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Determination of Factors Affecting School Life of Children Aged 7-12 with Type 1 Diabetes: A Sample of a University Hospital

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ABSTRACT

Aim: This research aims to investigate the factors influencing the school experiences of children with Type 1 Diabetes.

Material and Methods: The descriptive and cross-sectional study was conducted with 100 children aged 7-12, diagnosed with Type 1 diabetes mellitus. Research data was collected using the "Diabetes Management at School: Child Questionnaire." Descriptive statistics and chi-square tests were used for data analysis.

Results: There is a relationship between children's age and receiving assistance with insulin pump application at school (t=21.782, p<0.05). There was no significant relationship between children's HbA1c levels and missing school due to diabetes-related issues (t=0.410, p>0.05). A significant relationship was found between the age at first diabetes diagnosis and missing school due to diabetes-related issues (t=5.141, p<0.05). There is a significant relationship between children's HbA1c levels and experiencing failure at school due to diabetes (t= 16.504, p<0.05). A significant relationship exists between children's age at first diabetes diagnosis and experiencing failure at school due to diabetes (t=16.504 (p<0.05).

Conclusion: 50% of those diagnosed with diabetes between ages 0-5 had to miss school due to diabetes-related reasons. 75% of those with poor HbA1c levels experienced failure at school due to diabetes. Children diagnosed with diabetes before the age of five experienced more failure at school. This study concludes that HbA1c level and age at diagnosis are significant factors affecting a child's school attendance and performance. Education planning for the child, family, and school personnel, active involvement of school nurses in education planning, and implementing education programs from the time of diagnosis are recommended.

Keywords: *Child, Type 1 diabetes mellitus, School experience, Nursing*

7-12 Yaş Tip 1 Diyabetli Çocukların Okul Yaşantısını Etkileyen Faktörlerin Belirlenmesi: Bir Üniversite Hastanesi Örneği

ÖZ

Amaç: Bu araştırmanın amacı Tip 1 diabetes mellitus tanılı çocukların okul yaşantısını etkileyen faktörlerin incelenmesidir.

Gereç ve Yöntemler: Tanımlayıcı ve kesitsel tipteki çalışma, Tip 1 Diyabet tanılı 7-12 yaşındaki 100 çocukla yürütüldü. Araştırma verileri "Okulda Diyabet Yönetimi: Çocuk Soru Formu" ile toplandı. Verilerin değerlendirilmesinde tanımlayıcı istatistikler ve ki-kare testleri kullanıldı.

Bulgular: Çocukların yaşı ile okulda insülin pompa uygulamasında yardım alma durumu arasında bir ilişki vardır (t=21.782, p<0.05). Çocukların HbA1c düzeyi ile diyabete bağlı okula ara verme/devamsızlık yapma durumları arasında anlamlı bir ilişki yoktu (t=0.410, p>0.05). Çocukların ilk diyabet tanı alma yaşı ile diyabete bağlı okula ara verme / devamsızlık yapma durumları arasında anlamlı bir ilişki vardı (t=5.141, p<0.05). Çocukların HbA1c düzeyi ile diyabete bağlı okulda başarısızlık yaşama durumları arasında anlamlı bir ilişki vardı (t= 16.504, p<0.05). Çocukların ilk diyabet tanı alma yaşı ile diyabete bağlı okulda başarısızlık yaşama durumları arasında anlamlı bir ilişki vardı (t=16.504 (p<0.05).

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Sonuç: İlk diyabet tanısını 0-5 yaş arasında alanların %50'si diyabete bağlı olarak okula ara verme/devamsızlık yaptığı belirlendi. HbA1c düzeyi kötü olanların ise %75' inin diyabete bağlı olarak okulda başarısızlık yaşadıkları belirlendi. İlk diyabet tanı alma yaşı beş yaşından daha erken olan çocukların okulda başarısızlık yaşama durumları daha fazla idi. Bu çalışma sonucunda HbA1c değeri ve tanı alma yaşının, çocuğun okula devamsızlık süresini ve okuldaki başarısını etkileyen önemli faktörler olarak belirlenmiştir. Çocuğa, aileye ve okul personellerine eğitim planlanması, eğitim programı ve danışmanlık konularında okul hemşirelerinin aktif rol alması ve eğitim programlarının tanı anından itibaren uygulanması önerilmektedir.

