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İNCELEME / REVIEW ARTICLE

Profile of Preventive Dental Care in Turkey With Regard to Topical Fluoridation Implementations

Topikal Flor Uygulamalari İle Türkiye'de Koruyucu Diş Hekimliği Profili

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Abstract

Fluoride applications are very important in preventive oral health services. The aim of this study is to evaluate the national data of topical fluoride applications in Turkey for the effective planning of services related to oral and dental health care. This study includes a retrospective cross-sectional analysis, between the years 2012 and 2014, covering 81 provinces in Turkey. For the study, data were taken from The Ministry of Health Public Hospitals, Oral and Dental Health Centers and Dental Hospitals and data evaluation and status analysis of fluoride applications, classified according to years and regions, were carried out. According to the results, the admission rates per capita were 0.13, 0.19 and 0.20% while the prevalence of fluoride application was 0.97, 2.81 and 2.17% of the overall population for the years 2012, 2013 and 2014, respectively. Of the admissions, 7.7, 14.55 and 11.12% were topically fluoridated for years 2012, 2013 and 2014, respectively. The number of dentists per 100,000 people was 25.30, 26.30 and 28.00, corresponding to years 2012, 2013 and 2014. The number of fluoride applied patients per dentist was 20.14, 90.68 and 63.50 for the years 2012, 2013 and 2014. The fluoride application numbers per dental unit were 81.24 in 2013 and 54.62 in 2014, while the numbers of people per dental unit were 3.674 and 3.425 for the same years. In conclusion, more people could be reached and treatment costs could be decreased by proper planning and the effective use of oral and dental health services.

Keywords: Fluorides, Topical, Dental Health Services, Preventive Dentistry, Turkey

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Özet

Koruyucu ağız sağlığı hizmetlerinde flor uygulamaları çok önemlidir. Bu çalışmanın amacı, ağız ve diş sağlığı ile ilgili hizmetlerin etkin bir şekilde planlanması için Türkiye'deki topikal florür uygulamalarının ulusal verilerini değerlendirmektir. Bu çalışma, 2012-2014 yılları arasında Türkiye'de 81 ili kapsayan retrospektif bir kesitsel analizi içermektedir. Çalışma için Sağlık Bakanlığı Kamu Hastaneleri, Ağız ve Diş Sağlığı Merkezleri ve Diş Hastanelerinden veriler alınmış, florür uygulamalarının yıllara ve bölgelere göre sınıflandırılmış veri değerlendirmesi ve durum analizi yapılmıştır. Sonuçlara göre 2012, 2013 ve 2014 yıllarında kişi başı başvuru oranları sırasıyla% 0,13,% 0,19 ve% 0,20 iken florür uygulaması yaygınlığı toplam nüfusun% 0,97, 2,81 ve% 2,17'sidir. Başvuruların % 7.7, 14.55 ve 11.12'si sırasıyla 2012, 2013 ve 2014 yılları için topikal olarak florlanmıştır. 100.000 kişiye düşen diş hekimi sayısı 2012, 2013 ve 2014 yıllarına karşılık gelen 25,30, 26,30 ve 28,00 olmuştur. Diş hekimi başına florür uygulanan hasta sayısı 2012, 2013 ve 2014 yılları için 20,14, 90,68 ve 63,50 olmuştur. Florür uygulama sayıları Ünite başına düşen kişi sayısı 2013 yılında 81,24, 2014 yılında 54,62 iken aynı yıllar için ünite başına kişi sayısı 3,674 ve 3,425 olmuştur. Sonuç olarak, ağız ve diş sağlığı hizmetlerinin doğru planlanması ve etkin kullanımı ile daha fazla kişiye ulaşılabilir ve tedavi maliyetleri azaltılabilir.

