

Cost Analysis of Private Hemodialysis Centers in Turkey

Türkiye’de Özel Hemodiyaliz Merkezlerinin Maliyet Analizi

ABSTRACT

Chronic kidney disease is a worldwide public health problem. There is a continuing increase in the prevalence of patients on renal replacement therapies which causes an enormous economic burden to the healthcare system. Center hemodialysis is the most common type of renal replacement therapy in patients with end-stage renal disease. The aim of this study was to assess the cost of hemodialysis in private hemodialysis centers in Turkey. The study included a total of 296 centers with patient numbers between 51 and 150. The total number of patients treated in these centers was 26,659. The mean cost per hemodialysis session was calculated as 163.5 TL whereas the prices reimbursed by the Social Security Institution was 145 TL per session. This gap has the potential to cause serious problems considering the continuing rise in the number of hemodialysis patients. The healthcare authorities should search for solutions to decrease the expenses and an optimal price for reimbursement should be determined.

KEY WORDS: Hemodialysis, Center, Cost analysis

ÖZ

Kronik böbrek hastalığı tüm dünyada önemli bir halk sağlığı sorunudur. Renal replasman tedavisi gören hastaların prevalansı giderek artmakta ve bu durum sağlık sistemlerine ciddi bir ekonomik yük getirmektedir. Merkez hemodiyalizi, son dönem böbrek yetersizliği olan hastalarda en sık uygulanan renal replasman tedavisi yöntemidir. Bu çalışmanın amacı, Türkiye’de özel hemodiyaliz merkezlerindeki diyaliz maliyet analizinin yapılmasıdır. Bu amaçla, hasta sayısı 51 ile 150 arasında değişen toplam 296 özel merkez çalışmaya alınmıştır. Bu merkezlerde tedavi edilen toplam 26,659 hasta bulunmaktaydı. Yapılan analiz sonucunda seans başına ortalama maliyet 163,5 TL olarak hesaplanmıştır. Buna karşılık Sosyal Güvenlik Kurumu’nun seans başına geri ödemesi 145 TL’dir. Hemodiyaliz hastalarının sayılarının giderek artmakta olduğu gözönüne alınacak olursa, bu farklılık önemli sorunlara yol açabilir. Sağlık hizmeti veren otoriteler hemodiyaliz maliyetini azaltmak için çözümler bulmalı ve en uygun geri ödeme miktarı belirlenmelidir.

ANAHTAR SÖZCÜKLER: Hemodiyaliz, Merkez, Maliyet analizi

INTRODUCTION

Chronic kidney disease (CKD) is an important public health problem and its prevalence is increasing worldwide (1). The incidence and prevalence of renal replacement therapy (RRT) for patients with end-stage renal disease (ESRD) in Turkey have increased during the past decades (2,3).

The increase in the number of ESRD cases over the years may be considered

an indication that the treatment of this disease will be an important item on the agendas of the health policy makers in the near future. According to the Turkish Society of Nephrology (TSN) records, the point prevalence of ESRD requiring renal replacement therapy in Turkey was 819 per million population in 2009 while this figure was determined as 853 in 2010 (these figures includes child patients) (4,5). The incidence of ESRD shows a similar rise over the

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years. Incidence figures have been reported as 144 per million population in 1998, 188 in 2008, 197 in 2009, and 264 in 2010, respectively (4,5). This rising trend is expected to continue in the coming years, particularly due to the aging of the population and the increase in the occurrence of diabetes which is one of the most important underlying causes of ESRD.

An important majority of the ESRD patients in Turkey are treated by hemodialysis, particularly due to the problems faced in organ transplantation. The fact that hemodialysis treatment in Turkey is mainly conducted in hemodialysis centers has resulted in an increase in the number of both public and privately owned centers (6,7) (Table I). As shown in Table I, hemodialysis treatment is provided predominantly by the private sector. The analysis of the period between 1996 and 2011 shows that the ratio of the patients treated in the Ministry of Health institutions to the total number of hemodialysis patients has dropped from 71% in 1996 to 30% in 2011, while the ratio of the patients treated in the private sector has gone up from 29% in 1996 to 70% in 2011 (Table I).

Considering that hemodialysis treatment is predominantly financed by public funds, it is possible to say that the sectoral division between the service provider and the service operator is remarkable for this type of treatment compared to other types of treatments. The increase in the number of treated patients and hemodialysis machines has naturally led to an increase in the spending for this type of treatment. Hemodialysis expenditures in Turkey are covered by the public and the Social Security Institution (SSI) is the major financier of the services. Social Security Institution determines the principles of hemodialysis treatment as well as methods and amounts of reimbursement. These are published through Health Implementation Communiqué (HIC) annually or revised from time to time during implementation. In 2011, as in 2010, HIC set forth the reimbursement price for hemodialysis treatment as 145 TL per treatment.