Anahtar Sözcükler: *Çocuk, Tip 1 diabetes mellitus, Okul yaşantısı, Hemşirelik*

INTRODUCTION

Type 1 Diabetes is the most difficult disease to control, and one of the most important treatment goals of Type 1 Diabetes is to keep the glycemic level at a level close to the normal glycemic level and to prevent or delay long-term diabetes complications (1). Type 1 diabetes mellitus may vary depending on geographical regions, countries, and even cities (2). According to the American Diabetes Association (ADA) data from 2019, there are approximately 1.25 million individuals with Type 1 Diabetes in the United States, and it has been determined that about 40,000 people are newly diagnosed with diabetes each year (3). According to the 10th Diabetes Atlas data from the International Diabetes Federation (IDF), there are approximately 1.52 million individuals with Type 1 Diabetes worldwide. In Turkey, approximately 29,000 children and adolescents (0-19 years) with Type 1 Diabetes (4). According to the first study reporting the incidence and prevalence of Type 1 Diabetes in our country, it has been determined that approximately 2,500 children and adolescents (0-18 years) are diagnosed with Type 1 Diabetes each year (5). In Turkey, it is stated that there is Type 1 Diabetes in 27 out of every 1000 children. Type 1 Diabetes constitutes approximately 3-5% of all cases nationwide, with 90% being children under 18 (6). Globally, the increasing burden of diabetes is a significant public health issue that imposes unsustainable demands on individuals, caregivers, healthcare systems, and society (7).

Effective disease management is crucial in children with Type 1 Diabetes. Failure to manage it effectively can lead to disruptions in the child's quality of life, including symptoms related to the disease and treatment, the necessity for long-term monitoring and controls dictated by the nature of the condition, daily insulin applications, and routine blood glucose monitoring (8,9). Particularly, if a child receives a diabetes diagnosis during their school-age years, this can further negatively impact their daily life. This is because school is an institution where a child gains independence, develops productivity and initiative, and experiences a sense of achievement. Children diagnosed with diabetes may encounter difficulties related to their diagnosis and treatment. The importance of maintaining tight glycemic control in children with diabetes should be well known, and medical diet therapy, exercise, and health strategies should be applied correctly and regularly to achieve the desired results (10). For example, one of the most common problems encountered by children with Type 1 Diabetes is hypoglycemia, which is an acute complication of Type 1 Diabetes. Hypoglycemia is defined as a blood glucose level falling below 70 mg/dl (10). Being aware of the signs and symptoms of hypoglycemia attacks for children with Type 1 Diabetes and their parents and knowing the practices to be followed in these attacks will prevent the quality-of-life children and adolescents from being negatively affected (10). Many studies have also shown a positive relationship between glycemic control and health-related quality of life (11). The diabetes nurse, who meets and monitors the diabetic child and her/his family more frequently, is one of the critical people who positively affects the child/adolescent's quality of life-related to diabetes (11). The interventions implemented by the diabetes nurse to maximize their quality of life aim to provide them with physical, emotional, and psychosocial relief (10).

Managing a child's diabetes effectively during school hours is paramount (12). It is critical to create suitable environments in which they can adhere to their dietary plan, monitor blood glucose levels at the right times, administer insulin injections as per the treatment plan, and participate in activities like exercise and school trips (13,14). Failure to manage the diagnosis process well during the school years can lead to various school-related challenges, including increased absenteeism, potential grade repetition, decreased academic performance, disruptions or strains in friendships, and difficulty adapting to a new peer group (15,16).

When a child's overall health and treatment process is effectively managed, the child can continue attending school. Planning a child with Type 1 Diabetes's attendance at school and ensuring a positive school experience requires a collaborative effort. This involves the child with Type 1 Diabetes, their family, school administration, teachers, peers, and healthcare personnel working together and maintaining constant communication. The nurse should facilitate regular information exchange between the school, parents, and the hospital. If no

barriers prevent a child with Type 1 Diabetes from returning to school, they should be encouraged to attend. To do this, it is essential first to understand the child's perspectives and address any concerns about the child's return to school.