Anahtar Kelimeler: Florür, Topikal, Diş Sağlığı Hizmetleri, Koruyucu Diş Hekimliği, Türkiye

1. Introduction

Planning and revising national health systems requires close scrutiny of those belonging to the developed world as well as national progress priorities (Üstü et al., 2011; Figueras, Menabde & Busse, 2005.). The basic aim of health systems is to optimize the health level and to minimize the health status differences among individuals (Boelen et al., 2002; Hamzaoğlu, 2008). Labor force planning in healthcare encompasses the employment of an adequate number of highly qualified health workers distributed uniformly across a wide field of specializations and with appropriate timing (Hogarth, 1975). Unrealistic or insufficient planning disrupts the system's functioning by decreasing productivity within the system, increasing the costs and causing improper distribution of the resources and this prevents the population to get the desired health services (Üstü et al., 2011).

1.1. Health Indicators

Turkey is among the midscale countries in a ranking of health levels. The neonatal mortality rate is 11.1 per thousand, 23% of the population falls within the 0-14 years age group and 9% are older than 65 years.

The Ministry of Health, a leading participant within the Health Transition Program in Turkey, carries out studies on highly improved, patient oriented, easily reached, non-discriminating health services for health policies to be improved. Being in the preventable disease group, dental caries and periodontal diseases negatively affect both dental and general health. Unfortunately, 98% of the time, oral and dental health services are provided as restorative treatments in our country, whereas in countries where low-cost preventive dentistry is available, general health status improves and health-related expenditure decreases gradually. Despite the fact that no rational, fully effective health service planning with national oral and dental health programs have been put into place in our country, new implementations promise new resources and more flexibility (Öztek, et al., 2001).

The resources spent on oral and dental health services represented 4.8% of health expenses in 2002, while it has increased to 5.3% in 2013. The number of Oral and Dental Health Centers (ODHCs) was 127 in 2013 whereas it was only 14 in 2002. Likewise, the number of Oral and Dental Health Hospitals (ODHHs) has increased to 6 from only 1 in 2002, with the introduction of the Health Transition Program in Turkey. The employment numbers for dentists has increased from 16,000 in 2002 to 22,000 in 2013. Excluding universities and private practice, the number of dentists has increased from 3,211 in 2002 to 7,997 in 2013 (Aydın, 2006; Atasever & Demiralp, 2014).

In Turkey, the breakdown of the units offering oral and dental health services and working in affiliation with the Institution of Public Hospitals is given as; 6 ODHHs, 237 ODHCs and 546 hospital polyclinics of oral and dental health, with 753, 4832 and 1784 dental units, respectively. Within this scope, 689 institutions render service with 7369 dental units. Moreover, 45 institutions with 3167 units and 511 private corporations provide dental care (Başara, Güler, & Yentür, 2014).

Frequently observed oral and dental diseases play a role in many health conditions which can easily be controlled by prevention and the associated costs are quite different from treatment costs (Kim & Amar, 2006; Guay, 2006). WHO, FDI and IADR have specified the goals of oral and dental health for the period of 2000-2020 in the year 1999 (Kim & Amar, 2006; Johnston & Vieira, 2014). The World Oral Health Report 2003 from WHO has noted that those belonging to the lower socioeconomic ranks of developing countries are more prone to oral and dental diseases (Petersen, 2003). Studies on this issue have shown deeper inequalities in oral and dental health services compared with other health areas and concluded that socioeconomically advantaged groups have access to dental services more easily (Holst, Sheiham & Petersen, 2002; Yazıcıoğlu, 2006). Dental caries remains a public health issue in the world, affecting 60-90% of the population even in the richest countries. This is mainly due to exposure to excess sugar thorough routine diet and the rarity of preventive dentistry implementations like topical fluorides (Kohn et al., 2001).

1.2. Fluoride Applications

The importance of fluorides in preventing caries has been emphasized in the World Health Council Decisions and the World Health Report 2003. In various countries with medium or low income levels, it is hard for the individuals to access oral and dental health services. The Oral Health Programs of WHO, FDI and IADR act in synergy to focus on the disadvantaged population in this realm. The Global Counselling Center`s focus on 'oral health with fluoride' is the main component of this project (Petersen, 2003).

