Investigation of the frequency and distribution of teeth requiring endodontic treatment and endodontically treated teeth

Kanal tedavisi gerektiren ve kanal tedavisi geçirmiş daimi dişlerin sıklığı ve dağılımının incelenmesi

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SUMMARY

Aim: To determine the distribution and frequency of endodontic treatment and endodontic treatment requirement in permanent teeth.

Materials and Methods: Of the 19800 teeth from 775 individuals (age range 16-80 years) were included in the study. All patients were examined clinically and radiologically to determine the teeth requiring endodontic treatment and endodontically treated teeth. For each case, information was collected in a questionnaire including age, gender, education, residence place, income level, frequency of tooth brushing and dental visit. Obtained data were statistically analyzed by using chi-square test with a significance level at $p<0,05$.

Results: Out of 19800 teeth, the frequency of teeth requiring endodontic treatment and endodontically treated teeth was 3% and 4%, respectively. Presence of endodontic treatment showed statistical difference between age subgroups ($p<0.05$). Gender, frequency of tooth brushing and dental visit had effect on the endodontic treatment requirement ($p<0.05$).

Conclusion: This study provides an epidemiological data about endodontic treatment in a Turkish population. Such datas will help to identify public dental health problems which will constitute an essential step in improving the general health status of the citizens of this country.

Keywords: Endodontic treatment, distribution, oral health

ÖZET

Amaç: Çalışmanın amacı daimi dişlerde kanal tedavisi sıklığının ve kanal tedavisi gerektiren daimi dişlerin dağılımının saptanmasıdır.

Gereç ve Yöntem: Çalışmaya ilk muayene kliniğimize başvuran 775 hastadan (yaş aralığı: 16-80) 19800 diş dahil edilmiştir. Tüm hastalar kanal tedavisi geçirmiş ve gerekliliği olan dişlerin saptanması için, radyolojik ve klinik olarak muayene edilmiştir. Her hasta için yaş, cinsiyet, eğitim, yaşanılan yer, gelir düzeyi, diş fırçalama sıklığı ve diş hekimi ziyareti parametreleri kaydedilmiştir. Veriler ki-kare testi ile $p<0.05$ önemlilik düzeyinde analiz edilmiştir.

Bulgular: 19800 dişte kanal tedavisi gereksinimi %3, kanal tedavisi görmüş dişlerin oranı %4'tür. Kanal tedavisi görmüş olma durumu, farklı yaş gruplarındaki bireylerde anlamlı fark göstermektedir ($p<0.05$). Cinsiyet, diş fırçalama ve diş hekimi ziyaret sıklığı ile endodontik tedavi gerekliliği arasında anlamlı ilişki bulunmaktadır ($p<0.05$).

Sonuç: Çalışmamız Türk toplumunda kanal tedavisi konusunda epidemiyolojik bir bilgi sağlamaktadır. Bu veriler vatandaşların genel sağlık durumunun iyileştirilmesinde önemli bir adım teşkil edecek olan kamu diş sağlığı sorunlarının belirlenmesine yardımcı olacaktır.

Anahtar kelimeler: Endodontik tedavi, dağılım, ağız sağlığı

INTRODUCTION

Dental caries (tooth decay) is the most common disease worlwide.[1,2] Distribution of tooth decay is affected by many factors such as age, sex, oral hygiene habits and socieconomical status.[3] Caries is the main source of irritation in dental pulp and periradicular tissues[4] and it is considered to be one of the main reasons for endodontic treatment.[5] Pulp infection is one of the most important and common sequel of dental caries, periodontal disease, trauma and inadequate restorative procedures. Endodontic treatment is planned according to the cause of the disease.[5,6]

Studies based on epidemiology of the endodontic treatment is rare[7] and epidemiological health records offers important documentation to assess the frequency of teeth requiring endodontic treatment.[5,6] Endodontic services constitues 3% of all dental procedures.[8,9] When planning dental health services, it is essential to estimate the need for dental treatment in the population. Epidemiological studies based on radiographic examinations combined with limited clinical examinations have been used for such estimations.[10] However, certain conditions requiring endodontic treatment cannot be revealed by radiographic examination alone; for example, a necrotic pulp in a tooth without periapical radiolucency. Besides, endodontic treatment is sometimes necessary in teeth without endodontic disease; such as prosthetic reasons. Thus, for the true assessment of the need for endodontic treatment, it is necessary to combine clinical and radiological factors.[10,11]

Due to the lack of data about the endodontic treatment need and its sociodemographic aspects, the aim of this study was to determine the distribution and frequency of endodontic treatment and endodontic treatment need in a Turkish subpopulation. To the best of our knowledge this is the first comprehensive study adressed on these parameters.

