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Inequalities in Access to Diabetes Technologies in Children with Type 1 Diabetes: A Multicenter, Cross-sectional Study from Türkiye

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What is already known on this topic?

Technology use improves type 1 diabetes management in children, regardless of socioeconomic status. However, access to this technology has socioeconomic barriers.

What this study adds?

It was shown that socioeconomic characteristics affect access to diabetes technologies and glycemic management in a large group of families from Türkiye.

Abstract

Objective: To determine inequalities in access to diabetes technologies and the effect of socioeconomic factors on families with children with type 1 diabetes.

Methods: In this multicenter, cross-sectional study, parents of children with type 1 diabetes completed a questionnaire about household sociodemographic characteristics, latest hemoglobin A1c (HbA1c) values, continuous glucose monitoring (CGM) and insulin pump use of children, the education and working status of parents. These characteristics were compared between technology use (only-CGM, only-pump, CGM + pump, no technology use).

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Results: Among 882 families, only-CGM users, only-pump users, and CGM + pump users were compared with no technology users, adjusting for age, sex, region, education levels, number of working parents, and household income. Children living in the least developed region had lower odds of having only-CGM [odds ratio (OR) = 0.20, 95% confidence interval (CI): 0.12-0.34, p < 0.001] and having CGM + pump (OR = 0.07, 95% CI: 0.03-0.22, p < 0.001) compared with those living in the most developed region. Children with parents who had not finished high school had lower odds of having only-CGM (mothers: OR = 0.36, 95% CI: 0.19-0.66, p = 0.001; fathers: OR = 0.32, 95% CI: 0.18-0.60, p < 0.001) or both CGM + pump (mothers: OR = 0.27, 95% CI: 0.11-0.64, p = 0.003; fathers: OR = 0.34, 95% CI: 0.15-0.79, p = 0.012) rather than no-technology compared to children whose parents have a university degree. Every $840 increase in the household income increased the odds by 5% for having only-CGM (OR = 1.05, 95% CI: 1.02-1.09, p < 0.001) or CGM + pump (OR = 1.05, 95% CI: 1.01-1.08, p < 0.001).

Conclusion: Socioeconomic factors, such as parental education, region of residence, and income were associated with inequality in access to technologies. The inequalities are more prominent in access to CGM.

Keywords: Continuous glucose monitoring, inequality, technology, type 1 diabetes

Introduction

In the last decade, diabetes technologies, especially continuous glucose monitoring (CGM), have played an increasingly fundamental role in treating children with type 1 diabetes (T1D). In parallel, ensuring equal access to these technologies and evaluating inequalities in a multidimensional manner has become a matter of debate (1,2,3). Inequalities are directly related to the historical and current unequal distribution of social, political, economic, and environmental resources, and one of the groups most affected by inequalities is children (4). Inequalities in access to diabetes technologies should be addressed within the scope of "social determinants of health", screened routinely by healthcare providers during visits, and made the subject of advocacy for the social rights of children (5,6,7).

Equal access to CGM from diagnosis can lower hemoglobin A1c (HbA1c) in children with T1D despite other inequalities and, thus, can be a "leverage" to reduce the impact of inequalities on children's diabetes (8). The relationship between families and CGM goes beyond the numbers, CGM eases families' burden and reinforces their motivation to be "their children's pancreas" (9,10). Therefore, equal access to diabetes technologies contributes to making diabetes treatment more humane, in addition to its glycemic control benefits, such as improving HbA1c and reducing the frequency and fear of hypoglycemia (9,11).

In Türkiye, a medium-income country, 70% of children with T1D have HbA1c over 7.5%, and 35% have HbA1c over 9% (75 mmol/mol) (12). Moreover, in the Southeastern Anatolia region, one of the least developed regions of Türkiye, the prevalence of diabetic ketoacidosis (DKA) at presentation is 65.9%, 63% of these cases being severe DKA, and the frequency of DKA increases up to 87.5% between the ages of 0-4 (13). Despite the evidence and intense advocacy efforts over the last 5 years, Türkiye temporarily reimburses CGM for a limited number of children with T1D who meet strict criteria. Türkiye also provides partial reimbursement (approximately 20%) for insulin pumps. However, the prevalence of diabetes technology use and the characteristics of the population who have access are unknown. The aims of this study were to examine the use of diabetes technology in terms of socioeconomic groups and regions, to investigate the determinants and inequalities of access to diabetes technologies, and the socioeconomic determinants of better glycemic management among technology users. The results may provide useful information to health care decision-makers in addressing inequalities in access to diabetes technology.