Fluoride is the mineral that provides the highest resistance against acid attacks. Due to the associated slowing of demineralization and the promotion of remineralization processes in the oral medium, dentists prefer fluoride applications in healthy individuals and caries-prone patients, in erosion and sensitivity treatment and for groups in need of special care (Kohn et al., 2001; Wefel & Donly, 1999). More than eight-hundred studies have revealed that fluoride is the most effective agent in caries protection (Grignon et al., 2001). Fluoride strengthens enamel structure, decreases plaque formation rates, rematerializes initial caries lesions, prevents dentine hypersensitivity and can be applied either systemically or topically (Holst, Sheiham & Petersen, 2002; Orchardson & Gillam, 2006).

Systemic fluoride applications include drinking water fluoridation, adding fluoride to salt or milk, using fluoride supplements or chewing fluoridated gum (Ölmez, 1998; Grignon et al., 2001; Özperk, 1997).

Fluorides can be applied topically in the form of toothpaste, mouthwash, gel, solution, varnish or chewing gum (Ölmez, 1998; Kohn et al., 2001). The efficiency is about 15-20%, 20-50%, 30-40% for toothpastes, mouthwashes and in-office solutions or gels, respectively (Kohn et al., 2001; Ölmez, 1998). Being the most widely used agent against caries prophylaxis, fluoridated toothpaste use should be combined with the use of other agents in high-risk cases (Yazıcıoğlu, 2006).

Despite a marked reduction in the prevalence of dental caries formation in developed countries, an increase is observed in developing countries. By promulgating social dental health programs to improve oral and dental health, it is possible to reach more people and to lower the costs, but WHO has reported that only an estimated 20% of the world population benefits from the anti-cariogenic effect of fluorides (Petersen et al., 2005:686-693; Petersen, 2008).

The aim of this study is to evaluate the data of topical fluoride applications in our country to facilitate future preventive care planning.

2. Materials and methods

2.1. Content of the study

In Turkey, the responsibility of preventive dentistry belongs to the Ministry of Health. Due, in the main, to this fact, the affiliated ODHCs/ODHHs were recruited for the research. In 2014, there were 18,070 dental units, of which 7,956 (42.39%) belong to the Ministry of Health in Turkey. Also, a total of 37,925,956 polyclinic admissions were reported. The included ODHCs/ODHHs, which form the universe of this study, had a total capacity of 4872 and 846 dental units, respectively, and represent 42.39% of the total dental units (Bora Başara, Güler & Yentürk, 2015). These institutions also represent 63.82% of polyclinic admission numbers in Turkey. Other service units working intensively as restorative dentistry centers (such as universities, private practice and other institutions), from which data could not be gathered, properly were excluded. All of the universe for the study was included, so no sampling was performed.

2.2. Gathering and evaluating data

Data were gathered monthly for five years, beginning from 2010. Data from 137 ODHCs and 6 ODHHs in all 81 cities in Turkey were gathered in a data pool until the beginning of analyses in 2015. No related and organized health information could be reached for the term before

2012. The permission to use the aforementioned national database was provided by the Public Health Institution, Ministry of Health, Republic of Turkey and the mandatory research ethics committee approval was received from the Ethics Committee of Yildirim Beyazit University (Date: 28th August, 2015, number 107).

The population of the research consisted of patients under the age of 18 who received fluoride applications in ODHCs/ODHHs between the years 2012-2014, because topical fluoride application is only allowed for patients under 18 by regulations in our country.

The regions in this study were selected according to the Nomenclature of Territorial Units for Statistics-1 (NUTS-1) classification, as defined in Table 1. Cities were classified as "Level 3" in NUTS, neighbor cities similar to each other socially and geographically were grouped as "Level 1" and those similar to each other in development and population sizes as "Level 2", thus hierarchical NUTS was formed. Each one of the 81 cities was designated as a statistical region unit with regard to Level 3. Twenty-six Level 2 NUTs were defined by grouping Level 3 neighbor cities and twelve Level 1 NUTs were defined by grouping Level 2 NUTs. In all regional studies in the governmental sector, the NUTS study is used as a basis (Bora Başara, Güler & Yentürk, 2013).