As explained above, demand for hemodialysis treatment continues to increase every year and this increase in demand is mainly met by the private sector centers. As such, private sector is a very important and key partner in provision of these services. The real cost of these services have long been discussed in different spheres of the health care system. The private sector complains that the reimbursement price set by the SSI is not in line with the real cost of these services to the dialysis centers and asks for an increase in order to survive and sustain the quality of the services provided to the patients. The SSI, on the other hand, consistent with the cost containment approaches adopted in recent years in almost all segments of the health care system, have not responded positively to this demand so far. Costing studies in the Turkish health care system is rare and considering the evidence based policy making approaches and the need to justify the reimbursement price increases as mentioned above, their possible contribution to the health care system is

invaluable. Hence, the purpose of this study is to determine the cost per treatment in private hemodialysis centers.

MATERIAL and METHODS

The project covers private hemodialysis centers. According to 2011 data, there are 871 centers that provide hemodialysis services in Turkey. Among these centers, 44% of them are privately-owned providing healthcare services to 70% of the patients. The study focuses around a total of 296 centers with patients between 51 and 150, and the total number of patients treated in these centers is 26,659. Table II shows the distribution of centers based on the number of patients. Hemodialysis centers with patients less than 50 or more than 150 were excluded from the study due to the fact that they might have affected the average cost. Because the data of the centers to be analyzed had to be exact in order for the study to achieve its objective, cost analysis was conducted on 70 hemodialysis centers audited independently by international audit companies.

Table III shows the number of patients and treatments in the centers that are part of this study. This study is based on the previously conducted cost analysis study with the objective of calculating the unit costs per treatment in the private hemodialysis centers operating in Turkey, using the 2009 and 2010 data (9,10). In this study, the data of the year 2011 have been added to the previous study.

Being informed about the cost of healthcare services is one of the prerequisites of determining evidence-based healthcare policies. The important point to be emphasized here is that cost data are country-specific and cost calculations valid for one country may not be applicable in another country. Input costs and treatment methods applied are the two main reasons which may vary from one country to another. In this study, a cost system has been established to determine the unit cost per treatment of hemodialysis specific to Turkey and a cost table has been created to perform cost calculations.

Establishing a Costing System

In the costing system, only the production costs are charged to the costs of the produced services; on the other hand period expenses are reflected directly on the profit and loss statements. Production of service expenses are made up of fixed and variable costs. Variable production costs are costs that change in line with production volume and that do not arise when there is no production. Direct raw material and supplies, most of direct labor and some general production expenses such as power consumption, equipment spare parts are such costs. Fixed production costs are costs that are not affected by the production volume; in other words they are costs, the total of which would remain the same regardless of changes in production quantities. Many items of the general production costs (i.e. depreciation, lease, property and vehicle taxes and insurance premiums, wages of technical staff, etc.) and sometimes direct labor costs

Table I: The growth in the number of public and private hemodialysis centers, machines and patients in Turkey.

Years	Institution	Centers		Machines		Patients	
		Number	%	Number	%	Number	%
1996	Public	152	76	1.616	71	6.701	71
	Private	48	24	671	29	2.768	29
	Total	200	100	2.287	100	9.469	100
1997	Public	170	73	1.815	64	6.737	61
	Private	64	27	1.042	36	4.269	39
	Total	234	100	2.857	100	11.006	100
1998	Public	193	70	1.990	63	7.754	61
	Private	82	30	1.188	37	5.037	39
	Total	275	100	3.178	100	12.791	100
1999	Public	211	66	2.186	59	8.209	54
	Private	107	34	1.537	41	7.034	46
	Total	318	100	3.723	100	15.243	100
2000	Public	225	65	2.532	55	8.877	49
	Private	123	35	2.066	45	9.186	51
	Total	348	100	4.598	100	18.063	100
2001	Public	256	65	3.045	59	10.827	52
	Private	136	35	2.111	41	10.092	48
	Total	392	100	5.156	100	20.919	100
2002	Public	278	63	3.198	56	11.168	48
	Private	166	37	2.487	44	12.098	52
	Total	444	100	5.685	100	23.266	100
2003	Public	291	62	3.433	54	12.172	46
	Private	178	38	2.980	46	14.535	54
	Total	469	100	6.413	100	26.707	100
2004	Public	309	60	3.768	50	12.721	43
	Private	209	40	3.750	50	17.054	57
	Total	518	100	7.518	100	29.775	100
2005	Public	339	59	4.030	47	12.796	38
	Private	238	41	4.553	53	20.447	62
	Total	577	100	8.583	100	33.243	100
2006	Public	373	55	4.479	43	12.906	34
	Private	306	45	5.824	57	24.569	66
	Total	679	100	10.303	100	37.475	100
2007	Public	438	55	4.835	40	12.592	31
	Private	354	45	7.286	60	28.289	69
	Total	792	100	12.121	100	40.881	100
2008	Public	437	52	5.164	37	13.003	29
	Private	400	48	8.715	63	31.657	71
	Total	837	100	13.879	100	44.660	100
2009	Public	444	52	5.277	36	13.805	29
	Private	410	48	9.226	64	34.628	71
	Total	854	100	14.503	100	48.433	100
2010	Public	451	54	5.384	36	14.686	29
	Private	390	46	9.448	64	35.310	71
	Total	841	100	14.832	100	49.996	100
2011	Public	486	56	5.778	37	15.193	30
	Private	385	44	9.664	63	35.816	70
	Total	871	100	15.442	100	51.009	100

