jdhs
Journal of Dental Hygiene Science

J Dent Hyg Sci Vol. 23, No. 3, 2023, pp.225-235
https://doi.org/10.17135/jdhs.2023.23.3.225

RESEARCH ARTICLE

Impact of Periodontal Treatment and Demographic and Socioeconomic Factors on Tooth Loss in Persons with Disabilities: An Analysis of Korean National Health Insurance Claims Data

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Background: This study aimed to analyze the effects of periodontal treatment and individual- and tooth-related factors on tooth extraction in people with disabilities.

Methods: The Korea National Health Insurance claims data of individuals with disabilities aged 40~64 years with chronic periodontitis in 2008 were obtained. Of these, data on the disabled who underwent scaling/root planing, subgingival curettage/periodontal surgery, or non-periodontal treatments, and data on their teeth were selected. The extraction of 716,688 teeth from 39,097 patients was tracked until 2018, and the patient- and tooth-level factors related to tooth loss were identified using a mixed-effect logistic regression analysis.

Results: Data from approximately 17% of the teeth were extracted during a follow-up period of approximately 11 years. Among the tooth-level variables, scaling/root planing treatment at baseline and periodontal treatment during the follow-up period were associated with a lower risk of tooth loss (odds ratio=0.692 and 0.769, respectively, $p<0.001$). Non-vital teeth increased the risk of tooth loss by 3.159 times ($p<0.001$). Among the patient-level variables, females were less likely to have lost their teeth than males, and those with orthopedic impairment or brain lesions/mental disabilities, a higher age group, lower income level, or residents in medium/small cities or rural areas were more likely to have lost their teeth ($p<0.001$).

Conclusion: Through approximately 11 years of follow-up, scaling or root planing, experience with periodontal treatment at least once, female sex, older age, lower income, smaller residential areas, type of disability, and pulp vitality were found to be associated with tooth loss in individuals with disabilities aged 40~64 years with chronic periodontitis. To prevent tooth loss in individuals with disabilities, it is necessary to establish a dental treatment plan that considers the timing of periodontal treatment and the characteristics of the patient and teeth.

Key Words: Disabled persons, Periodontal diseases, Risk factors, Tooth loss

Introduction

1. Background

Tooth loss affects chewing, aesthetics, pronunciation, and nutrition, causing various functional disorders and significantly reducing the quality of life related to oral health[1,2]. Accordingly, it has been used as an effective indicator to assess the oral health of populations in many countries[3]. In South Korea, the prevalence of edentulism among disabled people in their 20s, 40s, and elderly is higher than that in the entire adult population, and the need for prosthetic treatment due to the loss of one or more teeth is also reportedly higher[4]. This suggests that the oral health status of people with disabilities is less favorable for maintaining their teeth than that of people without disabilities.

The systemic health of individuals with disabilities makes

Received: September 6, 2023, **Revised:** September 10, 2023, **Accepted:** September 13, 2023 eISSN 2233-7679

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them more susceptible to periodontal disease, which further accelerates tooth loss. Disabled people usually take medications to manage muscle tremors or behavioral issues stemming from their disabilities. As a result, there is a significant likelihood of developing periodontal disease due to secondary factors such as gingivitis, gingival hyperplasia, or dry mouth caused by these medications[5,6]. Furthermore, the prevalence of systemic diseases, such as hypertension, diabetes, and heart disease, which have been reported to be associated with periodontal disease, is higher among people with disabilities than among those without[7,8]. Therefore, it can be anticipated that individuals with disabilities are more likely to develop periodontal disease. According to a study that compared statistical data, the proportion of Koreans with disabilities requiring treatment beyond calculus removal was 10% higher than that of the entire adult population[4].

Periodontal disease is the primary cause of tooth loss[9]. Intellectually people with disabilities tend to have more severe gingivitis and tooth loss than those without[10], and approximately half of the teeth lost by people with disabilities result from periodontal disease[11]. The breakdown of periodontal tissue around the teeth caused by periodontal disease accumulates unless treated, eventually leading to tooth loss[9]. Therefore, it is important to maintain teeth by performing preventive or non-surgical therapy to remove the causative factors when the disease is at an earlier stage.