Table 1. Nomenclature of Territorial Units for Statistics (NUTS)

NUMBER	LEVEL 1	LEVEL 2	LEVEL 3
1	Istanbul	Istanbul Subregion	İstanbul
2	Western Anatolia	Ankara Subregion	Ankara
		Konya Subregion	Konya, Karaman
3	Eastern Marmara	Bursa Subregion	Bursa, Eskişehir, Bilecik
		Kocaeli Subregion	Kocaeli, Sakarya, Düzce, Bolu, Yalova
4	Aegean	İzmir Subregion	İzmir
		Aydın Subregion	Aydın, Denizli, Muğla
		Manisa Subregion	Manisa, Afyon, Kütahya, Uşak
5	Western Marmara	TekirdağSubregion	Tekirdağ, Edirne, Kırklareli
		Balıkesir Subregion	Balıkesir, Çanakkale
6	Mediterranean	Antalya Subregion	Antalya, Isparta, Burdur
		Adana Subregion	Adana, Mersin
		Hatay Subregion	Hatay, Kahramanmaraş,Osmaniye
7	Western Blacksea	ZonguldakSubregion	Zonguldak, Karabük, Bartın
		KastamonuSubregion	Kastamonu, Çankırı, Sinop
		Samsun Subregion	Samsun,Tokat,Çorum, Amasya
8	Central Anatolia	KırıkkaleSubregion	Kırıkkale,Aksaray,Niğde,Nevşehir, Kırşehir
		Kayseri Subregion	Kayseri,Sivas,Yozgat
9	Eastern Blacksea	Trabzon Subregion	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
10	Southeastern Anatolia	Gaziantep Subregion	Gaziantep,Adıyaman,Kilis
		Şanlıurfa Subregion	Şanlıurfa,Diyarbakır
		Mardin Subregion	Mardin,Batman, Şırnak, Siirt
11	Mideastern Anatolia	Malatya Subregion	Malatya, Elazığ, Bingöl, Tunceli
		Van Subregion	Van, Muş, Bitlis, Hakkari
12	Northeastern Anatolia	Erzurum Subregion	Erzurum,Erzican,Bayburt
		Ağrı Subregion	Ağrı, Kars, Iğdır

2.3. Statistical Method

The computerized data were presented as one and two-dimensional tables and the statistical analysis was carried out using IBM-SPSS for Windows, Version 22.0 package program. The results were transferred to tables and a graph. Admission rates per capita were calculated by using the population under 18 and the number of their admissions to ODHCs/ODHHs for that region. Fluoride applications for years and regions were reported as a sum. The change in fluoride application numbers according to years, regions, population, together with admission, dentist and dental unit numbers were calculated. Fluoride application numbers as per dentist, dental unit and population were noted as a mean. The distribution of dentist numbers per 100,000 people and number of fluoride applications per dentist regarding years and regions and also the changes in patient and fluoride application numbers per dental unit were also reported.

No hypothesis testing or comparisons were used because no sampling was performed and the data were mass data. The results were interpreted as an increase or decrease compared to another year.

3. Results

In 2012, the population aged under 18 who applied to ODHCs and ODHHs was 12.50%; in 2013, this rate increased to 19.29%; in 2014, this rate increased to 19.55% (Table 2).

Table 2. Distribution of the number of applications to ODHCs and ODHHs and of the number of applications to dentists in accordance with years and NUTS-1.

