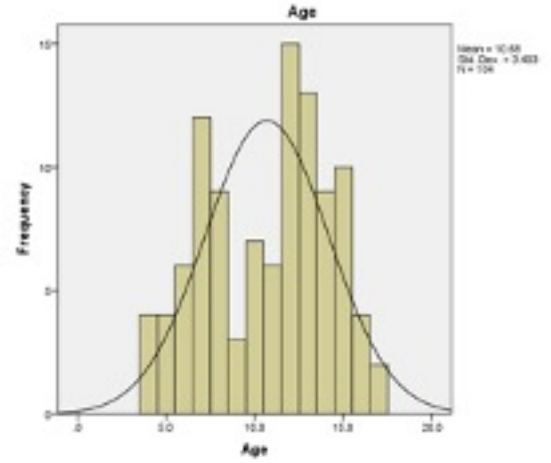

Figure 1. Mean age of the participants.

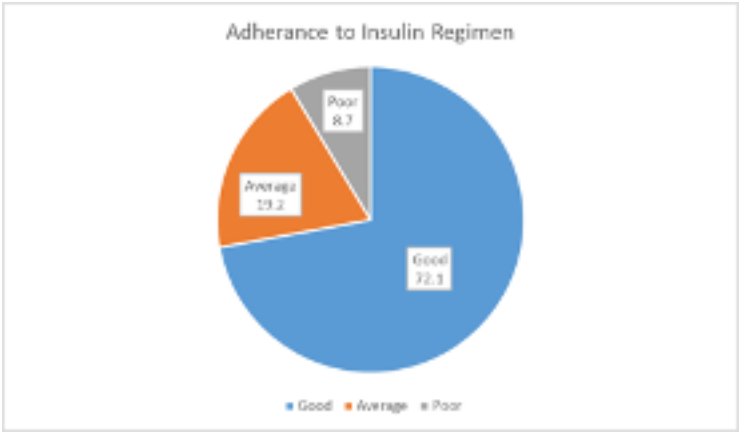

Figure 2. Adherence to Insulin Therapy.

Table 2. Shows the level of adhernce to insulin therapy by the studied factors.

FACTORS	Good Insulin adherence n=75, (%)	Average Insulin adherence n=20, (%)	Poor Insulin adherence n=9, (%)	P-value
Age (year) a	10.6 (3.55)	10.1 (3.33)	12.3 (3.27)	0.304
Age groups (years)				
Less than eight years	19 (73.1)	6 (13.1)	1 (13.8)	0.841
8-12	28 (70.0)	8 (20.0)	4 (10.0)	
13-16	28 (73.7)	6 (15.8)	4 (10.5)	
Sex				
Male	40 (75.5)	10 (18.9)	3 (5.7)	0.523
Female	35 (68.6)	10 (19.6)	6 (11.8)	
Family economic status				
Good	12 (80)	2 (13.3)	1 (6.7)	0.459
Fair	36(75)	10 (20.8)	2 (4.2)	
Bad	27(65.9)	8 (19.5)	6 (14.6)	
Family supervision of insulin injection				
Optimal	51 (73.9)	14(20.3)	4 (5.8)	0.016
Moderate	19 (82.6)	3 (13)	1 (4.3)	
Minimum	5 (41.7)	3 (25)	4 (33.3)	
Family supervision of BGMb				
Optimal	43 (74.1)	11 (19)	4 (6.9)	0.004
Moderate	25 (86.2)	4 (13.8)	0 (0.0)	
Minimum	7 (41.2)	5 (29.4)	5 (29.4)	
Father literacy status				
Illiterate	16 (57.1)	9(32.1)	3(10.7)	0.428
Primary	17(70.8)	6(25)	1(4.2)	
Secondary	27(79.4)	4(11.8)	3(8.8)	
College	14(82.4)	1(5.9)	2(11.8)	
Other	1(100)	0(0)	0(0)	
Mother literacy status				
Illiterate	27 (67.5)	10(25)	3(7.5)	0.799
Primary	24(70.6)	6(17.6)	4(11.8)	
Secondary	16(76.2)	3(14.3)	2(9.5)	
College	8(88.9)	1(11.1)	0(0)	
Insulin Injections per day				
Twice	47 (67.1)	16 (22.9)	7 (10)	0.474
Three times	18 (78.3)	3 (13)	2 (8.7)	
More than three times	10 (90.9)	1 (9.1)	0 (0.0)	
Insulin Regimen				
Single mix	54 (68.4)	18 (22.8)	7 (8.9)	0.425
Basal/Bolus	12 (85.7)	1 (7.1)	1 (7.1)	
Single	2 (66.7)	0 (0.0)	1 (33.3)	
>2 types	7 (87.5)	1 (12.5)	0 (0.0)	

a: Mean ± Standard Deviation. b: Blood Glucose Measuring (BGM)

