RESEARCH ARTICLE

Eren Cam[1]
Mehmet Nurullah Kurutkan[2]
Ilknur Arslanoglu[3]
Okan Butuner[4]

[1]University of Duzce, Institute of Social Sciences, Total Quality Management, Duzce, Turkey
[2]University of Duzce Department of Health Management, Duzce, Turkey
[3]University of Duzce, Faculty of Medicine, Duzce, Turkey
[4]University of Duzce, Department of Insurance and Social Security, Duzce, Turkey

Corresponding Author:
Ilknur Arslanoglu
University of Duzce, Faculty of Medicine, Duzce, Turkey
Phone: +90 5425138858
mail: ilkilkars@yahoo.com

Received: 28.07.2020
Acceptance: 13.11.2020
DOI: 10.18521/ktd.774512

This study was presented as a poster at the 2019 National Pediatric Endocrinology and Diabetes Congress.

Konuralp Medical Journal
e-ISSN1309–3878
konuralptipdergi@duzce.edu.tr
konuralptipdergisi@gmail.com
www.konuralptipdergi.duzce.edu.tr

Cost of Inpatient Pediatric Type 1 Diabetes Care in Turkey: Single Center Experience

ABSTRACT

Objective: To explore the financial cost of type 1 diabetic (T1D) children and adolescents during inpatient management for various reasons.

Methods: Ten years of electronic hospital records (2009-2018) of the pediatric ward were screened retrospectively and hospitalizations with a confirmed diagnose of T1D were analyzed. Costs are grouped as laboratory tests, clinical interventions, drugs, medical supplies, and total costs before being converted to US dollars according to the mid-year index published by the Central Bank of Turkey. Descriptive statistics and comparisons against patient-specific characteristics are presented.

Results: There were 400 eligible cases. Cost per case for the hospital and for the Social Security Institution (SSI) were $268 and $309 respectively. The clinical intervention was the largest (49.84 vs 55.33 %) and that of medical supplies was the smallest (0.43 vs 0.55 %) component of the cost. Blood pH, HbA1c, having a single parent, and the number of days in the ward were parameters influencing total cost significantly ($p<0.1$).

Conclusions: With strict monitoring of social protection mechanisms for families with type I diabetic children with high social risks, cost increases stemming from social risks that can be reduced. Also, it is beneficial to closely monitor the medical risks affecting the pH and HbA1c levels. The study offers the first data about pediatric T1D hospital stays in Turkey which are expected to help to reasonable resource distribution and efficiency of care.

Keywords: Cost, Type 1 Diabetes, Pediatric, Inpatient, Turkey.

Türkiye'de Yatış Hizmeti Verilen Pediatrik Tip I Diyabetli Hastaların Maliyeti: Tek Merkezin Tecrübesi

ÖZET

Amaç: Tip 1 diyabetli (T1D) çocuk ve adolesanların değişik nedenlerle yatarak tedavisinin maliyetini ortaya koymak.

Gereç ve Yöntem: Hastanenin elektronik hasta kayıtları 10 yıl geriye kadar (2009-2018) tarandı ve T1D olduğu doğrulanan olgular irdelendi. Maliyetler laboratuvar testleri, klinik girişimler, ilaçlar, tıbbi malzeme ve total olarak gruplandı ve Merkez Bankası yıl ortası verilerine göre Amerikan dolarına çevrildi. Tanımlayıcı istatistikler ve hasta verileriyle karşılaştırmalar sunuldu.

Bulgular: Dörtyüz olgunun hastaneye ve Sosyal Güvenlik Kurumu'na ortalama maliyeti sırasıyla 268 ve 309 dolardı. En yüksek maliyet klinik girişim (% 49.84 ve 55.33), en düşük maliyet (% 0.43 ve 0.55) medikal malzemeyle ilgiliydi. Kan pH'sı, HbA1c, tek ebeveyni olmak ve hastanede yatış süresi maliyeti anlamlı olarak etkilemekteydi ($p<0.05$).