REGIONS	2012			2013			2014		
	Population	Number of applications	%	Population	Number of applications	%	Population	Number of applications	%
Western Black Sea	1,011,716	166,828	16.49	986,959	283,511	28.73	964,011	279,419	28.99
Western Anatolia	1,712,850	317,259	18.52	1,716,624	457,387	26.64	1,730,266	467,832	27.04
Western Marmara	632,652	91,291	14.43	630,526	159,418	25.28	633,008	158,510	25.04
Central Anatolia	992,664	146,703	14.78	976,007	229,746	23.54	961,063	230,963	24.03
Eastern Marmara	1,601,653	269,272	16.81	1,607,435	386,620	24.05	1,622,078	388,953	23.98
Eastern Black Sea	581,580	83,000	14.27	565,592	127,538	22.55	552,938	122,916	22.23
North-eastern Anatolia	701,742	99,712	14.21	689,217	130,941	19.00	676,462	149,260	22.06
Central East Anatolia	1,210,643	136,512	11.28	1,202,679	218,524	18.17	1,193,353	239,389	20.06
Aegean	2,075,844	287,642	13.86	2,060,181	453,452	22.01	2,056,769	396,778	19.29
Mediterranean	2,506,473	292,687	11.68	2,502,560	451,137	18.03	2,505,986	444,225	17.73
Southeastern Anatolia	2,841,318	324,669	11.43	2,854,122	498,328	17.46	2,880,999	534,152	18.54
İstanbul	3,234,632	172,636	5.34	3,264,400	280,398	8.59	3,288,790	315,794	9.60
Total	19,105,779	2,388,211	12.50	19,058,315	3,677,000	19.29	19,067,737	3,728,191	19.55

When we examine the percentages of fluoride applications according to population and patient admissions; the percentages of fluoride applied patients in the whole population are 0.97, 2.81 and 2.17% for years 2012, 2013 and 2014, respectively. Of the admitted population under 18 years of age, 7.77, 14.55 and 11.12% corresponding to the years 2012, 2013 and 2014, were topically fluoridated (Table 3).

Table 3. The distribution of fluoride applications according to population and patients admitted regarding years and NUTS-1.

REGIONS	2012		2013		2014	
	According to population (%)	According to admissions (%)	According to population (%)	According to admissions (%)	According to population (%)	According to admissions (%)
Mediterranean	0.64	5.51	1.73	9.62	1.05	5.94
W. Blacksea	0.82	4.99	4.16	14.49	4.23	14.59
W. Anatolia	3.12	16.84	7.10	26.64	5.84	21.60
NE Anatolia	0.46	3.22	1.76	9.29	1.42	6.43
SE Anatolia	1.01	8.84	2.32	13.27	1.54	8.30
Aegean	1.07	7.73	3.69	16.77	2.63	13.65
E. Marmara	1.14	6.80	2.66	11.08	1.89	7.86
W. Marmara	0.64	4.42	3.20	12.65	3.08	12.31
E. Blacksea	0.84	5.91	2.06	9.13	1.90	8.54
İstanbul	0.21	3.88	0.95	11.02	0.96	10.02
ME Anatolia	0.67	5.96	2.43	13.36	1.91	9.52
C. Anatolia	1.15	7.80	4.05	17.19	2.41	10.03
Total	**0.97**	**7.77**	**2.81**	**14.55**	**2.17**	**11.12**

(W.=West, E.= East, NE=North-Eastern, SE=South-Eastern, ME=Mid-Eastern, C.=Central)

Table 4 shows us the distribution of dentists per 100,000 people and number of fluoride applications per dentist according to years and regions. The numbers of dentists per 100,000 people are; 25.30, 26.30 and 28.00 for the years 2012, 2013 and 2014, respectively. In 2012, the number of fluoride applied patients per dentist is 20.14, while the numbers are 90.68 for 2013 and 63.50 for 2014.

Table 4. The distribution of dentists per 100,000 people and fluoride applications per dentist according to years and NUTS-1.

REGIONS	2012		2013		2014	
	Dentist per 100,000 people	Fluoride application per dentist	Dentist per 100,000 people	Fluoride application per dentist	Dentist per 100,000 people	Fluoride application per dentist
Mediterranean	22.40	12.64	22.30	55.16	23.3	38.83
W. Blacksea	39.10	12.55	38.10	64.45	40.1	62.05
W. Anatolia	48.30	34.90	43.50	115.04	47.7	88.38
NE Anatolia	15.20	27.26	17.60	172.09	23.1	79.87
SE Anatolia	12.20	47.50	14.90	179.40	15.4	105.19
Aegean	31.90	13.13	34.60	73.58	34.3	50.80
E. Marmara	34.20	21.28	32.80	64.18	34.3	70.73
W. Marmara	37.60	8.34	43.60	60.83	41.2	63.08
E. Blacksea	25.10	15.86	29.30	127.00	31.8	62.94
İstanbul	17.90	7.75	18.20	40.86	21.3	37.92
ME Anatolia	12.10	27.86	19.00	109.00	20.2	71.76
C. Anatolia	26.60	17.21	28.40	89.39	30.6	49.45
Total	**25.30**	**20.14**	**26.30**	**90.68**	**28.0**	**63.50**