Methods

Participants

The study protocol was shared previously (14). In brief, parents of children and adolescents with T1D were recruited from nine pediatric endocrinology centers and the Children Diabetes Foundation Network in Türkiye. The online survey was distributed to the parents during routine visits to the clinics and through the Children Diabetes Foundation's social media groups. Only mothers or fathers whose children were diagnosed with T1D before the age of 18 years were included, caregivers other than the mother or father were excluded. Participants with a diabetes duration of < 3 months were excluded to ensure the families had sufficient experience with T1D. Of note, at the time of the study there was no reimbursement for CGM.

Questionnaire

Briefly, the questionnaire covered the child's clinical and household sociodemographic characteristics, CGM and pump use, the latest HbA1c value, the education level of both parents, the working statuses of both parents, and the financial burden of diabetes (14). Only one parent completed the questionnaire for the entire family. The Ethical Committee at Koç University approved the study (decision no: 2022.378.IRB3.176, date: 03.11.2022) in accordance with the Declaration of Helsinki.

Statistical Analysis

The primary outcome of the study is the socioeconomic determinants of technology use. Technology use is divided into four categories: CGM use only; pump use only; both CGM and pump use; and no use of technology.

For independent variables the 81 provinces of Türkiye were ranked in six groups based on socioeconomic development, according to the "socioeconomic development ranking of provinces research" of the Turkish Ministry of Industry and Technology (15). According to this ranking, we divided the provinces where the families were located into the six groups but rationalized these into three categories for analysis, which were the most developed region, the least developed region, and the remaining four groups as intermediate developed regions. The highest education levels of parents were analyzed in three categories, finished school before the end of high school, completed high school, and university degree or above.

Household income was collected as Turkish lira, converted to United States (US) dollars based on March 2022 US Dollar/Turkish lira exchange rates.

Descriptive statistics are presented as means with standard deviation for normally distributed continuous variables, median (interquartile range) for non-normally distributed continuous variables or absolute numbers with percentages for categorical variables. For univariate analysis, one-way ANOVA or Kruskal-Wallis tests were used for continuous variables, and the chi-square test was used for categorical comparisons. A multinominal logistic regression model was used to assess technology use (only CGM users, only pump users, and both CGM and pump users compared with no technology use), adjusting for age, sex, region where the family lived (least developed/intermediate/most developed), education levels of mothers, education levels of fathers, number of working parents, and household income.

Another analysis was conducted to evaluate which technology and which factors were associated with better glycemic outcomes among technology users. In this analysis, the factors associated with better glycemic control, indicated by lower HbA1c, in technology users (CGM and/or pump users). For this, a linear regression model used the HbA1c as the dependent variable and age, sex, diabetes duration, CGM use (only pump use vs. CGM with or without pump use), the number of working parents, education levels of mothers, education levels of fathers, the region where the family lives, and household income as predictors. After forward stepwise variable selection, diabetes duration, the region where the family lives, education levels of mothers, CGM use, and household income were included in the model as predictors. Statistical Package for the Social Sciences, version 28.0, was used for the analysis (IBM Inc., Armonk, NY, USA). A p value <0.05 was considered significant.

Results

Study Population

Of the 1254 responses, 372 were excluded due to missing information or duplicate responses. Among the final 882 responses (77.6% completed by mothers), 692 were from nine pediatric endocrinology clinics and 190 were from the online network of Children Diabetes Foundation. Participants were from 65 out of 81 provinces of Türkiye.

Participant families' characteristics are summarized in Table 1. Of 882 children with T1D (52.5% female, mean age 10.75 ± 4.6 years, diabetes duration 7 ± 3.8 years), 829 children (94%) were living with both parents while 53 children (6%) were with a single parent. In addition, 666 children (75.5%) had at least one sibling, and 86 (13%) of them had a sibling with a chronic medical condition. Twenty-five families (2.8%) had more than one child with T1D.