Our country has a significant limitation in studies to determine the school experiences of children with Type 1 Diabetes. At this point, there is a need for research to identify the challenges and develop action plans to improve the school experiences and quality of life for children with Type 1 Diabetes. Based on this information, the study aimed to determine relationships between a child's sociodemographic characteristics and insulin/pump applications at school, school absenteeism, and school success.

MATERIALS and METHODS

Study Design, Setting, and Participants

This descriptive and cross-sectional study aimed to examine the factors affecting the school experiences of children with Type 1 Diabetes. The research was conducted with children aged 7-12 years diagnosed with Type 1 Diabetes at a university hospital's Pediatric Endocrinology Clinic between November 2018 and May 2019. The Pediatric Endocrinology Clinic provides healthcare services for diagnosing and treating endocrine disorders in children and adolescents. The clinic operates five days a week, and an interdisciplinary team consisting of endocrinologists, diabetes nurses, dietitians, and psychologists collaboratively provides comprehensive support to children with Type 1 Diabetes and their families regarding treatment, monitoring, nutrition, and other related matters. Additionally, annual team-supported camps and educational publications are regularly organized for diabetic children and their parents.

The research was conducted with children diagnosed with Type 1 Diabetes who visited the Pediatric Endocrinology Clinic of a university hospital between November 2018 and May 2019. The study population consisted of 7-12-year-old children with Type 1 Diabetes who voluntarily agreed to participate in the research and were under the care and follow-up of the Pediatric Endocrinology Clinic. In this clinic, 100 children aged 7-12 are being monitored due to Type 1 Diabetes. The aim was to reach the entire sample without conducting a sample calculation. All 100 children and their parents who met the research criteria and were being followed in the clinic voluntarily agreed to participate. They completed the study with 100 children with Type 1 Diabetes and their parents. The posthoc analysis was performed with Real Statistics software based on the effect size w: 0.5 (middle), sample size: 100, df:1 (2x2 tables have 1 degree of freedom), alpha: 0.05 iterations: 1000, the power of the study was found power: 0.998.

Inclusion criteria: being between the ages of 7 and 12, currently attending school, having no mental retardation, having been diagnosed with type 1 diabetes at least 6 months ago, obtaining parental consent for participation in the study, being willing to participate in the study among children with type 1 diabetes.

Exclusion criteria: interrupting or discontinuing school attendance, having speech problems, having visual, auditory, or cognitive impairments, not willing to participate in the research.

The HbA1c (Glycated Hemoglobin) values are categorized by the American Diabetes Association (ADA) based on age. For children in our study group who are between the ages of 7 and 12 and have Type 1 Diabetes, the recommended HbA1c targets are as follows: for children under 6 years old: <8.5%; for children aged 6-12: <8%; for children aged 12 and older: <7.5%. These recommendations from the ADA serve as guidelines for managing HbA1c levels in children with Type 1 Diabetes in the specified age group.

Ethical Approval

The ethical committee approval and necessary permissions were obtained following the Helsinki Declaration. The process was as follows: The research obtained ethical committee approval on October 31, 2018, with protocol number 2018.183.IRB3.124. Written permission was obtained from the Koç University Hospital Directorate, where the data were collected. The researcher provided detailed information about the research to the children and families who agreed to participate. Written consent was obtained from the children and their families who agreed to participate in the research.

Data Collection Tools

The "School Diabetes Management- Child Questionnaire" was used for data collection in the study. The questionnaire form was designed to evaluate the difficulties and success of children with diabetes in the school environment. The form was prepared by the researcher based on important literature sources such as Doğan (17) and Tarı and Kitiş (18) and revised in line with the opinions of three experts. In this context, the content of the form was based on current and valid scientific findings. The "School Diabetes Management-Child Questionnaire" is divided into various sections to collect data in different areas. These sections include:

Demographic information: This section collects basic information such as the child's age, gender, grade level, and the family's socioeconomic status.

Diabetes management: Information related to diabetes management, such as the duration since the child's initial diabetes diagnosis, insulin treatment, and frequency of blood glucose measurements, is included in this section.

Diabetes practices at school: This section aims to assess the child's experiences with diabetes management in the school environment and the support provided by school personnel. It also gathers information about learning and social interaction difficulties experienced at school.