Adapted from Journal of Dialysis Statistics 2011 (8).

Table II: Dialysis centers according to number of patients in 2011.

Number of patients	Dialysis centers					
	Public and private		Private		Private centers that are part of the study	
	Number	%	Number	%	Number	%
0-50	424	50.1	51	13.2		
51-79	171	20.2	114	29.6	15	21.4
80-100	110	13.0	91	23.6	25	35.7
101-150	101	11.9	91	23.6	30	42.9
151 +	41	4.8	38	9.9		
Total	847	100	385	100	70	100

Adapted from Journal of Dialysis Statistics 2011.

are among fixed production costs. No matter which method is applied, variable production costs are definitely charged to the cost of the service produced. The way that the fixed production costs are charged may vary depending on the preferred method (11).

The costing system in this study has been established using *full costing method* based on the scope of the cost, *actual costing method* based on the timing of the cost, and *process costing method* based on the way the cost is determined (type of service production).

There are three methods of scope-based costing: full costing, variable costing, and normal costing. In the full costing method, all production costs both variable and fixed incurred in a specific period are charged to the production performed in that period. In short, all the service production costs of a period are charged in full to the service unit.

Service costs can be determined before or after production. There are three methods of costing, namely actual, estimated and standard costing that indicate the time of costing. Actual costing method has been used in this study. In actual costing method, actual costs incurred after production are taken into account. This method is also known as historical costing or backdated costing.

Charging the expenses to the manufactured products requires different approaches under different production conditions. These approaches can be explained with two methods which are order cost system and process costing. In this study, process costing has been used. Assuming that the whole service product utilizes the input equally, the method involves calculating unit service cost by dividing total cost by the produced service units.

Creating the Cost Chart

All enterprises in Turkey that keep accounting records on a balance sheet basis are required to comply with the "General

Communique on Accounting System Application" issued by the Ministry of Finance since the beginning of 1994. Cost calculations in this general communique which regulates the basic concepts and principles of accounting, financial statements, and Uniform Chart of Accounts make up class 7 of the Uniform Chart of Accounts (main cost classes 700-799). In this class, costs of services produced can be recorded using one of the two alternatives, 7/A or 7/B. In a rational recording system, the main alternative would be 7/A, in which cost account groups are classified as follows:

0. Direct raw materials and supplies
1. Wages and expenses of workers
2. Salaries and expenses of personnel (civil servants)
3. External utilities and services obtained
4. Miscellaneous expenses
5. Taxes, duties and fees
6. Depreciation and depletion expenses
7. Financial expenses

In this study, initially a cost table was created in Microsoft Excel program. The first column of this table included expense types, account codes and names while the first line included the hemodialysis centers (expense locations) that were part of the study. Cost account groups of 7/A alternative mentioned above were used while determining the expense types. Salaries and expenses of personnel (civil servants) classified in the third group were not included since such personnel are not employed by the private companies. Subgroups of expense types were created under the account groups. The expenses of the hemodialysis centers were taken from the yearend trial balance and entered into the Microsoft Access Program; then they were matched with the groups according to expense types and their totals were transferred to the Excel cost table. Total expenses and the amounts of these expenses based on their types

Table III: Number of patients and treatments in hemodialysis centers that are part of the study (2011).

Dialysis center	Number of patients	Number of treatments	Dialysis center	Number of patients	Number of treatments
1	55	7.861	36	99	14.859
2	82	12.642	37	124	16.568
3	79	13.436	38	90	13.537
4	99	16.145	39	134	20.261
5	50	8.778	40	87	14.752
6	90	13.313	41	78	12.360
7	126	17.307	42	83	11.840
8	106	16.799	43	125	17.909
9	112	17.180	44	58	9.331
10	116	16.554	45	150	17.997
11	68	11.279	46	88	11.023
12	148	21.185	47	103	13.549
13	127	18.002	48	89	14.040
14	61	10.104	49	101	15.809
15	90	14.487	50	88	15.490
16	77	11.618	51	69	11.748
17	116	17.284	52	135	19.758
18	113	17.823	53	86	13.989
19	99	13.289	54	100	14.543
20	83	13.305	55	88	12.323
21	88	13.131	56	126	18.368
22	112	15.480	57	85	12.913
23	79	11.874	58	77	11.596
24	96	13.178	59	115	17.775
25	99	13.927	60	126	18.721
26	130	22.238	61	135	18.057
27	69	10.961	62	95	14.834
28	139	19.403	63	119	14.056
29	145	18.932	64	125	21.634
30	83	12.186	65-66*	176	25.658
31	76	11.957	67	134	16.219
32	125	18.178	68	145	17.945
33	92	12.180	69	87	15.671
34	115	15.166	70	76	13.288
35	76	11.276			
Total				7.017	1.036.879