According to self-reported HbA1c values (n = 738), the mean last HbA1c was 7.5 ± 1.4% (58 mmol/mol). Reported current pump and CGM use were 19.4% and 49.7%, respectively. Of all children, 15% were using both pump and CGM, 4.4% using only pump, 34.7% using only CGM, and 45.9% were not using any diabetes technology.

Technology use (CGM and/or pump use) was 16.1% in the least developed region, 67.8% in the intermediate developed region, and 66.1% in the most developed region. CGM use was 14.4%, 60.1%, and 62.5% in these regions, respectively while pump use was 3.6%, 27.8%, and 22.5%, respectively.

Characteristics of Technology Users and Determinants of Technology Use

Family characteristics of only CGM users, only pump users, both pump and CGM users, and no technology users are shown in Table 2. Technology use did not differ by the sex and living arrangements of children (living with a single parent or both parents).

The number of siblings was higher in families in whom the child with T1D did not use technology. No technology users had similar household incomes to pump only users but lower household incomes than CGM users. Moreover,

Table 1. Characteristics of participants

	All participant families (n = 882)
Children	
Age, years, mean ± SD	10.75 ± 4.6
Sex, female, n (%)	463 (52.5)
Diabetes duration, years, mean ± SD	3.7 ± 3.5
Child's living arrangement, n (%)	
With both parents	829 (94.0)
With a single mother	51 (5.0)
With a single father	2 (1.0)
Children with sibling(s), n (%)	666 (75.5)
Sibling(s) with chronic condition, n (%)[a]	86 (13.0)
Sibling with T1D, n (%)[a]	25 (2.8)
Most recent HbA1c, mean ± SD[b]	7.5 ± 1.4
Current use of CGM, n (%)	438 (49.7)
Current use of pump, n (%)	171 (19.4)
No technology users, n (%)	405 (45.9)
Parents, mother/father	
Parents' age, years, mean ± SD	39 ± 6.4 / 42.3 ± 6.8
Highest educational level, n (%)/n (%)	
Less than high school	282 (32.0) / 227 (25.7)
High school graduate	221 (25.1) / 255 (28.9)
University degree or above	379 (43.0) / 400 (45.4)
Household income, Turkish lira/month, median (IQR)	7500 (4500-14000)
Number of working parents, n (%)	
Both parents are not working	71 (8.0)
Only one parent is working	518 (58.7)
Both parents are working	293 (33.2)
The region where family lives, n (%)	
The least developed	222 (25.2)
Intermediate	273 (31.0)
The most developed	387 (43.9)
Financial loss due to diabetes care, n (%)	
None to minimal loss	113 (12.8)
Moderate financial loss	262 (29.8)
High to severe financial loss	506 (57.4)

[a]Percentages were calculated for children with at least one sibling.
[b]HbA1c was self-reported from 738 responders.
SD: standard devation, HbA1c: hemoglobin A1c, T1D: type 1 diabetes, CGM: continuous glucose monitoring, IQR: interquartile range

their mother or father's education level was lower, they had fewer working parents, they reported less financial burden caused by diabetes, and they mostly lived in the least developed region compared to those using CGM and/or pump ($p < 0.001$ for all) (Table 2). Mean HbA1c levels by technology use are shown in Figure 1A. HbA1c was lower in CGM users compared to pump users [both CGM and pump vs. only pump: 7.05% (54 mmol/mol) vs. 8.0% (64 mmol/mol), $p < 0.001$] and insulin pen users [only CGM vs. no technology: 7.07% (54 mmol/mol) vs. 8.07% (65 mmol/mol), $p < 0.001$]. However, HbA1c did not differ by pump use in CGM users [both CGM and pump vs. only CGM: 7.05% (54 mmol/mol) vs. 7.07% (54 mmol/mol), $p = 0.868$] nor blood glucometer users [only pump vs. no technology: 8.00% (64 mmol/mol) vs. 8.07% (65 mmol/mol), $p = 0.810$]. HbA1c was lower in all regions with CGM use (Figure 1B).