Academic achievement and adaptation: This section evaluates the child's academic performance, classroom participation, homework habits, and examination challenges.

Psychosocial adaptation: Topics such as the child's relationships with peers, stress, and concerns experienced at school, self-esteem level, and positive or negative events within the school environment are examined in this section.

The "School Diabetes Management - Child Questionnaire" is a quantitative and qualitative data collection tool. The questionnaire consists of a total of 34 questions.

Data Collection Procedure

The study data were collected from children who were followed up in the pediatric endocrinology outpatient clinic of a university hospital. No intervention was applied to the children regarding diagnosis, treatment, follow-up, and realization of laboratory parameters in this study. Questionnaire forms were applied to the children after obtaining permission from the parents of the children who came to the outpatient clinic for routine examinations. The diagnosis and HbA1c values of the children were obtained from the hospital record system. Permissions for the processing of children's health data were included in the Informed Voluntary Consent Form and permission was obtained from the parents. The researcher prioritized ethical and effective communication with participant families and children during data collection. They introduced themselves and explained the research's purpose, scope, and methods, gaining verbal and written consent from families for child interviews. Interviews were conducted in a calm, secure environment within the diabetes education room, timed to coincide with outpatient clinic visits for participant convenience. Families and children received questionnaire forms with the researcher's assistance, and parents helped with relevant sections. The average time for form completion was 10-15 minutes, during which the researcher addressed any questions and provided support as needed.

Statistical Analysis

Quantitative and descriptive statistical evaluations were conducted using the IBM SPSS Statistics for Windows, Version 25.0 (Armonk, NY: IBM Corp.) statistical data analysis software package during the data analysis. For quantitative data analysis, percentage and mean values were calculated to examine the general distribution and trends in the data. These values were used to determine the overall characteristics of the sample group and to address the research questions. Chi-square tests were employed in the analysis of descriptive statistics. These tests were used to assess the relationship and independence between categorical variables. Chi-square tests were preferred to determine whether there was a significant difference among two or more groups. The significance level was set at $p<0.05$ for statistical significance.

RESULTS

The average age of the children participating in the research was 9.76 ± 1.75, 48% were female, and 45% were between the ages of 7-10. Regarding the age groups at which children received their initial diabetes diagnosis, it was determined that 72% of the children were diagnosed with diabetes between the ages of 0-5. When examining the HbA1c values of the children over the last three months, it was determined that the average HbA1c value measured in the last three months was 7.39% (Table 1).

When examining the distribution of children based on the number of daily insulin injections they need, it was determined that 62% needed to inject insulin four times a day and 35% of the children were found to use an insulin pump (Table 2).

Regarding the need for assistance, while administering insulin at school, it was found that 48% of the children required assistance, while 52% did not require any assistance. It was determined that 25% of the children administered insulin in the classroom, 4% in the teachers' room, 16% in the cafeteria, and 55% in other locations (Table 2).

Regarding experiencing difficulties with insulin administration at school, it was found that 56% of the children did not

Table 1: Distribution of children according to demographic characteristics.

Variables	Findings (n=100)
Age (Year ± SD)	9.76±1.75
HbA1c (% ± SD)	7.39±0.90
Gender n (%)	
Girl	48 (48.0)
Boy	52 (52.0)
Initial diabetes diagnosis' age groups, n (%)	
0-5 ages	72 (72.0)
6-12 ages	28 (28.0)

HbA1c: Hemoglobin A1c.

encounter any problems, while 44% experienced difficulties. It was determined that 22% could not find a suitable place to administer insulin, 25.4% were afraid of someone seeing them while administering insulin, 41.3% administered insulin by themselves, and 11.1% faced problems for other reasons (Table 2).

Regarding difficulties with insulin pump administration at school, it was found that 42.9% of the children did not encounter any problems, while 57.1% experienced difficulties. When examining the reasons for the difficulties faced by children who had problems with insulin pump administration, it was determined that 8% were uncomfortable while attaching the set, 12% found it uncomfortable to carry the pump, 24% experienced problems like the set getting blocked, 40% were not effectively using the pump (Table 2).