*The financial records of these hemodialysis centers that are part of the study have been consolidated. As the expenses of these centers cannot be broken down, patient and treatment information have been provided as total.

Table IV: Statistical data of hemodialysis centers (2011).

Dialysis center	Number of patients	Number of machines	Number of treatments	Number of staff	Average number of treatments per staff (yearly)	Average number of treatments per machine (yearly)	Average number of treatments per patient (weekly)
1	55	20	7.861	16	491.31	393.05	2.75
2	82	20	12.642	18	702.33	632.10	2.96
3	79	20	13.436	16	839.75	671.80	3.27
4	99	29	16.145	21	768.81	556.72	3.14
5	50	25	8.778	22	399.00	351.12	3.38
6	90	30	13.313	21	633.95	443.77	2.84
7	126	39	17.307	30	576.90	443.77	2.64
8	106	30	16.799	25	671.96	559.97	3.05
9	112	30	17.180	28	613.57	572.67	2.95
10	116	25	16.554	23	719.74	662.16	2.74
11	68	20	11.279	18	626.61	563.95	3.19
12	148	38	21.185	30	706.17	557.50	2.75
13	127	50	18.002	23	782.70	360.04	2.73
14	61	20	10.104	17	594.35	505.20	3.19
15	90	24	14.487	21	689.86	603.63	3.10
16	77	24	11.618	20	580.90	484.08	2.90
17	116	25	17.284	26	664.77	691.36	2.87
18	113	32	17.823	31	574.94	556.97	3.03
19	99	23	13.289	21	632.81	577.78	2.58
20	83	28	13.305	17	782.65	475.18	3.08
21	88	25	13.131	20	656.55	525.24	2.87
22	112	25	15.480	21	737.14	619.20	2.66
23	79	25	11.874	20	593.70	474.96	2.89
24	96	25	13.178	21	627.52	527.12	2.64
25	99	25	13.927	26	535.65	557.08	2.71
26	130	39	22.238	33	673.88	570.21	3.29
27	69	19	10.961	19	576.89	576.89	3.05
28	139	25	19.403	27	718.63	776.12	2.68
29	145	30	18.932	30	631.07	631.07	2.51
30	83	20	12.186	17	716.82	609.30	2.82
31	76	25	11.957	21	569.38	478.28	3.03
32	125	30	18.178	31	586.39	605.93	2.80
33	92	25	12.180	19	641.05	487.20	2.55
34	115	20	15.166	24	631.92	758.30	2.54
35	76	20	11.276	20	563.80	563.80	2.85
36	99	28	14.859	25	594.36	530.68	2.89
37	124	25	16.568	19	872.00	662.72	2.57
38	90	30	13.537	22	615.32	451.23	2.89
39	134	34	20.261	30	675.37	595.91	2.91
40	87	25	14.752	24	614.67	590.08	3.26
41	78	20	12.360	22	561.82	618.00	3.05
42	83	19	11.840	21	563.81	623.16	2.74
43	125	35	17.909	34	526.74	511.69	2.76
44	58	20	9.331	16	583.19	466.55	3.09
45	150	28	17.997	28	642.75	642.75	2.31
46	88	12	11.023	27	408.26	918.58	2.41
47	103	25	13.549	21	645.19	541.96	2.53
48	89	25	14.040	25	561.60	561.60	3.03

Table IV: (continued). Statistical data of hemodialysis centers (2011).

Dialysis center	Number of patients	Number of machines	Number of treatments	Number of staff	Average number of treatments per staff (yearly)	Average number of treatments per machine (yearly)	Average number of treatments per patient (weekly)
50	88	28	15.490	25	619.60	553.21	3.39
51	69	20	11.748	21	559.43	587.40	3.27
52	135	30	19.758	45	439.07	658.60	2.81
53	86	25	13.989	21	666.14	559.56	3.13
54	100	30	14.543	26	559.35	484.77	2.80
55	88	25	12.323	26	473.96	492.92	2.69
56	126	40	18.368	24	765.33	459.20	2.80
57	85	25	12.913	21	614.90	516.52	2.92
58	77	20	11.596	17	682.12	579.80	2.90
59	115	35	17.775	31	573.39	507.86	2.97
60	126	35	18.721	28	668.61	534.89	2.86
61	135	38	18.057	26	694.50	475.18	2.57
62	95	29	14.834	24	618.08	511.52	3.00
63	119	32	14.056	32	439.25	439.25	2.27
64	125	37	21.634	33	655.58	584.70	3.33
65-66	176	45	25.658	36	712.72	570.18	2.80
67	134	29	16.219	34	477.03	559.28	2.33
68	145	30	17.945	30	598.17	598.17	2.38
69	87	25	15.671	29	540.38	626.84	3.46
70	76	24	13.288	21	632.76	553.67	3.36
Total	7.017	1.888	1.036.879	1.682	616.46	549.19	2.84