To understand the social determinants of technology use, a multinomial logistic regression analysis was used (Table 3). In this analysis, technology use was assessed between CGM only users, pump only users, and combined CGM and pump users compared with no technology use), adjusting for age, sex, region (least/intermediate/most developed), education levels of mothers, education levels of fathers, number of working parents, and household income. The results showed that children living in the least developed region had lower odds of having CGM only [odds ratio (OR) = 0.20, 95% confidence interval (CI): 0.12-0.34] and having combined CGM and pump (OR = 0.07, 95% CI: 0.03-0.22) compared to living in the most developed region. Children with a mother who had not finished high school had lower odds of having CGM only (OR = 0.36, 95% CI: 0.19-0.66) or combined CGM and pump (OR = 0.27, 95% CI: 0.11-0.64) rather than no technology compared to children whose mother had a university degree or above. Fathers' education levels had a similar association for CGM only (OR = 0.32, 95% CI: 0.18-0.60) and combined CGM and pump users (OR = 0.34, 95% CI: 0.15-0.79) rather than no technology users. Every 12,000 Turkish lira (~840 US dollars) increase in the household income increased the odds by 5% for using CGM (OR = 1.05, 95% CI: 1.02-1.09) and cobined CGM and pump (OR = 1.05, 95% CI: 1.01-1.08).

Factors Associated with Better Glycemic Control in Technology Users

After showing better glycemic management by technology use (Figure 1A), we performed a linear regression analysis to examine variables associated with glycemic control among 431 CGM and/or pump-user children, specifically to investigate the effect of single or multiple technology use.

The model was adjusted for diabetes duration, region where the family lives, mother's education level, technology use (CGM only use, pump only use or CGM and pump use), and household income. Living in the least developed region was associated with 0.54% (6 mmol/mol) higher HbA1c [95% CI: 0.11% (1 mmol/mol) - 0.97% (11 mmol/mol), $p = 0.013$] compared with living in the most developed region. Children whose mothers had attended or completed high school had 0.26% (3 mmol/mol) higher HbA1c [95% CI: 0.01% (0.1

Table 2. Technology use by the characteristics of children and families

	Users of no technology (n = 405)	Pump only users (n = 39)	CGM only users (n = 306)	Both pump and CGM users (n = 132)	p
Age, years, mean ± SD	11.5 ± 4.6[a]	13.8 ± 5.4[a]	9.1 ± 4.1[b]	11.3 ± 4.6[b]	< 0.001
Sex, female, n (%)	216 (53.3)	24 (61.5)	149 (48.7)	74 (56.1)	0.279
Diabetes duration, years, mean ± SD	3.9 ± 3.6[a]	6.7 ± 5.1[b]	2.6 ± 2.6[c]	5.0 ± 3.3[d]	< 0.001
HbA1c, %, mean ± SD	8.1 ± 1.6[a]	8.0 ± 1.4[a]	7.1 ± 1.2[b]	7.1 ± 1.0[b]	< 0.001
Number of siblings, median (IQR)	2 (1-3)[a]	1 (1-2)[b]	1 (0-1)[b]	1 (0-1)[b]	< 0.001
Living arrangement, with both parents, n (%)	380 (93.8)	37 (94.9)	289 (94.4)	123 (93.2)	0.953
Household income, Turkish lira/month, median (IQR)	5000 (4000-7500)[a]	7000 (4250-10000)[a]	10000 (6500-18000)[b]	12000 (8000-20000)[b]	< 0.001
Region where family lives, n (%)					< 0.001
The least developed region	186 (45.9)	4 (10.3)	28 (9.2)	4 (3.0)	
Intermediate developed regions	88 (21.7)	21 (53.8)	109 (35.6)	55 (41.7)	
The most developed region	131 (32.3)	14 (35.9)	169 (55.2)	73 (55.3)	
Education level of mothers, n (%)					< 0.001
University degree or above	78 (19.3)	13 (33.3)	200 (65.4)	88 (66.7)	
High school graduates	110 (27.2)	15 (38.5)	64 (20.9)	32 (24.2)	
Less than high school	217 (53.6)	11 (28.2)	42 (13.7)	12 (9.1)	
Education level of fathers, n (%)					< 0.001
University degree or above	99 (24.4)	10 (25.6)	206 (67.3)	85 (64.4)	
High school graduates	138 (34.1)	18 (46.2)	64 (20.9)	35 (26.5)	
Less than high school	168 (41.5)	11 (28.2)	36 (11.8)	12 (9.1)	
Number of working parent, n (%)					< 0.001
Both parents working	76 (18.8)	9 (23.1)	135 (44.1)	73 (55.3)	
Only one parent working	272 (67.2)	27 (69.2)	162 (52.9)	57 (43.2)	
Both parents not working	57 (14.1)	3 (7.7)	9 (2.9)	2 (1.5)	
Financial loss due to diabetes care, n (%)					< 0.001
None to minimal loss	80 (19.8)	2 (5.1)	24 (7.8)	7 (5.3)	
Moderate financial loss	126 (31.1)	13 (33.3)	97 (31.7)	27 (20.5)	
High to severe financial loss	199 (49.1)	24 (61.5)	185 (60.5)	98 (74.2)	