The distribution of children's absenteeism status was examined, and it was determined that in the last 3 months, 3.2 ± 3.1 days. In the last 1 year, the absenteeism average was 6.7 ± 6.0. It was found that 57% occasionally had to be absent from school due to diabetes, 12% were absent due to hospitalization for treatment, 21.1% due to low or high blood glucose, and 40.4% due to routine check-ups. It was determined that 7% of the children had to leave or take a break from school due to diabetes, while 93% did not have to do so. Furthermore, 36% of the children experienced academic difficulties at school due to diabetes (Table 3).

There was a significant difference between children's age and the need for assistance with insulin application at school (x^2=21.782; p<0.01). It was determined that 77.8% of children under 10 years old received assistance with insulin pump application at school. There was no significant

Table 2: Distribution of characteristics related to pump/injection applications at school for children.

Characteristics Related to Pump/Injection	Findings (n=100)
Number of daily insulin injections*	
1	1 (1.0)
3	2 (2.0)
4	62 (62.0)
Using insulin pump	35 (35.0)
Receiving assistance while administering insulin at school*	
Yes	48 (48.0)
No	52 (52.0)
The location of insulin administration at school*	
Classroom	25 (25.0)
Teacher's office	4 (4.0)
Cafeteria	16 (16.0)
Others	55 (55.0)
Experiencing problems with insulin administration at school*	
Yes	44 (44.0)
No	56 (56.0)
Reasons for experiencing problems with insulin administration at school*	
Cannot find a suitable place to administer it.	14 (22.2)
Afraid someone will see me doing it.	16 (25.4)
Administer insulin by myself.	26 (41.3)
Others	7 (11.1)
Experiencing problems with insulin pump administration at school*	
Yes	20 (57.1)
No	15 (42.9)
Reasons for experiencing problems with insulin pump administration at school **	
Discomfort while attaching the set	2 (8.0)
Discomfort from carrying it	3 (12.0)
Set blockage	6 (24.0)
Ineffective use of the pump	10 (40.0)
Others	4 (16.0)

*Data are shown as n (%); ** Multiple options have been selected.

Table 3: Distribution of children's school absenteeism status and reasons.

Variable	Findings
Number of Absences (Mean ± SD)	
Last 3 months	3.2 ± 3.1
Last 1 year	6.7 ± 6.0
Attendance issues due to diabetes, n (%)	
No	43 (43.0)
Occasionally	57 (57.0)
Reasons for absenteeism from school, n (%)	
Treatment-related hospitalization	7 (12.3)
Hypoglycemia	12 (21.1)
Hyperglycemia	12 (21.1)
Psychological distress	2 (3.5)
Parents not sending	1 (1.8)
Routine check-ups	23 (40.4)
Having to leave/take a break from school due to diabetes, n (%)	
Yes	7 (7.0)
No	93 (93.0)
Experiencing academic failure due to diabetes, n (%)	
Yes	36 (36.0)
No	64 (64.0)

M: Mean, **SD:** Standard Deviation

difference between children's gender and the need for assistance with insulin application at school (p>0.05). There was also no significant difference between children's HbA1c levels and the occurrence of school absence due to diabetes (p>0.05) (Table 4).

There was a significant difference between the age at which children were first diagnosed with diabetes and school absence due to diabetes (x^2 = 5.141; p = 0.023). Among those first diagnosed with diabetes between the ages of 0-5, it was determined that 50% did not have to take breaks or be absent from school due to diabetes, while 50% had to take breaks or be absent occasionally. Among those first diagnosed with diabetes between the ages of 6-12, it was determined that the majority (75%) had to occasionally take breaks or be absent from school due to diabetes (Table 4).

There was a significant difference between the children's HbA1c levels and their academic performance at school due to diabetes (x^2=16.504; p<0.01). It was determined that 26.30% of those with good HbA1c levels and 75% with poor HbA1c levels experienced academic failure due to diabetes (Table 4).

There was a significant difference between the age at which children were first diagnosed with diabetes and their academic performance at school due to diabetes (x^2 = 16.504; p<0.01). It was determined that 33.30% of those aged 0-5 years old and 42.90% aged 6-12 years old experienced academic failure due to diabetes (Table 4).