Table V: Results of the hemodialysis centers' total expense analyses based on main expense types (TL).

Expense Type	2009	2010	2011	
	Ratio in total expenses (%)		Amount	Ratio in total expenses (%)
	(75 centers)	(70 centers)	(70 centers)	
Direct raw materials and supplies	27.2	26	47.586.253	28.1
Wages and expenses of workers	35.1	36.1	56.256.747	33.2
External utilities and services obtained	17.4	17.5	33.230.747	19.6
Miscellaneous expenses	8.9	8.4	12.851.820	7.6
Taxes, duties and fees	4.2	3.9	6.514.471	3.8
Depreciation and depletion expenses	6	5.9	10.704.025	6.3
Financial expenses	1.3	2.3	2.390.872	1.4
Total expenses	100	100	169.534.935	100

*Year 2009 (Tatar, 2010) and 2010 (Tatar, 2011) data have been taken from the previous cost analysis study.

were calculated. Total expenses of each individual hemodialysis center was divided by the produced service units to arrive at unit cost. Financial records of some of the dialysis centers (DC65-66) in this study are kept in consolidated form. Since the expenses of these centers cannot be broken down, they were entered directly into the cost table.

Data Sources

Data required for the study were obtained from the following sources:

- Statistical records of the hemodialysis centers (Number of patients, treatments, staff, machines)

- Accounting of the hemodialysis centers – 2011 yearend trial balance (detailed)
- Balance sheet (2011 fiscal period)
- Profit and loss statement (2011 fiscal period)

Table VI: Results of the hemodialysis centers' total expense analyses based on main and sub expense types (2011) (TL).

Expense code	Expense type	Amount (2011-TL)	Ratio in total expenses (%)		
			2011	2010	2009
0	Direct raw materials and supplies	47.586.253	28.1	26.2	27.2
	Stationery supplies group	10.105	0.0	0	0.1
	Nutritional, food and other kitchen consumables group	0	0.0	0	0.0
	Medical and laboratory supplies group	38.719.978	81.4	82.1	81.0
	Fuel, fuel additives and oil additives group	3.768.722	7.9	6.9	6.4
	Cleaning equipment group	841.042	1.8	2	2.2
	Clothing and furnishing supplies group	147.300	0.3	0.2	0.3
	Food group	0	0.0	1.2	1.4
	Spare parts group	951.164	2.0	1.6	1.7
	Raw materials group	187.323	0.4	0.5	0.5
	Other consumable supplies group	2.960.621	6.2	5.4	6.4
1	Wages and expenses of workers	56.256.747	33.2	35.9	35.1
	Basic wage	41.798.923	74.3	70.4	71.0
	Supplementary payments	1.241.765	2.2	2.71	2.7
	Overtime	2.812.574	5.0	5.99	6.0
	Social benefits	155.596	0.3	0.4	0.4
	Travel allowances	54.167	0.1	0.07	0.1
	Employer's insurance contribution	8.335.426	14.8	13.16	13.3
	Employer's unemployment premium contribution	140.384	0.2	0.33	0.3
	Severances	1.556.741	2.8	2.58	2.6
	Other wages and expenses	161.171	0.3	4.36	4.4
3	External utilities and services obtained	33.230.747	19.6	17.5	17.4
	Electricity, water, heating expenses	4.034.882	12.1	14.6	14.3
	Communication expenses	448.039	1.3	1.5	2.1
	Maintenance expenses	3.047.834	9.2	8.2	10.7
	Externally obtained medical services expenses	10.629.286	32.0	36.1	33.0
	Externally obtained personnel services	395.216	1.2	0.4	0.9
	Externally obtained services expenses	4.738.278	14.3	15.2	14.7
	Consultancy services expenses	9.937.212	29.9	24	24.2
4	Miscellaneous expenses	12.851.820	7.6	8.3	8.9
	Insurance expenses	200.644	1.6	0.9	1.1
	Marketing and advertising expenses	49.001	0.4	0.6	0.9
	Lease expenses	8.634.015	67.2	61.6	57.7
	Social expenses	174.221	1.4	1.6	1.9
	Educational and cultural expenses	48.760	0.4	0.2	0.1
	Accommodation and travel expenses	267.712	2.1	0.6	0.4
	Legal and notary services expenses	121.555	0.9	0.7	1.0
	Other miscellaneous expenses	3.355.913	26.1	33.8	36.9

Table VI: (Continued). Results of the hemodialysis centers' total expense analyses based on main and sub expense types (2011) (TL).