MATERIALS AND METHODS

The study protocol approved by the Necmettin Erbakan University Institutional Review Board (decision no: 2016/6). The study was carried out with patients who came for initial oral examination to Necmettin Erbakan University, Oral and Maxillofacial Radiology Department. A total of 19800 teeth of 775 individuals (age range 16-80 years) were included in the study. After written approval the patients underwent a thorough clinical and radiological examination. Main applications of endodontic treatment are pulp capping, amputation and root canal treatment.[12] In this study, mainly root canal treatments were discussed, amputation and pulp capping are excluded from the research. Third molars and teeth requiring retreatment were also excluded from the analysis when calculating the number of teeth requiring endodontic treatment. Teeth were categorized as endodontically treated if they had been obturated with a radio-opaque material in the pulp chamber and/or in one or more of the root canals.

Endodontic treatment need was determined both using radiographic and clinical examination. Teeth were categorized as requiring endodontic treatment regarding to presence of the irreversible pulpitis, apical periodontitis, periapical abscess, pulpal necrosis, prosthetic reasons, and periapical radiolucencies. The widening of the periapical periodontal ligament space exceeding about two times the width of a normal lateral periodontal ligament space was assessed as "periapical radiolucency".[11]

The panoramic radiographic examinations were performed by using J MORITA (2D Veraviewpocs, MFG corp, Kyoto, Japan) machine. Periapical radiographs were also taken when it was necessary. With respect to the accuracy of diagnosing a periapical radiolucency, the intraoral radiograph was found to be somewhat superior to the panoramic radiograph.[11] Clinical and radiographic examination were conducted by two trained and previously calibrated oral and maxillofacial radiologists. For each case, information was collected in a questionnaire including age, gender, education, residence place, income level, frequency of tooth brushing and dental visit.

Obtained data were statistically analyzed by using chi-square test with a significance level at $p<0.05$ with SPSS (version 21.0, SPSS Inc., Chicago, IL, USA).

RESULTS

The distribution of the study population based on age and sex is given in Table 1. The mean age of the participants was 33.34 years. Out of 19800 teeth, the frequency of endodontically treated teeth was 4%. 49.7% of the study population had at least one endodontically treated tooth. Presence of endodontic treatment showed statistical difference between age subgroups ($p<0.05$). The presence of endodontic treatment increased with aging. Gender had no effect on the presence of endodontic treatment ($p>0.05$).

Table 1. The distribution of the study population based on age and sex.

sex		Age subgroups (years) 15-29	30-44	45-59	>60	Total
	female	241	161	81	10	493
	male	101	123	49	9	282
Total		342	284	130	19	775

94.6% of the patients were living in the city. There was no significant relationship between residence place and presence of endodontic treatment ($p>0.05$). Education, income level, frequency of tooth brushing and dental visit had no significant effect on the presence of endodontic treatment ($p>0.05$). Most of the patients were

graduated from elementary school (43.87%) and this was followed by university (29.29%) and high school graduation (26.84%). The majority of the individuals had low income (85.55%) and the remaining part consisted of medium and high income level (14.45%). 'Everyday' was the most common tooth brushing frequency by 34.32% and this was followed by 'twice a week', 'sometimes', 'twice a day', 'never' by 23.74%, 20.9%, 20.52% and 0.516%, respectively. The majority of the patients visit their dentist 'in case complaint' (93.16%) and the remainig portion (6.84%) visits 'biennially' or 'once a year'.

Out of 19800 teeth, the frequency of teeth requiring endodontic treatment was 3%. 49.3% of the study population had at least one tooth which required endodontic treatment. Gender, education, frequency of tooth brushing and dental visit had an effect on the endodontic treatment requirement ($p<0.05$). Males had higher need of endodontic treatment than females. The endodontic treatment need decreased as the level of education increased (Table 2).

Table 2. Endodontic treatment need related to education level.

Education level	Endodontic treatment need (%)
Elementary school	53
High school	51
University	40

The group 'never brushing' consisted of 4 patients and they had highest endodontic treatment need percentage while the group brushing twice a day had lowest endodontic treatment need (Table 3).

Table 3. Endodontic treatment need related to frequency of tooth brushing.

Frequency of tooth brushing	Endodontic treatment need (%)
Never	75
Sometimes	62
Twice a week	54
Everyday	45
Twice a day	35

The group of patients who visit dentist in case of complaint had highest percentage of endodontic treatment need (Table 4).

Endodontic treatment was more frequent in maxilla and maxillary teeth were more often in need of endodotic treatment. The distribution of teeth based on presence and need of endodontic treatment is given in Table 5. All p values obtained in the study is presented in Table 6.

Table 4. Endodontic treatment need related to frequency of dental visit.

Frequency of dental visit	Endodontic treatment need (%)
Once a year	25
Biennially	17
In case of complaint	51

Table 5. The distribution of teeth based on presence and requirement of endodontic treatment.

Tooth type	Presence of endodontic treatment (number of teeth)	Endodontic treatment need (number of teeth)
Maxillary incisor-canine	95	29
Maxillary premolar	198	121
Maxillary molar	157	167
Maxilla total	**450**	**317**
Mandibular incisor-canine	26	28
Mandibular premolar	153	82
Mandibular molar	208	177
Mandible total	**387**	**287**
TOTAL	**837**	**604**

Table 6. p values obtained in the study.