DISCUSSION

This research explores factors influencing the school experiences of children with Type 1 Diabetes, specifically focusing on the relationship between children's age and the need for assistance in insulin administration at school. The analysis revealed a statistically significant association between age

Table 4: The factors that influence children's need for assistance with insulin pump application at school, school absenteeism, and academic performance at school.

Variables				
	Receiving Support While Administering Insulin at School			
Age Groups*	**Yes**	**No**	**x^2**	**p**
<10 ages	35 (77.8)	10 (22.2)	21.782	**<0.001**
>10 ages	17 (30.9)	38 (69.1)		
	Receiving Support While Administering Insulin at School			
Gender*	**Yes**	**No**	**x^2**	**p**
Girl	23 (47.9)	25 (52.1)	0.575	0.448
Boy	21 (40.4)	31 (59.6)		
	School Absence Due to Diabetes			
HbA1c level*	**Yes**	**No**	**x^2**	**p**
Good	46 (57.5)	34 (42.5)	0.410	0.840
Poor	11 (55.0)	9 (45.0)		
	School Absence Due to Diabetes			
Initial diabetes diagnosis' age*	**No**	**Occasionally**	**x^2**	**p**
0-5 ages	36 (50.0)	36 (50.0)	5.141	**0.023***
6-12 ages	7 (25.0)	21 (75.0)		
	School Failure Due to Diabetes			
HbA1c Level*	**Yes**	**No**	**x^2**	**p**
Good	21 (26.3)	59 (73.8)	16.504	**<0.001**
Bad	15 (75.0)	5 (25.0)		
	School Failure Due to Diabetes			
Initial diabetes diagnosis' age*	**Yes**	**No**	**x^2**	**p**
0-5 ages	24 (33.3)	48 (66.7)	16.504	**<0.001**
6-12 ages	12 (42.9)	16 (57.1)		

*Data are shown as n (%); x^2: Chi-square Analysis

and the requirement for assistance in insulin pump application. Among the participants, 48% received assistance, 52% did not, and 35% reported using insulin pumps. A study by Ekim and Pek (19) categorizing insulin administration skills by age groups found that most children under 10 received assistance in insulin pump application, while those aged 10 and above mostly managed without assistance. The need for assistance was notably higher in children aged 7-12 compared to those aged 13-18, consistent with Doğan's (17) study involving children aged 7-12, where half self-administered insulin, while others had assistance. Similarly, Tarı and Kitiş's (18) study involving children aged 5-18 found that 22% received assistance among 152 insulin users. The present study aligns with previous research, suggesting that younger children may be more likely to receive assistance while older children develop the skills and independence necessary for self-administration.

This study investigated the link between children's gender and problems in insulin administration at school, revealing no statistically significant relationship. These results align with the existing literature. Korbel et al. (20) explored gender differences in Type 1 Diabetes management during adolescence, finding associations of higher depression and weaker adherence among female adolescents. Franconi et al. (21) reported generally small gender differences in diabetes management, with women occasionally facing more difficulties. Conversely, Kautzky-Willer et al. (22) found that women experienced more challenges, while men were more successful. The conflicting nature of these results complicates the assessment of gender differences in diabetes management, emphasizing the need for nuanced consideration when evaluating insulin administration issues based on children's gender.

In this study, 7% of children took a break from school, citing reasons such as psychological impact and challenges in treatment adherence. Among participants, 53.2% missed school for fewer than 5 days. Fleming et al. (13) noted that diabetic children had higher school absenteeism, particularly with elevated HbA1c levels. Glaab et al. (15) found that diabetic children missed more school (average: 2.8 days) than healthy siblings, correlating with poor metabolic control. Vetiska et al. (23) reported that children with Type 1 Diabetes missed an average of 6 days yearly compared to healthy siblings. Cook (14) indicated a 6.1-day average school absenteeism for children with Type 1 Diabetes. In our study, children missed school for 1 to 15 days in the last 3 months (average: 3.2±3.1 days) and 1 to 30 days in the last year (average: 6.7±6.7 days), showing higher rates than Glaab et al. (15) and similar rates to Cook (14) and Vetiska et al. (23). Reasons for absenteeism included treatment-related hospitalization, hypoglycemia, hyperglycemia, psychological impact, parental non-sending, and routine check-ups, with parental concern for their child's well-being contributing to non-attendance.