(W.=West, E.= East, NE=North-Eastern, SE=South-Eastern, ME=Mid-Eastern, C.=Central)

The distribution of the population per dental unit and numbers of fluoride applications per dental unit are given in Table 5. Population per dental unit is; 3,674 and 3,425 for 2013 and 2014, respectively. The fluoride application numbers per dental unit are; 81.24 in 2013 and it reduces to 54.62 in 2014 (Table 5).

Table 5. The distribution of population per dental unit and number of fluoride applications per dental unit according to years and regions.

REGIONS	2013		2014	
	Population per unit	Fluoride application per unit	Population per unit	Fluoride application per unit
Mediterranean	4.583	53.77	4.291	33.29
W. Blacksea	2.518	52.16	2.357	55.58
W. Anatolia	2.295	102.27	2.040	77.16
NE Anatolia	5.261	129.05	4.150	60.15
SE Anatolia	6.385	165.63	5.638	86.33
Aegean	2.725	70.35	2.627	43.25
E. Marmara	2.889	60.80	2.763	68.02
W. Marmara	2.182	57.04	2.302	53.29
E. Blacksea	3.470	118.17	3.291	49.75
İstanbul	5.291	41.09	4.916	38.61
ME Anatolia	5.032	99.05	4.698	69.40
C. Anatolia	3.221	76.42	3.032	37.65
Total	**3.674**	**81.24**	**3.425**	**54.62**

(W.=West, E. =East, NE=North-Eastern, SE=South-eEastern, ME=Mid-Eastern, C.=Central)

4. Discussion

Despite many local reports, this is the very first study in our country reporting Turkey's profile of preventive topical fluoride use, which is extremely important for caries prevention. We strongly think that, this study will therefore be important or national and international data comparisons.

Our study showed an increasing trend in the number of admissions to ODHCs/ODHHs of patients under 18 years of age and also in the admission rates per dentist, in the evaluated years. In 2013, Western Blacksea, Western Anatolia and Western Marmara Regions had the highest admission rates, while Istanbul and Southeastern Anatolia had the lowest.

Regarding all sectors providing oral and dental health services and all populations, the numbers of applications were 5,462,923, 2,278,6281, 25,177,013, 29,910,473, 34,939,584 and 37,760,696 in the years 2002, 2009, 2010, 2011, 2012 and 2013, respectively, according to the data provided by the Ministry of Health. The universities and private sector were not included in data before 2012 (BoraBaşara, Güler & Yentürk, 2013). Admission rates per dentist are 0.49% for all sectors. The regions with highest rates were Western Blacksea, Western Anatolia and Eastern Marmara, while the lowest rates were for Istanbul, South-Eastern Anatolia and Mid-Eastern Anatolia regions. These highest and lowest rates are in agreement with our results representing ODHCs/ODHHs.

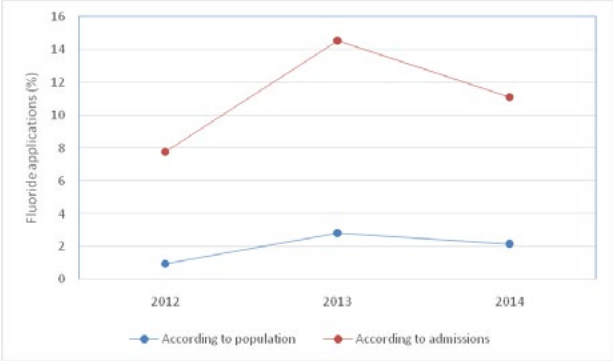
In our study, Western Anatolia, Western Blacksea and Egean Regions were the leaders regarding fluoride application rates for the population under 18 years of age, while Mediterranean, North-Eastern Anatolia and Eastern Marmara were again at the bottom of the ranking.