Sonuç: Sosyal riski yüksek olan ailelere yönelik sosyal koruma mekanizmalarının sıkı takip edilmesi ile sosyal risklerden kaynaklı maliyet artışları azaltılabilir. Ayrıca pH ve HbA1c düzeyini etkileyen medikal risklerin sıkı takip edilmesinde fayda vardır. Türkiye'de çocuk T1D inin yatarak tedavisi ile ilgili ilk yayın olması nedeniyle çalışmanın kaynak dağılımı ve bakım etkinliğine katkı sağlayacağını düşünmekteyiz.

Anahtar Kelimeler: Maliyet, Tip 1 Diyabet, Çocuk, Yatarak Tedavi, Türkiye.

INTRODUCTION

Type 1 diabetes (T1D) is a chronic disease related to permanent damage of pancreatic insulin-secreting cells and affecting mostly children and young adults. According to the National Diabetes Statistics reported by the Centre for Disease Control (CDC), T1D constitutes 5% of all diabetes cases (2). Epidemiological studies reveal an increase in T1D incidence especially among young children (3). The estimated increase rate of T1D incidence is around 3% (4,5). International Diabetes Federation (IDF) reports the overall number of T1D cases between 0-20 years of age as 1.106.500 with yearly 132.600 new cases (6). In the same reference, 25.669 recorded T1D cases in all age groups were reported about Turkey. But this number should be an underestimation since in a paper about all documented T1D cases even under the age of 18 years the number is above 17 000 (7). Some items are paid, partially paid, and not paid at all, according to the Health Practice communiqué on type 1 diabetes. Fully paid; It is insulins and needle tips. Partially paid items are strip, insulin pump and insulin pump set, and reservoir/patch. Non-paid items are the Glucometer, Lancet, continuous glucose measurement sensors, soothing and iPort (23).

The financial cost of diabetes care is a burden with respect to the patient and family as well as to institutions responsible for care and pay-back. In the USA 24.7 million people (approximately 7.6 % of the population and 9.7 % of adults) were diagnosed with diabetes in the year 2017. The corresponding overall cost of diabetes to the nation was 327 billion dollars, 237 billions of this (73 %) were explained by directly diabetes-related health expenses whereas the remaining 90 billion (27 %) were arising from issues like loss of working days because of diabetes, etc. (1).

Regarding this picture the importance of documenting the financial burden of T1D in every aspect is reasonable although there are not sufficient data about this issue in the literature. Especially data related to T1D, the pediatric age group, and Turkey are lacking. In the search records made on DergiPark, Google Scholar, WOS database, and the YOK thesis search site, no study was found on the cost of Type 1 diabetes-related disease of hospitalized patients. We conducted this study to compensate for the gap in this field.

MATERIAL AND METHODS

The present study relies on a retrospective review of hospitalized patients in the pediatric ward of Duzce University Teaching Hospital. Among the 783 patients whose clinical records and social risk assessment were made, those lacking the parameters given in Table 3 and Table 4 were not included in the analysis. Thus, people with missing records were not included in the cost study.

Ethics: The ethical approval for the study was obtained from Duzce University Faculty of Medicine Noninvasive Health Investigations Ethics Committee on 26 March 2018 (No: 2018/53). The application permission for the study was obtained from the Head Chief Physician. Also, permission was obtained from the patients included in the study to determine the social risk. Acted by Research and Publication Ethics.

Case Selection: At the first round hospitalizations with ICD 10 codes E10 were screened by an information technologist (IT) who is hospital staff and has access to the electronic hospital records. Ten years of electronic hospital records (2009-2018) were available. Afterward, the selected records were revised by the pediatric endocrinologist and compared with those cases files in the pediatric endocrinology departments archive. Cases without a confirmed diagnose of T1D or sufficient clinical parameters and that whit a hospitalization duration of fewer than 24 hours (i.e. hospitalized for an extensive yearly check-up) were eliminated.