HbA1c was self-reported from 738 responders. Other data were from 882 responses.
One-way ANOVA, Kruskal-Wallis, or chi-square tests were used as appropriate.
[a,b]Subgroup comparison of continuous variables after Bonferroni correction were shown with superscript letters, while same superscript letters are not significantly different and different letters significantly differ.
SD: standard devation, HbA1c: hemoglobin A1c, CGM: continuous glucose monitoring, IQR: interquartile range

mmol/mol) - 0.51% (6 mmol/mol), p = 0.04] than children whose mothers had a university degree or above. Using only pump was associated with 0.57% (6 mmol/mol) higher HbA1c [95% CI: 0.15% (2 mmol/mol) - 1.00% (11 mmol/mol), p = 0.007] compared to CGM use, with or without a pump. A 12,000 Turkish lira (~840 US dollars) increase in household income was associated with a 0.02% (0.1 mmol/mol) decrease in HbA1c [95% CI: 0.003% (0.1 mmol/mol) - 0.03% (0.1 mmol/mol), p = 0.017]. A one year increase in diabetes duration was associated with a 0.05% (0.1 mmol/mol) increase in HbA1c [95% CI: 0.015 (0.1 mmol/mol) - 0.087% (1 mmol/mol), p = 0.006].

Discussion

This study showed inequality in access to diabetes technologies in Türkiye and the associated socioeconomic