Expense code	Expense type	Amount (2011-TL)	Ratio in total expenses (%)		
			2011		
5	Taxes, duties and fees	6.514.471	3.8	4	4.2
	Taxes	5.799.551	89.0	97.2	97.6
	Duties	0	0.0	0	0.1
	Fees	511.905	7.9	0.3	0.8
	Late payment charges for taxes, duties and fees	0	0.0	0	0.0
	Other taxes, duties and fees	203.015	3.1	2.4	1.5
6	Depreciation and depletion expenses	10.704.025	6.3	5.9	6.0
	Depreciation of fixed tangible assets	8.159.373	76.2	71.4	73.8
	Depreciation of fixed intangible assets	2.544.652	23.8	27.1	23.8
	Other depreciation and depletion expenses	0	0.0	1.5	2.5
7	Financial expenses	2.390.872	1.4	2.2	1.3
	Other financial expenses	2.390.872	100.0	100.0	100.0
	Total expenses	169.534.935	100.0	100.0	100

*Year 2009 (Tatar. 2010) and 2010 (Tatar. 2011) data have been taken from the previous cost analysis study.

RESULTS

Number of patients, treatments, staff, machines as well as number of treatments per patient, staff and machines in the hemodialysis centers are shown in Table IV. As seen in the table, average weekly number of treatments per patient is 2.84.

Analyses on expense and revenue types in the centers that are part of the study are shown in Table V. Wages and expenses of workers with a share of 33.2%, followed by direct raw materials and supplies with a share of 28.1% stand out as the two major cost groups in the total expenses. Wages and expenses of workers include the wages paid to all employees, social security premiums, social benefits and similar expenses. Healthcare services are labor-intensive services; therefore the share of wages and expenses of workers to be higher than the other cost groups is an expected result. Direct raw materials and supplies include various expenses like stationery, medical supplies, medications, fuel and food. Externally obtained utilities and services include electricity, communication, transportation, maintenance and cleaning services. Expenses like insurance premiums, advertising and marketing expenses, various accommodation and travel allowances are grouped under miscellaneous expenses.

Results of the analyses based on these expense types are shown in detail in Table VI. As may be observed in the table, the highest share in the direct raw materials and expenses group belongs to medical and laboratory supplies subgroup with 81.4% while

basic wages make up the highest share with 74.3% in the wages and expenses of workers group. The major expense subgroup in the externally obtained utilities and services expense type is externally obtained medical services expenses with 32.0%. Lease expenses have the highest share in the miscellaneous expenses group with 67.2%. Direct raw materials and supplies expenses as well as external utilities and services obtained expenses have shown an increase in 2011. The share of direct raw materials and supplies in total expenses ranged between 18.8% and 37.8%, while the general average share of this expense group is 28.1%. Taking into account that the highest share in this group belongs to medical and laboratory supplies, it would be accurate to state that the hemodialysis centers procure these supplies at different prices depending on their buying and negotiation power. The analysis of another expense type, wages and expenses of workers in view of its share in the total expenses shows that it ranged from 21.8% to 48.6%, while the average share of this expense group in total expenses is 33.2%. The third most important group in the expense types is externally obtained utilities and services with a general average share of 19.6% in the total expenses, ranging between 7.6% and 31.9%. The important point that needs to be reiterated is that the expense types as well as their distribution will vary due to specific conditions and different healthcare systems in each country. Assuming that labor, supplies, leases, electricity, water and similar utilities cost the same in all the countries and their share to be equal, and using the cost of services in another country as basis to determine the prices of the same services in

Table VII: Unit cost analyses according to hemodialysis centers (2011) (TL).