Documenting of Costs: After determining the eligible hospital stays, another staff IT with access to financial documents collected data about each stay regarding the cost for the hospital and for the Social Security Institution (SSI) separately using SQL code. Costs were grouped into five categories: Laboratory tests, clinical interventions, drugs, medical supplies, and total cost. The cost data were calculated in TL. Results were then converted to US dollars according to the mid-year index published by the Central Bank of Turkey. The aim of the conversion was to facilitate international comparisons by one hand and to fix the finding against inflation effects in the country on the other hand.

Clinical Parameters: Hospitalizations were grouped in five categories according to their reasons: Newly diagnosed T1D, ketoacidosis during follow-up, revision of metabolic control, the institution of insulin pump therapy, and others. Age, sex, plasma glucose, HbA1c, venous pH, socioeconomic condition of the family, parental status (single or not) were personal parameters collected. Socioeconomic variables were collected during direct interviews with families by the same social worker who is part of the pediatric diabetes team. Although these data were available since the year of 2014, they were useful for all cases retrospectively since all cases were still on follow-up.

Statistics: Descriptive statistics and comparisons against patient-specific characteristics are presented. The values for skewness and kurtosis between -2 and +2 are considered acceptable in order to prove normal univariate distribution (19, 20). Since both the variables used in the different analyses and all the variables used in the linear

regression are between the above threshold values, the data are considered to be normally distributed. Analyses of differences between variables were made using a t-test, analyses of group differences using one way ANOVA, and those of factors directly influencing costs using linear regression. In the difference analysis, the arithmetic means, standard deviation, and confidence interval were given, and the evaluation was made.

RESULTS

Almost six out of every ten people (58.3%) are girls. The average age of the patients in the 0 to 19 age group is 11.16. The rate of single-parent people is 21.1%. The 10-14 age group (35.7%) is the most common. The family income of the children is generally low and very low. The reasons for hospitalization are mostly for metabolic regulation and diagnostic purposes (See Table 1).

Table 1. Patient characteristics (n: 400), Turkey, 2009–2018

Females n (%)	233 (58.3)
Age [years, mean (SD)]	10.45 (4.52)
HbA1c [%, mean (SD)]	11.16 (2.76)
pH mean (SD)*	7.27 (0.14)
Glucose at admission [mg/dl, mean (SD)]	342.89 (171.89)
Single parent n (%)**	59 (21.1)
Age groups in years n (%)	
• **0-4**	51(12.75)
• **5-9**	112 (28.00)
• **10-14**	143 (35.75)
• **15-19**	94 (23.50)
Socio-economic level n (%)***	
• **High**	4 (1.4)
• **Medium**	55 (19.6)
• **Low**	124 (44.1)
• **Very low**	98 (34.9)
Reason for hospitalization	
• **Diagnose**	104 (26)
• **Transition to pump**	46 (11.5)
• **Ketoacidosis**	93 (23.3)
• **Metabolic regulation**	147 (36.8)
• **Others**	10 (2.5)

*n: 279 **n: 294 ***n: 281

There were 400 children with T1D cases with a mean age of 10.54 (SD±4.52), 58.3 % of whom were girls. Mean HbA1c at or +/- 2 months prior/after hospitalization in cases already in follow-up was 11.16 (SD±2.76) %. This value is quite high in comparison to the concomitant median value of 8.59 % of the background population (i.e. all documentable cases in our center's follow-up in the year of 2018, n: 316).

Family with a single parent was observed in 20.1 % if the parental status is reported. The socio-economic level of the families was low in 44.1% and very low in 34.9% of cases. That means four out of every five families having children hospitalized for diabetes are facing difficulty in maintaining family needs essential for life! Regarding the reason for hospitalization, four out of ten hospitalizations were to improve metabolic control. Table 1 depicts case characteristics in more detail. Most of the parents (51.1 %) were graduated from gymnasium (60.7 % of mothers and 51.1 % of fathers) whereas higher grades (at least two years of university) were reported 18.7 % and 24 % in mothers and fathers respectively. The question of a number of people in the family was responded by 275 families which revealed a range of 1-11 regarding the number of children. The highest frequencies were observed in the groups of families with 2 and 3 children (40.4 and 32 % respectively).