Since South Korea implemented coverage for preventive scaling for adults aged over 19 years in 2013, the number of users of the benefits has increased not only for people without disabilities but also for those with disabilities[12,13]. However, it has been reported that the rate of unmet dental treatment is still high among some individuals with disabilities with periodontal disease and dental caries[14]. In addition, the status of dental caries among disabled children and adolescents[15], oral health status of people with disabilities in certain regions[16,17], dental care utilization by them[18,19], and inadequate oral healthcare systems[20] have been reported. However, most studies have reported cross-sectional results, and there is a lack of information regarding the factors influencing tooth loss, which represents the ultimate outcome of oral health based on long-term follow-up results. Furthermore, although the prevalence of severe periodontitis peaks globally in people over 40 years of age[21], there is a lack of information regarding the effectiveness of periodontal treatment in maintaining teeth in Koreans with disabilities in these age groups. Accordingly, this study assumed that if tooth loss in middle-aged people with disabilities is tracked longitudinally, it would be possible to identify the factors contributing to tooth loss and assess the actual effectiveness of periodontal treatment in preserving the teeth of people with disabilities. Thus, this study aimed to provide basic evidence that can be taken into consideration when planning dental treatment for people with disabilities in South Korea based on the research results.

2. Objectives

This study aimed to ascertain the impact of periodontal treatment and demographic and socioeconomic factors on tooth loss in people with disabilities using National Health Insurance claims data.

Materials and Methods

1. Ethics statement

Because this study used customized claims data from 2002 to 2018 provided by National Health Insurance (NHI) for research purposes, it was conducted after receiving approval for exemption from review by the Wonkwang University Institutional Review Board for this research using secondary data (IRB No.: WKIRB-201911-SB-082).

2. Subjects

The most common age groups for gingival and periodontal diseases among South Koreans with disabilities were those in their 40s and 60s from 2016 to 2020[22]. Accordingly, individuals aged 40 to 64 years were included in this study, and their data were obtained from the 2008 to 2018 NHI claims data for monitoring tooth extraction for at least 10 years.

Data from 39, 686 people with disabilities of 15 types[23] with chronic periodontitis (K05.3) as the primary or secondary disease were selected. The study subjects were classified into periodontal treatment and non-periodontal groups based on the treatment codes. The periodontal treatment

group of 19,098 people with disabilities was defined as those with claims data for scaling (U2232), root planing (U2240, U2244), subgingival curettage, or periodontal surgery (U10XX, U11XX) in 2008. People with disabilities whose claims data corresponded to other dental treatment codes were classified into the non-periodontal group (n= 19,999). Finally, the tooth data of the study participants were analyzed. Only the teeth with a history of periodontal treatment were included in the periodontal treatment group. In contrast, in the non-periodontal group, all remaining teeth were analyzed. During this process, third molars and teeth extracted within 90 days of the same disease after any dental treatment were excluded. Data from 39,097 people with disabilities and 716,688 teeth were analyzed.

3. Study design

The dependent variable was whether the teeth were extracted (tooth loss), which was monitored using tooth extraction treatment codes (U441X) from the date of the first dental treatment in 2008 (baseline) to December 31, 2018. The independent variables were classified as patient- and tooth-level variables. Patient-level variables included the following demographic and socioeconomic factors: sex (male or female), age groups (40～49 years, 50～59 years, or 60～64 years), residential area (metropolitan city, medium-/small-sized city, or rural area), income level (quintiles: first [lowest], second, third, fourth, or fifth quintiles [highest]), medical aid (no or yes), and type of disability. In this study, the disability types were arbitrarily reclassified based on considerations related to the types and criteria of disabilities as defined in the Enforcement Decree of the Welfare of Persons with Disabilities Act[23], the application of the additional point system of National Dental Insurance[24], and characteristics of disability that can significantly impact the cognitive capacity related to the need for oral care or the ability to practice oral health behavior were as follows (Table 1): 1) Brain and mental disabilities (brain lesions and mental disorders that affect the awareness of the need for oral care and the practice of oral health behaviors due to cranial nerve and mental problems, and are eligible for the additional point system of National Dental Insurance); 2) orthopedic impairment (a condition where individuals may have difficulty performing own oral health behaviors tasks, such as toothbrushing, due to primary problems in their musculoskeletal system, including bones, joints, and muscles. This can happen when someone loses the function of their thumb or multiple fingers, such as the second finger of one hand)[23]; and 3) physical disabilities (conditions where the primary obstacle to performing oral health behaviors is not a musculoskeletal problem but rather issues related to internal organs or other external physical disabilities).