In our study, 16.7% of children diagnosed with diabetes at ages 0-5 missed school for 15 days or more, while 58.8% diagnosed at ages 6-12 missed less than 5 days. There is a significant link between the age of the first diabetes diagnosis and school absenteeism. McCarthy et al. (24) found, in a study of diabetic children with an average age of 14.8, that those diagnosed at 8.3 missed more school than healthy siblings. Wagner et al. (25) reported that diabetic children (aged 8-15, diagnosed at 5.3) missed more school (average: 6.1 days) than their healthy counterparts. Various studies explore diabetes's impact on education, attributing school absenteeism to the challenges of diabetes management, including insulin injections and dietary adjustments. Parents may exert more control at early ages (0-5), resulting in lower absenteeism rates. However, as diabetes management complexity increases, so does the likelihood of school absenteeism.

This study reveals a significant link between children's HbA1c levels and diabetes-related academic failure. Most children with good glycemic control (73.8%) avoided academic failure, while 75% with poor control experienced setbacks. The importance of glycemic control, observed in both Type 1 and Type 2 diabetes patients in previous studies, is underscored. Gorska-Ciebiada et al. (26) showed that good glycemic control reduces diabetes complications and improves quality of life. Prior research notes diabetes's negative impact on academic achievements, varying with glycemic control levels (27,28). Good glycemic control is associated with enhanced concentration and cognitive functions, leading to higher academic success (29). These findings contribute to understanding factors influencing the academic performance of children with diabetes and support the need for diabetes education, treatment programs, and regular glycemic control to improve their academic achievements and quality of life.

The study found that 33.3% of children diagnosed with diabetes between 0-5 years and 42.9% between 6-12 experienced academic failure. There is a relationship between the age of diabetes diagnosis and academic failure, aligning with some prior research, though conflicting findings exist. Aziz and Sulaiman (30) reported lower school performance for children diagnosed before age 7, while our study found higher academic failure among those diagnosed between 6-12. Cooper et al. (31) found no significant relationship between diagnosis age and school performance. Cook (14) suggested that early diabetes diagnosis could affect cogni-

tive memory and lead to lower academic performance, especially in younger children. Challenges in adapting to school life and managing diabetes, particularly in the 6-12 age group, might contribute to academic difficulties. Increasing responsibility for diabetes management as children age could explain the higher prevalence of academic failure in this group.

In conclusion, this study sheds light on the intricate interplay between children's age, glycemic control, insulin administration, and their school experiences in diabetes management. The results emphasize the importance of age-related factors, with younger children often requiring more assistance and potentially facing more challenges in school due to diabetes. Furthermore, the link between glycemic control and academic performance highlights the critical role of maintaining stable blood glucose levels for children's educational success. Nevertheless, it is crucial to acknowledge the limitations of this research, including the relatively small sample size, potential self-reporting biases, and the cross-sectional design. Future studies with larger and more diverse cohorts, longitudinal perspectives, and objective measurements will be essential to elucidate these relationships further and develop targeted interventions to support children with diabetes in educational settings. Furthermore, it is essential to designate an active role for school nurses in every educational institution. Having a school nurse should be a mandatory requirement for all schools, where they play a vital role in facilitating collaboration between children with Type 1 Diabetes, their families, and school staff, and making the necessary arrangements. Additionally, school nurses should conduct regular training sessions for school personnel to enhance their knowledge about Type 1 Diabetes.

This study has several limitations. Firstly, the study's relatively small sample size may limit the generalizability of the results to a broader population of children with diabetes. Additionally, the reliance on self-reported data, especially regarding school-related experiences, introduces the possibility of recall bias and subjectivity. The cross-sectional nature of the study design precludes the establishment of causal relationships and long-term trends. Furthermore, the study's focus on a single geographical region may not capture potential variations in diabetes management and school experiences in different cultural or socioeconomic contexts. Finally, the study did not explore the potential influence of factors such as socioeconomic status, parental involvement, or specific school policies, which could contribute to a more comprehensive understanding of the challenges faced by children with diabetes in school settings. Future research should address these limitations and provide a more nuanced perspective on this important issue.

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