The mean cost per person for the hospital was $268 and for the Social Security Institution (SSI) $309 between the years 2009-2018, but there was a fluctuation between years. There was a peak in the year of 2014 ($486) and a nadir in 2018 ($134) (Figure 1, Table 2).

Table 2. Costs with regard to the hospital and Social Security Institution (SSI) ($)

Year	PN	Hospital Costs						SSI Costs					
		LT	**I**	**Ph**	**MS**	**HTC**	**H-CPP**	**LT**	**I**	**Ph**	**MS**	**SSI-TC**	**SSI- CPP**
2009	3	477	289	64	0	830	277	477	404	98	0	978	326
2010	2	157	140	23	0	320	160	157	218	37	0	412	206
2011	6	413	433	98	2	946	158	413	657	153	2	1,225	204
2012	28	3.240	5.814	2.008	6	11.068	395	3.240	7.535	2205	6	12.986	464
2013	42	6.121	6.093	756	4	12.974	309	6.121	9.051	977	19	16.169	385
2014	59	10.336	12.422	1.210	99	24.067	408	10.373	16.658	1.450	208	28.688	486
2015	72	11.844	8.238	1.686	115	21.884	304	11.844	12.158	1.900	161	26.064	362
2016	81	7.185	7.887	1.451	107	16.630	205	7.154	9.460	1.591	138	18.342	226
2017	80	4.068	9.898	998	122	15.086	189	4.072	9.977	1.051	135	15.236	190
2018	27	1.166	2.303	104	10	3.582	133	1.166	2.329	111	10	3.616	134
General Sum		45.006	5.3518	8.398	464	107.386		45.017	68.446	9.573	679	123.715	

PN: Patient Number; LT:Laboratory Tests, I:Intervention; Ph:Pharmaceuticals; MS:Medical Supplies; HTC: Hospital Total Cost; H-CPP:Cost Per Person for the Hospital; SSI-TC: SSI Total Cost; SSI- CPP: Cost Per Person for SSI

From the hospital's point of view $134 (49.84 % of the cost) was that of intervention whereas laboratory tests ($113) made up the 41.91 % and pharmaceuticals ($21) 7.82 %. The lowest component of the cost was the item of medical supplies (1$) with a percentage of 0.43. On the other hand, the pay-back system (SSI in our case) paid 55.33 % for intervention and 36.39 percent for laboratory tests. Again, the portion of medical supplies was the smallest (0.55 %). Interventions, for which the SSI paid $171 made up the most important source of the hospital's profit. When we looked at the SSI costs closer, there were statistical differences between groups of sex, age, cause of hospitalization, and diabetes duration. There was a significantly higher cost of being male, 0-4 years old, and have attended for the first diagnosis. In addition, the first five years with diabetes have a relatively higher cost (according to 15-19 years group). We did not find any differences in the total cost regarding socioeconomic differences. (Table 3)

Figure 1. Distribution of mean annual cost of inpatient pediatric T1D management in Turkey between years 2009–2018