Tooth-level variables included the type of treatment the tooth underwent at baseline (non-periodontal or no treatment [non-periodontal treatment], scaling/root planing, or subgingival curettage/periodontal surgery [curettage/periodontal surgery]), non-vital teeth (no or yes), and periodontal treatment during the follow-up period (no or yes). Pulp vitality was confirmed using root canal filling treatment codes from 2002 to 2008.

4. Statistical analysis

Differences in the distribution of individuals with disabilities and teeth between the two groups, based on demographic and socioeconomic characteristics, were tested using the chi-square test. The data in this study had a multilevel structure, with teeth clustered within patients. Mixed-effects logistic regression was used to analyze the

Table 1. Types of Disabilities Reclassified for This Study

Types of disabilities reclassified for this study (3 types)	Types of disabilities based on Enforcement Decree of the Welfare of Persons with Disabilities Act[23] (15 types)
Brain/mental disabilities	Disability of brain lesion, intellectual disorder, mental disorder, or autism
Orthopedic impairment	Only the orthopedic impairment among the external physical disabilities
Physical disabilities	Other external disabilities or internal organ disabilities (Visual disability, hearing disability, speech disability, kidney dysfunction, cardiac dysfunction, respiratory dysfunction, hepatic dysfunction, intestinal fistular/urinary fistular, facial disfigurement, or epilepsy)

impact of patient- or tooth-level variables on tooth loss in data with a hierarchical structure. Statistical significance was confirmed at a p-value <0.05, and the analysis was conducted using R software (version 4.0.3; R Foundation for Statistical Computing, Vienna, Austria).

Results

1. Characteristics of study subjects with disabilities and their teeth

Table 2 shows the distribution of people with disabilities according to their demographic and socioeconomic characteristics. The distribution of the characteristics between the two groups was similar. In both groups, there were approximately twice as many males as females. The 60～64 years age group was the largest in both groups, representing over 70%, followed by the 50～59 and 40～49 years age groups. Metropolitan city residents constituted the largest group at over 54%, and medium-/small-sized cities constituted the smallest at 10% to 13%. According to income level, the first quintile (lowest) was the largest in the non-periodontal group at 32.91% and the periodontal group at 28.19%, whereas the second quintile group had the lowest distribution at 14% and 13%, respectively. The number of medical aid recipients was approximately 12% to 16%. Depending on the type of disability, orthopedic impairments were the most common at over 60%, followed by physical disabilities (26%), and brain and mental disabilities (11% to 13%).

Table 3 shows the distribution based on the characteristics of the subjects' teeth. The number of teeth in the non-periodontal treatment group (n=515,195) was 2.6 times greater than that in the periodontal treatment group (n=201,493). Among the teeth in the periodontal treatment group, 75.36% received scaling/root planing treatment at the start of the study, and 24.64% received curettage/

Table 2. Study Subject Characteristics According to Groups

Variable	Classification	Group		p-value[a]
		Non-periodontal Tx	Periodontal Tx	
No. of persons		19,999 (100.00)	19,098 (100.00)	
Sex	Male	13,775 (68.88)	11,847 (62.03)	<0.001
	Female	6,224 (31.12)	7,251 (37.97)	
Age groups (y)	40～49	1,940(9.70)	2,213 (11.59)	<0.001
	50～59	3,266 (16.33)	3,376 (17.68)	
	60～64	14,793 (73.97)	13,509 (70.73)	
Residential area[b]	Metropolitan	10,943 (54.72)	11,511(60.27)	<0.001
	Medium/small city	2,688 (13.44)	2,000 (10.47)	
	Rural	6,367 (31.84)	5,587 (29.26)	
Income level	Q1 (lowest)	6,581 (32.91)	5,383 (28.19)	<0.001
	Q2	2,798 (13.99)	2,390 (12.51)	
	Q3	3,484 (17.42)	3,146 (16.47)	
	Q4	3,922 (19.61)	4,092 (21.43)	
	Q5 (highest)	3,214 (16.07)	4,087 (21.40)	
Medical aid	No	16,898 (84.49)	16,799 (87.96)	<0.001
	Yes	3,101 (15.51)	2,299 (12.04)	
Type of disability	Physical[c]	5,261 (26.31)	4,946 (25.90)	<0.001
	Orthopedic	12,012 (60.06)	12,037 (63.03)	
	Brain and mental[d]	2,726 (13.63)	2,115 (11.07)	