Variables	P values	
	Presence of endodontic treatment	Endodontic treatment need
Age	0,003*	0,197
Gender	0,882	0,002*
Residence place	0,297	0,630
Education	0,892	0,007*
Income level	0,320	0,568
Frequency of tooth brushing	0,122	0,000**
Frequency of dental visit	0,224	0,000**

*The significance level is 0.05
**The significance level is 0.001

DISCUSSION

It should be emphasized that this study was not based on an epidemiological survey, but on patients referred to university clinic. Thus, the material did not necessarily reflect the need for treatment in a population, but can be used to illustrate the relative frequency of different ways unveiling endodontic diseases.[10]

In this study, we used both clinical and radiographic examination. Petersson.[10] reported that only 39% of the teeth requiring endodontic treatment had a periapical radiolucency. Thus, more than half of the teeth in need of endodontic treatment would not have been discovered in epidemiological studies based on radiographic examinations. Our radiological examination based on panoramic radiographs which allowed the collection of a large volume of patient data in university clinics without exposing study participants to excessive radiation.[13,14]

Periapical radiographs were just taken when it was necessary.

According to World Health Organisation (WHO) socio-cultural risk factors of tooth decay are consist of parameters such as education level, income level and occupation. Environmental risk factors are dietary habits, oral hygiene, smoking and alcohol use.[15] In this study we found that oral hygene parameters such as tooth brushing and dental visit frequency had an significant effect on endodontic treatment need.

There is not adequate study reporting the endodontic treatment need in the literature. To our knowledge this is the first study revealing the endodontic treatment need in Turkish population. We evaluated 17800 teeth and found an endodontic treatment need of 3%. Similarly, Weiger[11] studied on 7897 teeth of the 323 patients and they reported that the endodontic treatment need was 2.3% related to all examined teeth.

When tooth was used as a unit the frequency of endodontically treated teeth was 4%. This result was within the findings reported (2%-21%) in previous studies.[11,16-23] The differences between the studies may be considered as a variety of health care systems and cost of treatment.[22,24]

It is appropriate to mention that the general patient profile of our hospital consists of people with limited socioeconomical status. The great portion of the study population (93.16%) visits dentist just in case of complaint. Our results revealed that about half of the Turkish population had at least one tooth which required endodontic treatment and endodontically treated tooth. Similarly, Liu[25] found out that over half of the study participants required endodontic treatment. They also found association between endodontic disease and quality of life. Number of teeth requiring endodontic treatment was associated with poor quality of life.

Among socioeconomic factors, patient's education level is clearly important in development of dental caries.[26] Most of the participants of this study were university graduates. The endodontic treatment need decreased as the level of education increased. Patient's education level is the best predictor of health conditions compared with other socioeconomic indicators such as income and employment.[27,28] Education levels have been shown to be associated with patient's dental visits, tooth brushing frequency, and dental caries prevalence.[29]

With respect to the age factor, we found out that the presence of endodontic treatment increased with aging, in accordance with some studies.[14,21] This increase may be a result of longer exposure to caries and function.[18] Age-related changes of dental pulp complex influence the frequency of endodontic treatment in elderly people.[30] Besides, younger individuals tend to attend regular check-up more often when compared to elderly and thus they have a lower incidence of caries and periodontal diseases.[31]

In various studies, caries has been shown to be more prevalent in women because of such mechanisms: earlier eruption of teeth in girls, hormonal fluctuations in pregnancy, the biochemical composition of saliva, etc.[32] Contrastly, our results showed that men are the population portion that needs more endodontic treatment (56.7%) This result can be explained with the greater interest of female patients to have dental care and their regular attendance for check-ups.[33,34]

Variability exists in the literature regarding whether maxillary or mandibular teeth are most commonly treated endodontically and which tooth types are most frequently treated.[35] Our results revealed that endodontic treatment was more frequent in maxilla and maxillary teeth were more often in need of endodotic treatment. Wayman[36] reported in a survey covering a period of 8 years and 3350 consecutive endodontic patients, the most frequently treated tooth was the mandibular first molar, at 18% of the time. The maxillary first molar was the second most frequently treated tooth, an average of 12% of the time. In accordance with our results, the literature shows that the posterior teeth are more often in need of endodontic treatment, with a frequency range of 53% to 72% compared with anterior teeth with a frequency range of 28% to 47%.[36] Because they remain longer in the mouth, their morphology facilitates dental plaque accumulation, and show large pulpal chambers.[37]

CONCLUSION

As a conclusion, in terms of sociodemographic factors we can conclude that gender and education, on the other hand frequency of tooth brushing and dental visit had an effect on endodontic treatment need. This datas will be useful and must be taken into account when planning health policy. Further studies with larger samples will add significance to the literature.

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