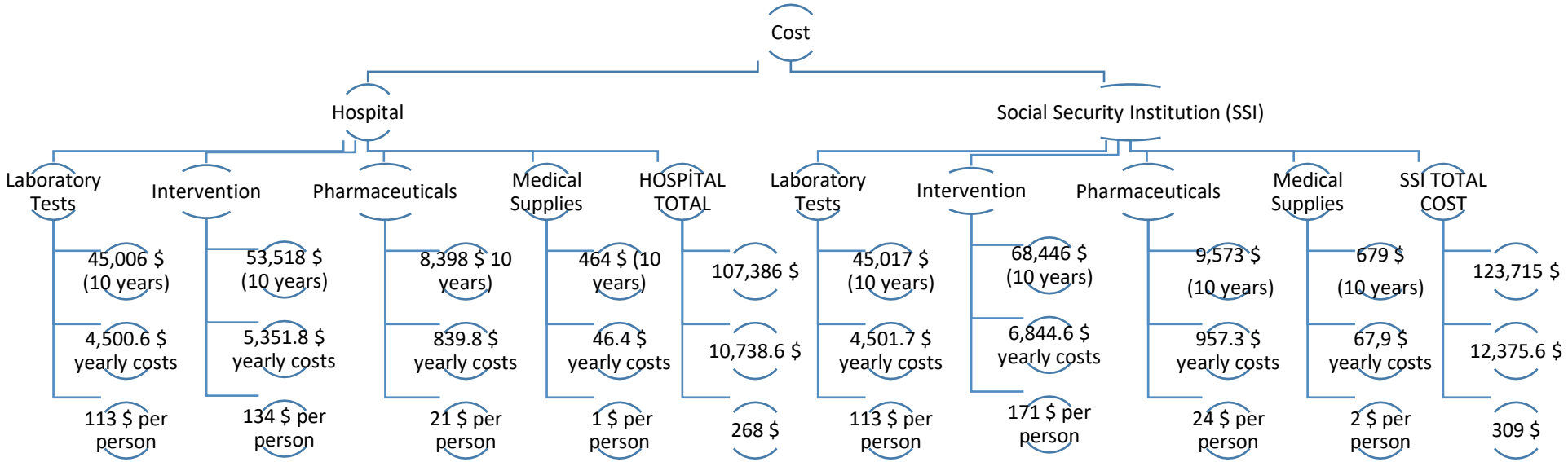

Table 3. Direct costs of type 1 diabetes by patient characteristics with regard to the Social Security Institution (Turkey 2009–2018)

	Mean (95% CI) (US$)	***P*-value**
Sex		0.018
• **Female**	278.33 (251.92- 304.74)	
• **Male**	352.47 (289.36-415.57)	
Age (Years)		**0.032**
• **0–4**	407.17 (262.53-551.80)	
• **5–9**	336.51 (265.41-407.60)	
• **10–14**	272.05 (238.64-305.45)	
• **15–19**	280.38 (245.50-315.26)	
Socio-economic level		0.463
• **High**	243.89 (-86.65-574.43)	
• **Medium**	347.62 (220.21-475.04)	
• **Low**	276.84 (240.44-313.24)	
• **Very low**	305.79 (260.42-351.16)	
Reason for hospitalization		**0.041**
• **Diagnose**	363.63 (292.84-434.41)	
• **Transition to pump**	224.14 (160.45-287.83)	
• **Ketoacidosis**	347.59 (265.63-429.55)	
• **Metabolic regulation**	274.78 (238.74-310.81)	
• **Others**	286.75 (182.43-391.08)	
Diabetes duration		**0.000**
• **<5**	312.44 (265.57-359.32)	
• **≥ 5-<10**	304.86 (272.07-337.65)	
• **≥ 10-<15**	238.22 (185.69-290.74)	
• **≥ 15**	1064.76 (-1518.14-3647.66)	

Regression is the study of the relationships between variables. Regression is a statistical method that investigates the possibility of estimating the value of parameters that establish a relationship between dependent and independent variables (21). The assumptions of the multiple linear regression model are as follows (22): Normal distribution, no autocorrelation, and no or little multicollinearity between independent variables. Linear regression analyses were made regarding both hospital and SSI costs. Total cost, which was the dependent variable was significantly influenced by the independent variables of HbA1c, and number of days in intensive care unit. Independent variables such as gender, age, first blood glucose, number of family members, a distance of residence from the hospital in kilometers, being in the emergency department for the first night of the hospital stay, number of days in intensive care unit and number of repeated hospitalizations in the same center were not found to significantly influence the total cost. These two models explained the variance in costs as 58,8% (hospital costs) and 56,2% (SSI costs) respectively. (Table 4). According to the results of autocorrelation and collinearity analysis, the results of the model can be trusted.