Values are presented as n (%). Unit:person.
Tx: treatment, Q1: first quintile, Q2: second quintile, Q3: thirdquintile, Q4: fourth quintile, Q5: fifth quintile.
[a]p-value was obtained by chi-square test. [b]There was missing information for one person in the non-periodontal treatment group. [c]Visual disability, hearing disability, speech disability, kidney dysfunction, cardiac dysfunction, respiratory dysfunction, hepatic dysfunction, intestinal fistular/ urinary fistular, facial disfigurement, or epilepsy. [d]Disability of brain lesion, intellectual disorder, mental disorder, or autism.

Table 3. Tooth Characteristics According to Groups

Variable	Classification	Group		p-value[a]
		Non-periodontal Tx	Periodontal Tx	
No. of teeth		515,195 (100.00)	201,493 (100.00)	
Type of periodontal Tx at baseline	Non-periodontal Tx	515,195 (100.00)	0 (0.00)	<0.001
	Scaling /root planing	0 (0.00)	151,850 (75.36)	
	Curettage /periodontal surgery	0 (0.00)	49,643 (24.64)	
Periodontal Tx during follow-up	No	355,804 (69.06)	71,533 (35.50)	<0.001
	Yes	159,391 (30.94)	129,960 (64.50)	
Non-vital tooth	No	494,092 (95.90)	188,539 (93.57)	<0.001
	Yes	21,103 (4.10)	12,954 (6.43)	
Loss of tooth	No	419,359 (81.40)	174,737 (86.72)	<0.001
	Yes	95,836 (18.60)	26,756 (13.28)	

Values are presented as n (%). Unit: tooth.
Tx: treatment.
[a]p-value was obtained by chi-square test.

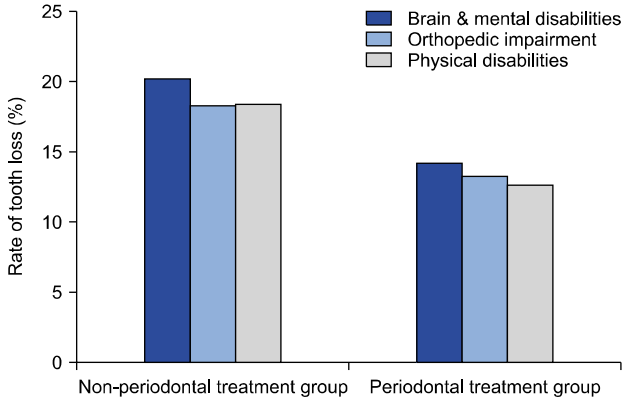

Fig. 1. Loss rate of study teeth according to type of disabilities in non-periodontal and periodontal treatment groups.

periodontal surgery. In both groups, vital teeth accounted for approximately 94% of all teeth. During the follow-up period, 64.50% of teeth in the periodontal treatment group received periodontal treatment, whereas only 30.94% of teeth in the non-periodontal group received it.

2. Tooth loss rate according to periodontal treatment and disability type

As a result of tracking tooth loss, the tooth loss rate in the two groups was 18.60% and 13.28%, respectively, with a slightly lower rate in the periodontal treatment group (Table 3). Within each group, the rate of tooth loss was highest in the teeth of persons with brain/mental disabilities (Fig. 1).

3. Factors related to tooth loss

Table 4 shows the results of the analysis of the relationship between tooth loss that occurred during the follow-up period and demographic and socioeconomic factors. Teeth that received scaling/root planing were less likely to be lost than teeth that did not receive periodontal treatment (teeth of the non-periodontal group) (odds ratio [OR]= 0.692; 95% confidence interval [CI]=0.688～0.717). Conversely, curettage/periodontal surgery was not significantly associated with tooth loss (p=0.688). Throughout the follow-up period, teeth that underwent periodontal treatment at least once, regardless of the type of treatment, were observed to have a higher likelihood of remaining in the oral cavity compared to teeth that did not receive any periodontal treatment (OR=0.769, 95% CI=0.752～0.787). Non-vital teeth significantly increased the likelihood of tooth loss, with the risk being 3.159 times higher than that of vital teeth (95% CI=3.069～3.253).