Dialysis center	Unit cost per patient	Unit cost per machine	Unit cost per treatment
1	24.754.4	68.074.6	173.2
2	22.909.8	93.930.0	148.6
3	23.751.0	93.816.3	139.6
4	21.104.8	72.047.6	129.4
5	31.529.4	63.058.8	179.6
6	21.237.5	63.712.5	143.6
7	25.149.2	81.251.4	183.1
8	26.703.4	94.352.0	168.5
9	20.533.8	76.659.6	133.9
10	17.528.1	81.330.3	122.8
11	26.260.8	89.286.7	158.3
12	20.675.5	80.525.5	144.4
13	21.448.5	54.479.1	151.3
14	28.725.4	87.612.4	173.4
15	26.734.2	100.253.3	166.1
16	24.517.2	78.659.2	162.5
17	21.538.4	99.938.1	144.6
18	27.744.1	97.971.4	175.9
19	20.379.1	87.718.9	151.8
20	26.214.9	77.708.3	163.5
21	26.313.3	92.622.8	176.3
22	26.322.4	117.924.1	190.4
23	25.619.4	80.957.4	170.5
24	24.643.0	94.628.9	179.5
25	19.558.1	77.450.1	139.0
26	25.490.2	84.967.5	149.0
27	28.155.7	102.249.5	177.2
28	22.689.2	126.151.9	162.5
29	23.637.9	114.249.7	181.0
30	21.902.9	90.896.9	149.2
31	24.940.8	75.820.0	158.5
32	25.043.2	104.346.5	172.2
33	23.702.3	87.224.3	179.0
34	20.854.0	119.910.3	158.1
35	24.301.3	92.345.0	163.8
36	23.754.4	83.988.9	158.3
37	28.430.6	141.015.8	212.8
38	23.507.3	70.521.9	156.3
39	23.769.2	93.678.5	157.2
40	24.920.7	86.723.9	147.0

Table VII: (Continued). Unit cost analyses according to hemodialysis centers (2011) (TL).

Dialysis center	Unit cost per patient	Unit cost per machine	Unit cost per treatment
41	27.409.0	106.895.2	173.0
42	21.664.1	94.637.9	151.9
43	25.108.1	89.671.7	175.2
44	26.088.9	75.657.8	162.2
45	17.550.4	94.020.2	146.3
46	21.200.7	155.472.0	169.3
47	21.365.1	88.024.0	162.4
48	26.482.4	94.277.4	167.9
49	23.898.6	80.458.6	152.7
50	29.239.3	91.894.9	166.1
51	27.387.0	94.485.0	160.9
52	20.561.4	92.526.4	140.5
53	25.842.5	88.898.3	158.9
54	24.656.1	82.186.9	169.5
55	25.729.3	90.567.1	183.7
56	22.808.9	71.848.0	156.5
57	27.558.7	93.699.7	181.4
58	28.486.2	109.671.8	189.2
59	26.892.7	88.361.7	174.0
60	23.771.9	85.578.7	160.0
61	22.691.0	80.612.9	169.6
62	27.662.5	90.618.6	177.2
63	26.303.2	97.815.1	222.7
64	26.937.5	91.005.1	155.6
65-66	23.464.3	91.771.6	161.0
67	23.266.3	107.506.2	192.2
68	20.741.4	100.250.2	167.6
69	32.909.9	114.526.4	182.7
70	25.934.6	82.126.3	148.3

the country would not be an accurate and scientific approach. A very simple example for this would be the fact that while prices of the solutions and medications used in treatment are determined according to free market conditions in some countries, they are regulated by the governments in many others. In this case, the share of medications in the total expenses would cost very differently in one country compared to another. On a similar note, expenses like wages paid for labor and social security premiums should be determined and calculated according to each country's specific conditions.

The results of the unit cost analyses obtained in the study are presented in Table VII. The table shows the studied centers'

unit costs per patient, machine and treatment. The costs vary depending on the geographic location of the centers, rents, personnel costs, patient transportation and other expenses.

Analysis results of the studied centers' average unit costs per patient, machine and treatment are provided in Table VIII in comparison to 2009 and 2010 results. In this study, unit cost per patient has been found as 24,160.6 TL, unit cost per machine as 89,796 TL and unit cost per treatment as 163.5 TL, respectively. Unit cost per treatment displays a rising trend over the years. The reason for the decline of unit treatment cost in 2011 compared to 2010 can be explained by the increase in the number of treatments and to a lesser extent by the decrease in personnel

Table VIII: Results of average unit cost analysis (TL).

Hemodialysis centers	2009	2010	2011
Total expense amount	166.415.560	163.419.945	169.534.935
Total number of patients	7.102	6.861	7.017
Total number of machines	1.818	1.820	1.888
Total number of treatments	1.018.712	996.057	1.036.879
Average unit cost – patient	23.432.2	23.818.7	24.160.6
Average unit cost – machines	91.537.7	89.791.2	89.796
Average unit cost - treatment	163.4	164.1	163.5

*2009 cost analysis has been conducted over 75 centers, 2010 and 2011 for 70 centers, respectively.

Table IX: Average costs per treatment in hemodialysis centers grouped according to number of patients (2011, TL).