DISCUSSION

There are few studies focusing on T1D, especially in children. In Turkey, even any cost data about diabetes, in general, are very scarce. For example, none of 182 theses on the website of the Turkish Council of Higher Education about T1D were related to costs, as well as none of those among several papers in the database Dergipark, which comprises of periodicals in the Turkish language were related to inpatient pediatric diabetes cost (8, 9). The unique one we could find was about 211 diabetic cases, 36 from which were T1D (10). The present study is not just about the cost analysis of 400 T1D cases, moreover, it deals with a better-defined series, i.e. hospitalized T1D children and adolescents.

Turkey's National Diabetes Program (2015-2020) reports a lack of studies about T1D incidence in Turkey (11). On the other hand, there are two studies about T1D incidence under the age of 18 years in Turkey which reveal similar findings, i.e. 18 190 and 17 175 total cases and incidence around 10/100000/year (6,7). But as mentioned above data about costs of diabetes management are lacking.

According to the study of Keskek et al (10), which is about hospital stays of T1D and T2D diabetic people 54.6±16.6 years of age, the average cost of treatment was calculated as $607.4 (sum of costs of services, drugs, and equipment) which is higher than that in our study ($309). Because costs of Type I and Type II diabetes are given in total we could not compare. In this study, the cost of Type I diabetes is not given directly.

Several existing studies are reporting diabetes costs without separating T1D and T2D.

.

Table 4. Parameters affecting total cost

	With regard to the hospital				With regard to the Social Security Institution			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
Sex	96.99808	88.08192	1.101226	0.2765	101.8504	89.89695	1.132968	0.2631
Age	-5.495098	11.02143	-0.498583	0.6204	-5.78813	11.24854	-0.514567	0.6093
PH	-48.07541	42.17129	-1.140003	0.2602	-38.5965	43.04027	-0.896754	0.3745
Glucose	38.5355	20.40018	1.888979	0.0652	35.10055	20.82055	1.685861	0.0986
HbA1c	290.1316	108.1001	2.683915	0.0101	291.1615	110.3276	2.639062	0.0113
Single parent	-76.43895	43.62546	-1.752164	0.0864	-81.7807	44.52442	-1.836762	0.0727
Number of persons in the family	-1.434815	0.897441	-1.598784	0.1167	-1.73182	0.915934	-1.890769	0.065
Distance to the hospital (km)	-16.5861	105.7421	-0.156854	0.876	-2.16787	107.921	-0.020088	0.9841
To have the first care in emergency	-170.0193	233.9485	-0.726738	0.4711	-167.193	238.7693	-0.700229	0.4873
Number of days in intensive care unit	76.17033	12.22818	6.229081	0.000	73.66704	12.48016	5.902733	0.000
Number of days in the ward	160.8325	114.6908	1.402313	0.1675	200.7163	117.0542	1.71473	0.0931
R-squared	0.588626	Adjusted R-squared	0.499196		R-squared	0.562596	Adjusted R-squared	0.467508
	Heteroskedasticity Test: Breusch-Pagan-Godfrey				Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.343193	Prob. F(10.46)		0.237	F-statistic	1.222966	Prob. F(10.46)	0.3021
	Breusch-Godfrey Serial Correlation LM Test:				Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.343193	Prob. F(10.46)		0.237	F-statistic	0.543699	Prob. F(2.44)	0.5844

The cost of T1D/person is variating from country to country. African countries Tanzania (1992-$287), Sudan (1995-$283), Somali ($357), and Burkina Faso ($185) represent the lowest (12) whereas USA and European countries the highest extremes in the spectrum (13). This might have various explanations. One of them appears to be the opportunity of the private services to determine the fees of health services in developed countries with a functioning free-market economy. The costs for this study ($ 268 and $ 309) are similar to those in countries such as Sudan, Somalia, Burkina Faso, and Tanzania. It can be said that the reason is that the prices determined in the Health Application Communiqué are set very low.