Among the patient-level variables, females had a lower risk of tooth loss than males (OR=0.692, 95% CI=0.669～0.716). In contrast, the risk of tooth loss tended to increase in older age groups compared to those in their 40s and in lower income quintiles than in the highest income quintile (p<0.001). Compared with residents in metropolitan cities, those in medium-/small-sized cities and rural areas had a higher likelihood of tooth loss (OR=1.070 and 1.140, respectively, p<0.001). When considering the type of disability, orthopedic impairment was found to increase

Table 4. Effect of Periodontal Treatment, Demographic, and Socioeconomic Variables for Tooth Loss: Result of Mixed-Effect Logistic Regression

Variable	Classification	OR	95% CI		p-value
			Lower	Upper	
Type of periodontal Tx at baseline	Non-periodontal Tx	1 (Ref)			
	Scaling/root planing	0.692	0.668	0.717	<0.001
Periodontal Tx during follow-up	No	1 (Ref)			
	Yes	0.769	0.752	0.787	<0.001
Non-vital tooth	No	1 (Ref)			
	Yes	3.159	3.069	3.253	<0.001
Sex	Male	1 (Ref)			
	Female	0.692	0.669	0.716	<0.001
Age group (y)	40~49	1 (Ref)			
	50~59	1.334	1.253	1.421	<0.001
	60~64	1.592	1.509	1.680	<0.001
Income level	Q5 (highest)	1 (Ref)			
	Q4	1.085	1.031	1.142	0.002
	Q3	1.109	1.051	1.170	<0.001
	Q2	1.138	1.075	1.205	<0.001
	Q1 (lowest)	1.206	1.143	1.272	<0.001
Medical aid	No	1 (Ref)			
	Yes	1.027	0.970	1.089	0.360
Residential area	Metropolitan city	1 (Ref)			
	Medium/small city	1.070	1.033	1.109	<0.001
	Rural area	1.140	1.084	1.198	<0.001
Type of disability	Physical	1 (Ref)			
	Orthopedic	1.079	1.039	1.120	<0.001
	Brain/mental	1.148	1.087	1.212	<0.001

OR: odds ratio, CI: confidence interval, Ref: reference, Tx: treatment, Q1: first quintile, Q2: second quintile, Q3: thirdquintile, Q4: fourth quintile, Q5: fifth quintile.

the likelihood of tooth extraction by 1.079 times (95% CI=1.039~1.120), and brain/mental disability by 1.148 times (95% CI=1.087~1.212) compared with physical disability. Medical aid use did not exhibit a significant relationship with tooth loss (p=0.360).

Discussion

1. Interpretation

This study aimed to identify demographic and socioeconomic factors related to tooth loss by tracking teeth for approximately 10 to 11 years using the NHI claims data of middle-aged people with disabilities with chronic periodontitis. The results confirmed that tooth-related variables, such as the type of periodontal treatment, experience with periodontal treatment during the follow-up period, and pulp vitality, as well as patient-related variables, including sex, age, income level, residential area, and type of disability, were associated with tooth loss.

2. Key results and comparison

In this study, scaling/root planing treatment was found to decrease the possibility of tooth loss compared with non-periodontal treatment. However, no significant association was observed between subgingival curettage/periodontal surgery and tooth loss. For patients with chronic periodontitis, non-surgical periodontal treatments such as scaling and root planing are effective in reducing periodontal pocket depth and gingivitis[25]. One potential risk after non-surgical treatment is the presence of residual pockets, which is why surgical periodontal treatment is applied when the disease advances[26]. Nonetheless, tooth loss can occur if periodontal health is not restored after surgical treatment and periodontal disease continues to advance.

This indicates that the risk of dental mortality depends on attachment loss and bone height at baseline[27]. Furthermore, the periodontal health of people with disabilities is worse than that of people without any disabilities[4]. For these reasons, it is postulated that the prognosis of subgingival curettage or surgical treatment in this study resulted in a lack of a significant effect on maintaining teeth.