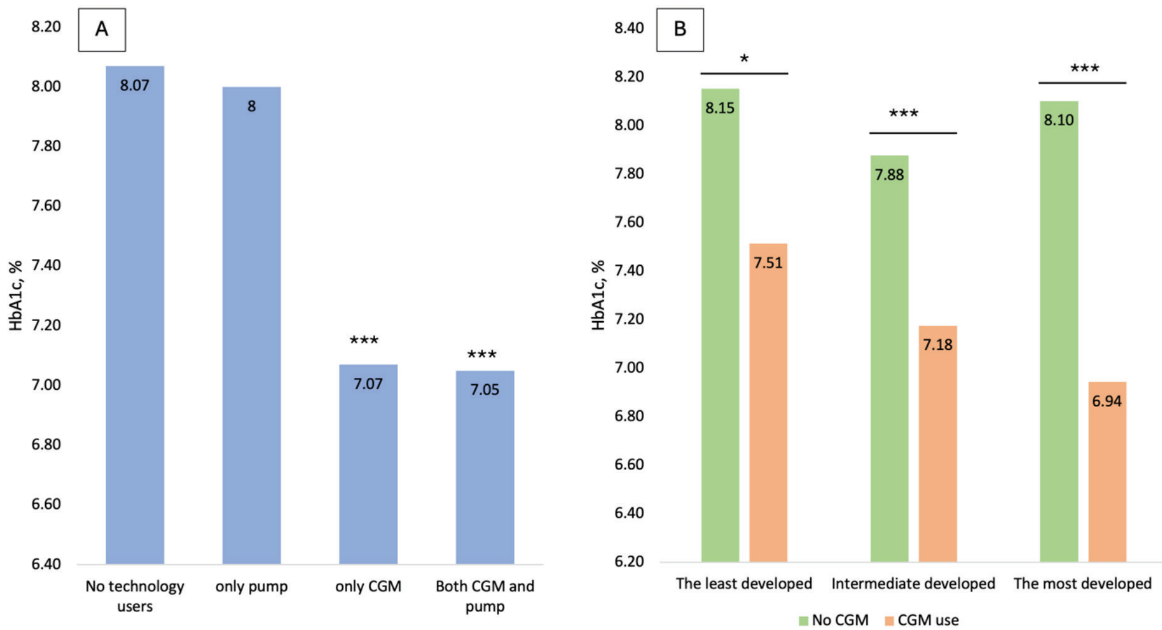

Figure 1. HbA1c levels by technology use and regions. A) HbA1c levels by CGM and/or pump use, three technology categories were compared with no technology users. B) HbA1c levels by CGM use in the least, intermediate and most developed regions

*p < 0.05, **p < 0.01, ***p < 0.001.

HbA1c: hemoglobin A1c, CGM: continuous glucose monitoring

determinants, such as education level of parents, socioeconomic development level of the region of residence, and household income. Moreover, these factors were also associated with HbA1c levels among technology users. Inequality in access to diabetes technologies has emerged as an important problem for children with diabetes, regardless of the socioeconomic development level of the countries, as shown by studies from the United States and New Zealand (2,16). The present study, the first data published from Türkiye, shows significantly lower technology use in underdeveloped regions than in intermediate and most developed regions, and the difference between regions is more prominent for pump use. This latter may be due to several factors, such as CGM use being relatively easy and individual preferences and skills, whereas pump use requires more skills and the presence of healthcare providers familiar with the use of technology.

It has been stated that access to health care results from the interface between the supply-side characteristics of health systems and organizations and the demand-side characteristics of populations (17). Similarly, in the present study it was shown that inequalities in access to diabetes technologies are multi-layered and they are not just related to affordability or coverage by reimbursement. Among those layers, population factors, such as parental education level, household income, and the working status of parents affected the inequality in access to diabetes technologies. However, there are also health system related factors at play, such as the supply and reimbursement of diabetes technologies, and the number and availability of healthcare providers that are experienced with diabetes technologies (18). These factors contributing to inequality affect all individuals in a region, regardless of individual factors. Thus, equitable access to technologies, including CGM and/or automatic insulin delivery systems, requires programs that prioritize the most disadvantaged areas and consider the social determinants of health (5). The present study found a close parallel between household income, parental education, and the number of working parents and, moreover, these were collectively associated with access to technology.

Studies from New Zealand and Germany show that inequalities regarding T1D care and metabolic control are not only socioeconomic but there are also barriers arising from ethnicity, language, and cultural differences (16,19). Another point, that may be equally as important as these obstacles, is whether families who do not use this technology are even aware of the existence and benefits of these technologies. Lack of awareness may be another factor associated with access to technology. However, we

Table 3. Variables related to only pump use, only CGM use, and both CGM and pump use by multinomial logistic regression analysis