Diabetes cost/person was reported as $4,730 in a study from Texas-USA and in another one from England £3,224 (14,15). A study from the USA about newly diagnosed pediatric T1D cases reported the yearly total cost of diabetes as $12,332 if hospitalized initially and $5,053 if not, while pediatric endocrinology care cost $4,080 and $3,904 for the same groups respectively (16). Gray and Fenn (17) stated that the cost per capita in the US was $2,042. In this study, the cost per person was determined as $ 269 for the hospital and $ 309 for the social security institution. Tariffs used in health services in Turkey do not show the actual costs.

Therefore, when compared with other countries, the costs found are lower than in other countries.There is a specific situation in Turkey about health service costs. The costs announced in the Health Application Communiqué (HAC), which is the main determinant of officially covered health costs in Turkey remained stable for 11 years whereas US dollars gained considerable value against Turkish Lira during this period. This explains the relatively lower cost of health expenses in the country. Therefore the costs determined in the present study don't reflect the real market prices. The financial gap is compensated partly by the patient's own budget and partly by the hospital's income. In addition, the corresponding prices when supplied by private hospitals are many times more. The same condition explains the yearly decrease in the cost of dollars in our study. Despite the decrease of the expenses based on dollars, real expenses based on Turkish Lira are increasing to some extent due to the increase in patient numbers.

The financial burden of diabetes is expected to increase due to an increase in its prevalence. Development of more sophisticated and expensive therapeutic strategies might increase the cost per person on one hand, but in the long run, they might have an opposite effect, i.e. a decrease in the global cost for the society due to decreased complications and days out of work.

Limitations: This study is about inpatient pediatric T1D costs in a public health center. Thus the situation in private care or that during outpatient management, expenses of daily insulin as well as monitoring, the cost of adult T1D cases, medical supplies which are not covered by the insurance and the remaining indirect costs of T1D, namely transportation, working day losses, etc. are lacking. Moreover, the same items in our study should be

checked on a more extensive basis, for example in multicenter studies in different regions with different facilities.

CONCLUSION

Despite its limitations, this study offers the first data about pediatric diabetes care in Turkey. The parties concerned should be motivated to perform studies designed to highlight all the above-mentioned aspects of diabetes cost and how to structure diabetes care to be the most cost-effective and successful in reaching metabolic targets. Governments have to develop strategies such as social interactions aiming for psychosocial support and education to prevent complications and minimize medical interventions. Empowerment of primary care or empowerment of tertiary care via satellite social facilities & staff are realistic strategies as well. Studies are depicting the positive effect of structured diabetes management models as well (18)

In future studies, it would be beneficial to study according to other cost perspectives (patient, social, and lifetime cost perspectives). Also, the costs of outpatient clinic patients should be calculated. Finally, a cost study should be conducted for out-of-pocket health expenditures that are not covered by the social security institution and made by families. Besides, cost studies should be done multi-center. For the centers that are successful according to the multi-center cost results, a reward system should be developed in the reimbursement system.