Additionally, the success of periodontal treatment depends on dental maintenance visits[28]. This is supported by the finding that the likelihood of tooth loss was lower when periodontal treatment was administered during the follow-up period. This is clearly seen in the distribution of the subjects' teeth in Table 3. It was confirmed that 64% of the teeth in the periodontal treatment group and approximately 31% of the teeth in the non-periodontal group received periodontal treatment during the follow-up period.

Among tooth-related factors, non-vital teeth had a relatively high OR value for tooth loss. The reasons for the extraction of endodontically treated teeth include periodontal disease, failure of endodontic treatment, irreparable tooth fracture, and a history of diabetes[29,30]. A total of 50.35% of the teeth received periodontal treatment from the start to the end of the study, indicating that the teeth had periodontal disease that required treatment beyond scaling. Additionally, people with disabilities have a higher risk of diabetes and other systemic diseases than those without[7,31]. This may have influenced the high rate of non-vital tooth loss. Moreover, a previous study reported that most failures of endodontic treatment occur early after treatment, and tooth extraction is performed more frequently on these teeth than on relatively difficult re-root canal treatment or root apical surgery[32]. Because root canal treatment and crown restoration to preserve the teeth of people with disabilities require a considerable amount of time and cost, teeth are strategically extracted if they are not essential teeth[33]. The effect of this decision-making process on dental treatment cannot be excluded from this study.

Considering the cumulative impact of oral diseases, the prevalence of such conditions and the resulting tooth loss tends to increase with age[3]. However, it is also worth considering that 88.1% of people with disabilities in Korea have acquired disabilities due to diseases and injuries, in addition to age. In 2017, the percentage of people with disabilities aged <18 years in Korea was 3.3%, which increased with age, reaching 30.3% for those aged $50\sim64$ years and 46.6% for those aged >64 years[31]. The physical condition of people with disabilities makes them more susceptible to oral diseases[5–7]. Ultimately, it has been postulated that as age increases, there is a greater likelihood of tooth loss due to the accumulation of damage caused by oral diseases and the combined negative effects of acquired disability.

Females had a lower risk of tooth loss than males in this study. According to a previous study, the probability of utilizing dental care among people with disabilities in Korea was 1.07 times higher for females than for males[18]. A high rate of dental care utilization is not directly related to better oral health. However, considering a research result showing that 44% of people with disabilities in some regions visited dental institutions for regular checkups[34], females would have had more opportunities to detect oral diseases and receive treatment than males.

The results of this study, which indicate a higher risk of tooth loss in medium-/small-sized cities and rural areas than in metropolitan cities, can be considered in relation to inequality in the distribution of dental resources and utilization of dental institutions depending on the region. According to statistical data from Korea in 2020, the rate of oral examinations for people with disabilities was 20.1% in metropolitan cities, 17.4% in medium-/small-sized cities, and 11.4% in rural areas[35]. A previous study found that in smaller administrative districts, patients tended to visit medical institutions located at greater distance[36]. Another study reported an inequality in the distribution of dental clinics, with wealthier regions having advantages across the country[37]. As of 2023, there are only 12 regional oral health centers for people with disabilities in 17 cities and provinces in South Korea. This suggests an insufficient supply of advanced dental procedures requiring general anesthesia for people with disabilities living in rural areas or small cities.

According to a recent study, the rate of unmet medical care for individuals with disabilities when it comes to dental care was higher than that for medical care; the primary reason for this was economic contraints[14,38]. Although people with disabilities generally have a lower economic

status and a higher proportion of medical aid recipients, this study did not find a significant relationship between medical aid and tooth loss. However, the results of this study demonstrated a higher OR value for tooth loss in lower-income groups, indicating that economic constraints were the primary factor preventing disabled people from receiving dental treatment.