	Only pump					Only CGM					Both pump and CGM				
			95% CI					95% CI					95% CI		
	Beta	OR	Lower	Upper	p values	Beta	OR	Lower	Upper	p values	Beta	OR	Lower	Upper	p values
Age	0.1	1.11	1.03	1.19	**0.006**	-0.12	0.89	0.85	0.93	**<0.001**	-0.01	0.99	0.95	1.05	0.82
Male vs. female	-0.34	0.71	0.35	1.43	0.339	-0.04	0.96	0.66	1.39	0.827	-0.27	0.76	0.48	1.2	0.245
Household income, Turkish lira[a]	0.03	1.04	0.99	1.08	0.128	0.05	1.05	1.02	1.09	**0.001**	0.05	1.05	1.01	1.08	**0.005**
Education level of mothers															
Less than high school vs. university degree or above	-1.11	0.33	0.1	1.04	0.059	-1.04	0.36	0.19	0.66	**0.001**	-1.31	0.27	0.11	0.64	**0.003**
High school vs. university degree or above	-0.35	0.71	0.27	1.88	0.489	-0.67	0.51	0.3	0.87	**0.013**	-0.46	0.63	0.33	1.19	0.157
Education level of fathers															
Less than high school vs. university degree or above	0.39	1.48	0.47	4.6	0.501	-1.13	0.32	0.18	0.6	**<0.001**	-1.07	0.34	0.15	0.79	**0.012**
High school vs. university degree or above	0.65	1.91	0.74	4.92	0.182	-0.71	0.49	0.3	0.81	**0.005**	-0.39	0.68	0.37	1.23	0.2
Number of working parents															
Both parents working vs. both parents not working	-0.21	0.81	0.18	3.7	0.784	0.13	1.14	0.45	2.89	0.782	1.27	3.57	0.76	16.91	0.108
Only one parent working vs. both parents not working	0.46	1.59	0.43	5.83	0.489	0.37	1.45	0.62	3.38	0.39	1.11	3.03	0.67	13.68	0.15
Region where family lives															
The least developed vs. most developed	-1.11	0.33	0.1	1.08	0.067	-1.61	0.2	0.12	0.34	**<0.001**	-2.61	0.07	0.03	0.22	**<0.001**
Intermediate developed vs. most developed	0.96	2.62	1.22	5.62	**0.013**	0	1	0.66	1.53	0.984	0.18	1.2	0.74	1.95	0.463

Reference category was the no technology user group.
[a]A unit increase in household income is 12,000 Turkish lira (approximately 840 US dollars).
OR: odds ratio, CI: confidence interval, CGM: continuous glucose monitoring, US: United States

did not obtain information from parents about whether they were familiar with diabetes technologies. Therefore, there is a need to evaluate the lack of awareness about available technologies, social and cultural barriers related to language, mothers' education, and employment in the least developed regions in a separate study (20). A qualitative study emphasized that inequalities have a complex structure involving people with diabetes, their families, and diabetes teams (21). The choices of people with diabetes are directed by their culture and beliefs, which should be considered, and specific programs should be developed to reduce inequalities instead of giving all responsibility to the people with diabetes concerning their choices for T1D management (21).

An important paradox about diabetes technologies is that diabetes technologies are the most promising developments for the improvement of diabetes treatment, but they may carry the risk of increasing inequalities both worldwide and within countries if the necessary measures are not taken (5). The reason for this is that in today's conditions, it is not the children who need it most, but those who are economically and socially advantaged that benefit most from these technologies. This situation also applies to Türkiye, as shown by our results. We believe that this is unethical, and that socioeconomic inequalities and structural exclusionary processes have a critical detrimental effect on the health of children with diabetes. It seems to us that providing equal access to diabetes technologies from diagnosis may be the first step in reducing the impact of inequalities on glucose management (8). The present study showed that CGM use in all regions resulted in lower HbA1c, regardless of pump use, while the same effect was not found for pump use. However, CGM use was associated with more socioeconomic factors. Therefore, in countries with limited economic opportunities, priority should be given to providing CGM to all children with diabetes (3).

The strengths of this study include the large number of families from all regions and meticulous data collection.

Study Limitations

The limitations of this study included its cross-sectional study design, reliance on self-reported data, and unknown response rates. Another limitation was the failure to inquire about participants' awareness of the existence of diabetes care devices and their benefits, which are determinants of technology access. Furthermore, the lack of information about pump models and the number of users of automated insulin delivery systems hindered glycemic assessment in our study, despite the evident improvement in glycemia associated with automated insulin delivery systems (18).

Conclusion

There were inequalities in access to diabetes technologies, affected by factors such as parental education, regional socioeconomic development, and household income. These disparities are more pronounced in terms of access to CGM, despite its significant contribution to improving glycemic control. Thus, there is a need for specific initiatives to overcome disparities in technology access for children with T1D, especially those from disadvantaged socioeconomic backgrounds.

Ethics

Ethics Committee Approval: The Ethical Committee at Koç University approved the study (decision no: 2022.378. IRB3.176, date: 03.11.2022) in accordance with the Declaration of Helsinki.

Informed Consent: Consent form was filled out by all participants.

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Footnotes

Authorship Contributions

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