REFERENCES

1. American Diabetes Association. Economic costs of diabetes in the US in 2017. Diabetes care. 2018;41(5):917-928.
2. Centers for Disease Control and Prevention. [Internet]. National diabetes statistics report, 2017. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2017. [cited 2020 Jul 20] Available from: https://dev.diabetes.org/sites/default/files/2019-06/cdc-statistics-report-2017.pdf
3. DIAMOND Project Group. Incidence and trends of childhood Type 1 diabetes worldwide 1990–1999. Diabet. Med.. 2006;23:857-66.
4. Stipančić G, La Grasta Sabolić L, Pozgaj Sepec M, Radica A, Skrabić V, Severinski S, Kujundzić Tiljak M. Regional differences in incidence and clinical presentation of type 1 diabetes in children aged under 15 years in Croatia. Croat Med J. 2012;53:141-8.
5. Patterson CC, Dahlquist GG, Gyürüs E, Green A, Soltész G and EURODIAB Study Group. Incidence trends for childhood type 1 diabetes in Europe during 1989–2003 and predicted new cases 2005–20: a multicentre prospective registration study. The Lancet. 2009;373:2027-33.
6. International Diabetes Federation [Internet]. IDF Diabetes Atlas Country Report. 8th ed. Brussels: 2017. Available from: https://www.idf.org/e-library/epidemiology-research/diabetes-atlas/134-idf-diabetes-atlas-8th-edition.html
7. Yeşilkaya E, Cinaz P, Andıran N, Bideci A, Hatun Ş, Sarı E et al. First report on the nationwide incidence and prevalence of Type 1 diabetes among children in Turkey. Diabet. Med. 2017;34:405-10.
8. Yüksek Öğretim Kurulu Başkanlığı. [Internet]. Tez Merkezi. [cited 2020 July 19] Available from: https://tez.yok.gov.tr/UlusalTezMerkezi
9. https://dergipark.org.tr/tr/search?q=title%3A+%22cost+AND+diabetes+AND+Turkey%22&section=articles
10. Keskek SO, Kirim S, Yanmaz N, Keskek NS, Ortoglu G, Canataroglu A. Direct medical cost of type 1 and type 2 diabetes in Turkey. Int J Diabetes Dev Ctries. 2014;34:77–81
11. World Health Organization Türkiye Diyabet Programı 2015-2020.; [Internet]. 2014. [cited 2020 July 19] Available from: https://extranet.who.int/ncdccs/Data/TUR_D1_T%C3%BCrkiye%20Diyabet%20Program%C4%B1%202015-2020.pdf
12. Mapa-Tassou C, Katte JC, Maadjhou CM, Mbanya JC. Economic Impact of Diabetes in Africa. Curr. Diab. Rep.. 2019;19:5.
13. Cobas RA, Ferraz MB, Matheus ASDM, Tannus LRM, Negrato CA, Araujo LAD et al. The cost of type 1 diabetes: a nationwide multicentre study in Brazil. Bull. World Health Organ.. 2013;91:434-40.
14. Ying AK, Lairson DR, Giardino AP, Bondy ML, Zaheer I, Haymond MW, Heptulla RA. Predictors of direct costs of diabetes care in pediatric patients with type 1 diabetes. Pediatr Diabetes. 2011;12:177-82.
15. Currie CJ, Poole CD, Woehl A, Morgan CL, Cawley S, Rousculp MD et al. The financial costs of healthcare treatment for people with Type 1 or Type 2 diabetes in the UK with particular reference to differing severity of peripheral neuropathy. Diabet. Med.. 2007;24:187-94.
16. Jasinski CF, Rodriguez-Monguio R, Tonyushkina K, Allen H. Healthcare cost of type 1 diabetes mellitus in new-onset children in a hospital compared to an outpatient setting. BMC Pediatr.. 2013;13:55.
17. Gray AM, Fenn P. The cost of insulin-dependent diabetes mellitus in England and Wales. Diabet. Med.. 1995;12:1068-76.

18. Weinger K, Beverly EA, Lee Y, Sitnokov L, Ganda OP, Caballero AE. The effect of a structured behavioral intervention on poorly controlled diabetes: a randomized controlled trial. Arch Intern Med. 2011;171:1990-9.
19. George, D., & Mallery, M. SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update (10a ed.) Boston: Pearson. 2010
20. Gravetter, F., & Wallnau, L. Essentials of statistics for the behavioral sciences (8th ed.). Belmont, CA: Wadsworth. 2014.
21. Yavuz, S. Hataları Ardışık Bağımlı (Otokorelasyonlu) Olan Regresyon Modellerinin Tahmin Edilmesi. Ataturk University J of Eco.& Adm. Sci.. 2009. 23(3).
22. Kalaycı Ş. SPSS Uygulamalı Çok Değişkenli İstatistik Teknikleri, Asil Yayınları, Ankara. 2006.
23. Sağlık Uygulama Tebliği, Sosyal Güvenlik Kurumu, [Internet]. [cited 2020 July 19] Available from https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=17229&MevzuatTur=9&MevzuatTertip=5