Fluoride applications were available in Turkey before 2012, but no statistical recordings were taken, so it is impossible to give exact numbers before 2013. An obvious uptrend is observed beginning in 2013 and ongoing in 2014. This uptrend could be interpreted as a positive development signal in a country like Turkey in which oral and dental health services are mainly provided as part of restorative and/or prosthetic dentistry fields and preventive services are still not offered population-wide, systematically. The Decree Law, numbered 663, regarding the organization and duties of the Ministry of Health and its associated organizations, was published and came into force on November 2nd 2011. The Public Hospitals Institution and the attached General Secretariat which are direct results of the aforementioned law are thought to have played a great role in this positive change.

With the legislative decree numbered 663, the Turkish Institution of Public Health was established under the Ministry of Health to open, run, evaluate and control hospitals, ODHCs and similar health institutions. Furthermore it was authorized to supervise the affiliated units to give preventive, diagnostic, restorative and rehabilitative health services in these hospitals in order to render secondary and tertiary health services. It was also tasked with carrying out personnel assignments, transfers, transactions of benefits, pay scale determinations and procurement activities, renting, upgrading, fixing institute properties, etc.

The increase in the number of dentists per capita has positively affected fluoride application rates from 2012 up to 2013 (Figure 1).

Figure 1. Fluoride application percentages according to population and admissions



In contrast, the relative decrease in fluoride application rates between 2013 and 2014 is thought to be related to the regulations which limit overtime hours and additional payments for the health facility staff affiliated with the Turkey Public Health Institution. Also the campaign process against fluoride use with high media coverage, beginning at the end of 2013, could have affected parents' ideas and decisions when they are offered topical fluorides for their children. The increase in 2013 could not be sustained as a result.

In our study, the regions with highest number of dentists per 100,000 people in ODHCs/ ODHHs in 2014 were Western Anatolia, Western Marmara and Western Blacksea, while South-Eastern Anatolia, Mid-Eastern Anatolia and Istanbul had respectively the lowest numbers.

Regarding topical fluoride application rates per dentist; South-Eastern,Anatolia, Western Anatolia and North-Eastern Anatolia were the leaders, while Istanbul, Mediterranean and Central Anatolia showed the worst rates.

It is contradictory that South-Eastern Anatolia has a high level for fluoridation with the least number of dentists. This finding tells us that, in order to increase the number of preventive applications like topical fluorides, it is essential that dentists be eager and aware of the concept of preventive dentistry and that the patients be demanding of it. This, rather than a mere increase in dentist numbers, is the most effective measure found here.

According to the data gathered by the General Directorate of Health Research in Turkey, dentist numbers per 100,000 people in all sectors are 24.7, 26.4, 26.3, 26.4, 26.3, 27.3, 27.9, 28.4, 29.1, 28.2, 28.3 and 29.1 for the years 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012 and 2013, respectively. Istanbul and Western Anatolia regions had the highest percentages while Mid- and South-Eastern Anatolia had the lowest. When we compare this with the international counterparts in 2013; against Turkey's 29 dentists per 100,000 people, the world, the European Union, high-income countries, the WHO European Region, the WHO Asian Region and upper-middle income group countries have, in the same order, 27, 68, 58, 58, 50 and 37 dentists per 100,000 (Bora Başara, Güler & Yentürk, 2014). In this regard, Turkey equaled the world's mean but lagged behind the developed nations.

In Turkey, the population per dental unit in ODHCs/ODHHs was 3,674 in 2013 and 3,425 in 2014. The numbers of fluoride applications per dental unit was 81.24 in 2013 but, surprisingly, 54.62 in 2014; in other words, the increase in dental unit numbers has not been reflected on the number of fluoride applications, suggesting causes other than the dental unit numbers affecting the prevalence of fluoride use.