This study confirmed that the likelihood of tooth loss was higher for the other two types of disabilities than for physical disability. The distinct features associated with each disability type present increased difficulties in oral care and dental treatment[39]. People with orthopedic impairments, especially those with rheumatoid arthritis, have an association with a higher incidence of mandibular dysfunction, encounter difficulties in self-care activities such as toothbrushing, and are more susceptible to severe periodontal disase[40]. In addition, types of disabilities that present challenges for dentists in providing dental services were reported in the following order: cerebral palsy, intellectual disability, and developmental disability[20]. People with cerebral palsy have difficulty in opening their mouths, and individuals with intellectual disabilities may face challenges during dental treatment. Patient cooperation and behavioral control during treatment are factors that indicate dissatisfaction among oral healthcare providers for the disabled[41]. It is also worth noting that the four types of disabilities corresponding to brain/mental disabilities in the present study were classified as severely disabled in dental treatment in South Korea. A study from Australia suggested that dental treatment for individuals with autism and intellectual disabilities, which often necessitates sedation or general anesthesia, can be more challenging and less conservative than treatment for physical disabilities. This difficulty may have contributed to the pattern of more tooth extractions than fillings[42]. Another study further substantiated that people with mentally retarded disabilities who were able to cooperate with dental treatment and tolerate basic preventive procedures experienced fewer tooth losses than those who could not[11].

In 2018, gingivitis and periodontal disease were reported to be the most frequent diseases with the highest rate of out-of-pocket payments among the Korean population with disabilities[43]. Moreover, a recent study found that the utilization of preventive scaling services in NHI among middle-aged people with disabilities was lower than that of other age groups, and the authors of the study raised the possibility that there may have been relatively less social interest in this age group[13]. In this situation, the present study confirmed that the positive results of periodontal treatment are meaningful for providing evidence that regular preventive periodontal treatment is very important for tooth maintenance and oral health in the middle-aged group with disabilities. Considering that the largest spending item among the average monthly additional household expenses related to disability is medical bills[31], the results of this study could serve as basic evidence suggesting that a differentiated payment system is necessary to lower access barriers to preventive scaling.

Identifying trends in tooth loss is important for establishing of dental care service and ensuring adequate healthcare workforce[3]. Experts have suggested that when establishing a treatment plan for a person with disability, the use of anesthesia for behavior control, systemic disease, economic issues, oral habits, and oral hygiene ability should be taken into consideration[41,44]. This study identified demographic and socioeconomic factors related to tooth loss in a middle-aged group with disabilities with chronic periodontitis by retrospectively analyzing national data. This is significant in that it confirmed the factors to be considered when developing a long-term dental treatment plan for these patients and demonstrated the effectiveness of periodontal treatment in maintaining teeth. This will help distinguish high-risk people with disabilities who are prone to periodontal disease and tooth loss, which is a different concept from that of severely people with disabilities who have difficulty receiving general dental services without general anesthesia. It is expected that detecting oral diseases at an earlier stage through early screening of high-risk groups among people with disabilities and monitoring them with special attention will be of great help in providing them with the opportunity to receive timely and less invasive treatment.

3. Suggestion

Tooth loss or tooth retention can be considered a comprehensive result that indicates the effectiveness and quality

of dental treatments, relationship between dentist and patient, contemporary dental treatment philosophy, and accessibility of dental care services[3,45]. To preserve the teeth and ensure the overall oral health of people with disabilities, it is necessary to establish a treatment plan that considers patient- and tooth-specific characteristics from a long-term perspective. Furthermore, the timely application of preventive periodontal treatments to manage periodontal disease is essential.

4. Limitations

As this study did not include data from people with no disabilities in the analysis, the interpretation of the results should be limited to the group with disabilities. Additionally, the variables used in the analysis did not include data on oral health behaviors, such as the number of teeth brushed. Therefore, it was not possible to confirm the influence of the oral health behavior of the study subjects on tooth loss. Finally, tooth loss was tracked using only the tooth extraction treatment code, and the variables related to the main diseases requiring tooth extraction were not considered. Therefore, the exact cause of the tooth loss remains unknown.

Notes

Conflict of interest

No potential conflict of interest relevant to this article was reported.

Ethical approval

This study was approved for exempt review by the Wonkwang University Institutional Review Board (IRB No. WKIRB-201911-SB-082).

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Funding

This study was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2021R1F1A1051049) by the Korea Environment Industry & Technology Institute (KEITI) through the "Climate Change R&D Project for New Climate Regime," which is funded by the Korea Ministry of Environment (MOE) [grant number: 2022003570006].

Acknowledgements

The author thanks professor Hosung Shin for advice on statistical analysis.

Data availability

The data used in this study were provided from database of National Health Insurance (https://nhiss.nhis.or.kr) under permission for the current study. Therefore, there are restrictions on the public use of this data, but data are available for reasonable reasons and with permission of the NHI.

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