Groups based on number of patients	Number of hemodialysis centers in the group	Number of total treatments	Amount of total expenses	Average unit cost per treatment
51-79	15	167.467	27.654.394	165.1
80-100	25	337.053	54.352.529	161.3
101-150	30	532.359	87.528.012	164.4
Total	70	1.036.879	169.534.935	163.5

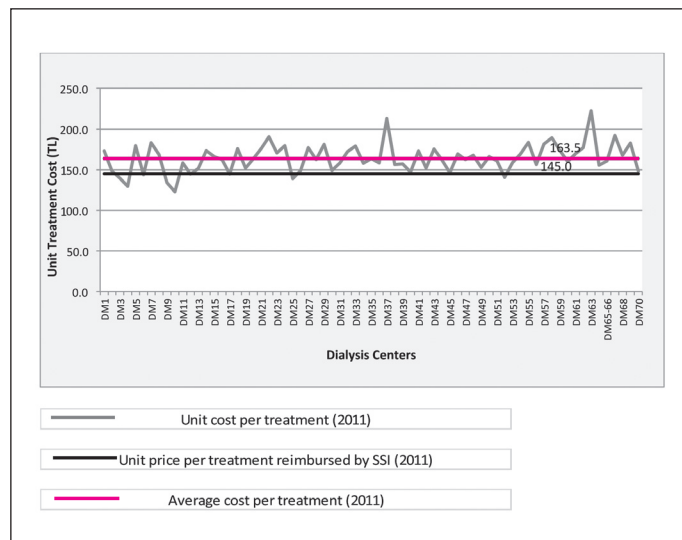


Figure 1: Analysis results for average treatment costs of dialysis centers (2011) (TL).

expenses. Unit cost per patient is an important data especially in terms of developing ESRD-related healthcare policies. Multiplying the existing number of ESRD patients and the number of potential future ESRD patients by this figure would provide insight to the share of hemodialysis treatment in the healthcare expenditure. Unit cost per machine, on the other hand, may pro-

vide information about the costs to be borne, particularly while planning procurement of new hemodialysis machines. The most important type of cost in terms of this study is unit cost per treatment. According to Health Implementation Communiqué, reimbursement amount in 2011 which is also the year that provided the data for this study was 145 TL per treatment. A comparative graph of hemodialysis centers' unit costs per treatment, unit price per treatment reimbursed by SSI and the average unit cost found in this study is shown in Figure 1.

As explained in the scope of the study, hemodialysis centers have been grouped according to the number of patients and only the centers that treat 51-79, 80-100, and 101-150 patients have been included in this study. Table IX shows average costs per treatment in these groups of centers. As the table indicates, average unit cost per treatment is higher in the hemodialysis center groups with the lowest and the highest number of patients compared to the other group.

DISCUSSION

The objective of this study is to determine the cost per treatment in private hemodialysis centers. Hemodialysis centers with 51-150 patients were divided into three groups as part of the study and of the 296 centers that met this criterion, the data of 70 centers whose financial data were accessible have been analyzed. This study is based on the 2009 and 2010 cost analysis study, and conducted by adding the data of 2011.

The present study showed that the average unit cost per treatment is high for centers with low number of patients because of constant expenses. However, unit cost also increases after a certain number of patients (more than 100 in our study) because of the increased expenses, such as increased wages due to increased numbers of personnel and increased expenses of patient transportation.

At the conclusion of the study, average cost per treatment in the centers that took part in the study was found to be 163.5 TL. This figure is higher than the unit price per treatment reimbursed by SSI; as such it is an indication that the centers' earnings are less than their actual costs. The reimbursement of dialysis in Turkey is significantly lower than many other countries. In a study by Vanholder et al. (12) reimbursement of dialysis in seven countries was analyzed. There were important differences between countries, ranging from 689 USD per week (230 USD per session) in United States to 744 USD per week (248 USD per session) in United Kingdom, 745 USD per week (248 USD per session) in Canada, 1364 USD per week (454 USD per session) in France and 1668 USD per week (556 USD per session) in the Netherlands.

The fact that hemodialysis centers are earning less than their actual costs in Turkey may in time lead to a compromise from patient service quality and later result in closing down. A total of 33 privately owned hemodialysis centers have closed down in the last two years while only 8 new ones have been opened. Due to the fact that they are earning less than their costs, private hemodialysis centers choose a number of methods like merging depending on location and physical availability, financing by bank loans, delaying loan payments and freezing doctors' and personnel wages in order to continue providing services. Considering that the main service provider of hemodialysis treatment is the private sector, the decrease in the number of dialysis centers may cause serious problems in terms of patients' access to services.

As emphasized in this manuscript, private sector is an indispensable partner in hemodialysis treatment and plays an important role in providing these services. On the other hand, as a result of the latest health reforms, SSI has acquired a monopsonic power and become the sole buyer of healthcare services in Turkey. Under these circumstances, SSI as the buyer of the services in hemodialysis treatment and private hemodialysis centers as the predominant provider of these services are meeting the requirements and needs of ESRD patients with different interests. Thus, it would be essential for both SSI and private HD centers to determine a unit treatment price based on the service costs of these centers. The unit cost per treatment found in this study is higher than the unit price

per treatment reimbursed by SSI; as such it does not seem likely that private hemodialysis centers, despite all their efforts, will be able to sustain their services at this price level for long.

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