In 2014, the regions with the highest levels of population per unit were Western Anatolia, Western Marmara and Western Black sea while those with the lowest levels were South-East Anatolia, Istanbul and Central Anatolia; the situation is the same with the number of dentists.

Populations per unit affiliated with the Ministry of Health were 61,632 in 2002, 14,309 in 2009, 12,775 in 2010, 12,113 in 2011, 10,730 in 2012 and 10,575 in 2013.

The leading regions for fluoride applications per dental unit are; South-Eastern, Western and Central Anatolia. Mediterranean, Istanbul and Aegean regions are, in this respect, the last. This pattern is also seen with fluoride applications per dentist. It is contradictory that; South-Eastern and Central Anatolia regions are good in fluoride application rates, while they have the fewest number of dental units.

A recent study, run by the National Academy for State Health Policy in America, Medicaid/SCHIP, American Dental Association and American Academy of Pediatric Dentists, details the content and quality of local fluoride applications in these regions. The Medicaid programs cover the cost of services provided through the first step doctors, by making families share the responsibility of oral and dental healthcare with the government and, thus, decrease oral and dental diseases. Some states like North Carolina have observed fewer dental caries cases and more utilization of oral and dental services in the young population. The struggle against early childhood caries necessitates the cooperation of dental and medical communities (Cantrell, 2008).

Another study, assessing the use of caries prevention services by Northwest Precedent dental network practitioners, compared the numbers of patients experiencing caries who had and had not received preventive services in the last 12 months. A total of 1,877 patients aged 3-92 years were eligible and, of those, 87% had received fluoride varnish or gel application in the 1-17 years age group. Briefly, one third of the patients had received preventive services (either sealants or any kind of topical fluoride treatment) in private dental practices (Ferracane et al., 2011). In our study, we used the data of ODHCs/ODHHs in which preventive services are given, from all 81 cities of Turkey from our national database. Other service units such as universities and private practice in which mainly restorative services are administered and from which healthy data could not be gained, were excluded.

In Turkey, gel or varnish forms of topical fluorides, which are routinely purchased by the formal dental institutions in question, are used. Topical fluoride applications are financed by the Social Security Institution only up to the age of 15 although it is possible to make this application far beyond (Atasever & Demiralp, 2015). In the mid-nineties, there was a significant shift in the understanding and practice of dentistry in Germany, from that of a restorative to a preventive nature. Firstly, the German Institute of Dentists presented an article entitled 'Prophylaxis for a Lifetime' and developed logical lifetime prophylaxis layouts including fluoridation for eight different age groups in 1995. In 2004, fluoridation agents including tablets, gels or varnishes were made available for 793,350 children and adolescents. From the institutions or schools in the activity, about 12% of the children were protected by fluoridation (Akar, 2014).

By preventive dental care, together with the support given through national campaigns for oral hygiene and healthy nutrition, many countries like Denmark have reached much better levels in oral and dental health care. In a literature study run in three different Scandinavian countries, it was announced that different dental personnel used different preventive strategies and, moreover, choices of fluoride vehicles (fluoride toothpastes, tablets, varnishes or even lozenges) also varied in public dental healthcare. The study also focused on the fact that, based on today's evidence-based dentistry, no evidence for the perfect choice of caries prevention exists, highlighting the need for further research and data providing evidence at the population level (Fathalla, 2011).

The ''Health for everybody'' concept, as introduced in the Alma-Ata Manifest (1978), which prescribes carrying on with urgent and effective studies, has played a major role in improving health policies (Gökalp & Doğan, 2006; GüçizDoğan & Gökalp, 2008). In Turkey, dental

services are offered mainly in the form of restorative or prosthodontic dentistry and no systematic population-wide implementations are tried (Topaloğlu, Eden, & Frencken, 2009). Nevertheless, the budgetary allocations from limited resources of the country should be directed to preventive oral and dental health services with lower costs and better benefits (Akar, 2014).

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