DISCUSSION

This study provides information about factors associated with insulin adherence and some demographic characteristics of T1DM in Sulaimani City. First, regarding the age groups regarding insulin adherence rate, the current study demonstrates that older age group children (above eight years old) had the highest adherence rate compared to younger age group children (less than eight years old).

There was a non-significant relation between gender and insulin adherence rate, the same results found in Kyokunzire study 2018 [13], Gomes study 2016 [15] and Ying study 2017 [10].

The socioeconomic status of children families had non-significant relation with insulin adherence rate in this examination. However, 36.4 % of families having fair economic status had good adherent children to insulin therapy, and it was statistically not significant, the same result observed in Kyokunzire study 2018 [13] and Gomes study 2016 [15].

Parental educations were also among the studied factors, and the result showed that parental level of education played a positive contributing factor in better adherence to insulin therapy; however, this was statistically not significant it was concordant with Hassan study 2010, which showed that literacy with numerical skills mother effect on the better outcome of the glycaemic control program [16] and Schillinger 2002 found a prominent relationship between mother literacy with better glycaemic control [17]. While Khalid H.S study 2019 did not find significant relations between them [4].

The rate of adherence in the current study revealed that 72.1% of the cases were at good adherence, and the remainder, 27.9% had average to poor adherence. Paloma A V et al. 2019 in Mexico reported that only 50% of the patients were adherent [9]. In Iran, Shadi Farsaei et al. 2014 found that 85.7% of the children with type 1 diabetes had intermediate to high adherence [6]. Catherine Kyokunzire 2018 reported that 52% of children and adolescents adhered to insulin [13]. In another study done in Saudi Arabia by Dalia Almaghaslah et al. 2018, they noted that most participants (62%) showed intermediate to high adherence [18]. Another study done by Davies et al. 2013 on factors affecting adherence to insulin therapy found that adherence to insulin therapy is generally poor [19]. According to these studies and in comparison, with this study; high rate of adherence can be attributed to several issues like insulin availability for coast free in the hospital, regular control and check-up at the diabetic clinic in the hospital, absence of telehealth service may make the parent supervise their children more, or the answer of the questionnaire is overrated by the caregivers, and the sample size always should be taken in regards.

Family supervision of insulin injections and the daily blood glucose monitoring was among the statistically significant factors in this analysis, and they showed higher insulin adherence therapy. 70 (67.3%) cases out of the 104 participants had good insulin adherence in families doing optimum to moderate supervision of the insulin injections. Regarding family supervision of the BGM, the result showed that nearly half of those who took part, 43 cases (41.3%), have a higher insulin adherence therapy; many other studies are consistent with this study. They concluded that children with family or social support have a higher adherence rate. Like DiMatteo, a 2004 study found that adherence is 1.74 times higher within patients from cohesive families and 1.53 times lower in patients from families in conflict [20]. Amy Lewandowski and Dennis Drotar's study in 2006 found that parents have a significant and beneficial effect on improving treatment adherence in type 1 diabetic adolescents [21]. Pereira et al. study 2008 found that supported diabetic patients have shown higher insulin adherence and higher family social aid predicts higher adherence and higher quality of life [22]; meanwhile, Tricia A Miller and M Robin DiMatteo 2013 have concluded that family and social support are essential aspects of adherence to diabetes management [23] and both studies are concordant with the result and conclusion of this study.

Conclusion and recommendation

The majority of T1DM were at good adherence to insulin therapy because of family supervision of the injections and the BGM. Further family and children psychological support, educational learning, and telehealth communications with hotlines for emergencies are suitable interventions toward better adherence to insulin therapy.

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