Original Research

Evaluation of Oral Health in Stroke Patients

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Abstract

Objectives: Oral health problems are frequently seen in stroke patients and are known to be associated with pneumonia, cognitive disorders, sensorimotor deficits, and even mortality. In this study, we aimed to investigate whether there is a difference in oral health between adults who have had a stroke and healthy age-matched adults.
Materials and Methods: In total, 58 individuals who had a stroke and 26 healthy individuals were included in the study. The "Oral Health Assessment Tool (OHAT)" and a demographic information form were used as assessment tools in the study. An independent *t*-test was used to analyze differences between the groups. Data were collected face-to-face.
Results: The control group scored lower than stroke survivors in all sub-dimensions of the OHAT except the salivary sub-dimension ($p<0.001$). Similarly, in the total score, it was determined that the control group had significantly better oral health than stroke patients.
Conclusion: Oral health is a serious problem in individuals who have had a stroke compared to healthy adults. Oral health should be closely monitored and treated in stroke patients, especially in hospital settings.

Keywords: oral health, stroke, oral health assessment tool (OHAT), comparative study.

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Introduction

Stroke can have serious effects on brain structures and is reported as one of the main causes of death (Normalize et al., 2018). Oral health issues and swallowing disorders are common in patients with cerebral strokes (Smithard et al., 1996; Mann et al., 1999). In healthy cases, there is no oral/facial pain, gum disease, tooth decay/loss, and functional mouth movements are intact (WHO). These particular domains may be negatively affected in stroke patients (Dai et al., 2015). Poor oral health cases are typically associated with stroke (Kim et al., 2018) due to several reasons. Some of these include reduced mobility, decreased sensation, and restricted access to care (Lyons et al., 2018). In cases where oral health is inadequate, pneumonia and worsened nutritional status may occur, leading to longer hospital stay durations (Yoon & Steele, 2007; Bijani et al., 2014).

Studies have reported that oral health status is important not only for swallowing and feeding skills, but also for cognitive skills. Likewise, poor oral health is common in patients with cognitive impairment (Moon & Sim, 2018). Unfortutanely, oral health is typically not prioritized in post-stroke patients during their hospital stay (Kwok et al., 2015). O'Malley et al. (2020) also report in their qualitative study that oral health tends to be neglected in hospital settings. It is important to note that because oral hygiene is a prominent and highly active component of oral health status, the two terms will be used interchangably.

There are many studies comparing oral health status between stroke patients and healthy individuals. Sensorimotor deficits of stroke patients primarily affect the tongue, lips and chewing muscles (Dursun & Çankaya, 2018). Patients with chewing difficulties likewise have impaired oral health (Zeng et al., 2020). Furthermore, restriction of movements in the upper extremities also adversely affects oral health due to difficulties with brushing the teeth and similar oral hygiene activities (Schimmel et al., 2013). For example, a patient with severe right arm weakness is likely to have more trouble with brushing their teeth compared to a patient with mild or moderate right arm weakness. In light of this information, other factors in addition to oral health status should be considered in issues regarding orofacial regions. Post-stroke patients should have a thorough evaluation of their oral health status. In their systematic review, Zeng et al., (2020) report that there are serious discrepancies in oral health between stroke patients and healthy individuals. The authors conclude that their findings should be expanded and supported by further research. In Turkey, there is currently no research on the oral health status of stroke patients. Based on the aforementioned literature, oral health in stroke patients

is often problematic and is an area that needs more attention. Our study aims to examine the difference in oral health status between stroke patients and healthy age-matched individuals.

Method

This study was deemed ethically appropriate by the Ankara City Hospital Ethics Committee (Date of decision: 05/14/2020, Research Code: E1-20-533).

Participants

Inpatient services at Ankara City Hospital were used to recruit patients for this study. Patients who had a cerebrovascular accident (CVA) and were referred to the neurogenic swallowing disorders laboratory were evaluated. Before starting the study, a power analysis was performed. As a result of the power analysis with a medium effect size ($d = .50$) and power of .80, we planned on including 52 participants for the patient group and 20 participants for the control group. Inclusionary criteria for the patient group were: 1) CVA, 2) less than 3 months since stroke, 3) age over 18, and 4) native Turkish speaker. For the control group, inclusionary criteria were 1) no history of stroke or chronic illness, 2) age over 18, and 3) native Turkish speaker. In total, 59 patients were recruited. One patient did not want to be evaluated. The final sample consisted of 58 patients. Twenty-six adults were recruited and evaluated for the control group. Snowball sampling was used to reach the control group participants. Demographic information of the participants is shown in Table 1.

Forms

Demographic information form

This form included information such as age, gender, time since stroke, etiology, and education level. In order to fill-out the Demographic Information Form, software containing patient information available to clinicians at the hospital where the research was conducted was used. After completing the demographic information form, the Oral Health Assessment Tool was used.

Oral health assessment tool (OHAT)

This tool was developed by Chalmers et al. (2005) to assess the oral health of elderly individuals. A total of eight domains are evaluated: lips, tongue, gums and mucosa, saliva, teeth, dentures, oral hygiene, and dental pain. Each item adresses a specific component of the oral cavity. The lips, tongue, gums/mucosa, teeth/dentures are observed visually in order for rating each item. When filling out the tool, a score of 0 (healthy), 1 (altered), or 2 (unhealthy) is given

for each parameter. The total score ranges from 0 (very healthy) to 16 (very unhealthy). If the participant receives a score of 1 or 2 for any parameter, a referral to the dentist is recommended.

OHAT was adapted to Turkish by Şahin & Jablonsvki (2019). The inter-rater reliability coefficient is 72, and expert opinions for content validity are over .80 for each item. In line with this information, it has been reported that OHAT-TR is a valid and reliable tool (Şahin & Jablonsvksi, 2019).

Data Collection

A demographic information form and the OHAT form were used. The application took approximately 5 minutes for each patient. Data were collected face-to-face. Prior to data collection, participants were informed about the research and informed consent was obtained. Data collection lasted approximately 18 months.

Statistical Analysis

The IBM SPSS 23.00 package program was used for the analysis of the study. Descriptive statistics were used to report demographic information. Since the data obtained from the participants did not show a normal distribution, the difference between the patient and control groups was examined with an independent *t*-test.

Results

Descriptive Statistics

Descriptive statistics of participants' gender, age, and time since stroke are given in Table 1. The patient group included 36 males (62%), with a large majority over the age of 55 (95%). The average time since the stroke event was 10 weeks. The control group included 15 males (58%) with a large majority older than 55 (92%).

Table 1: Demographic Characteristics of Participants (Patient Group, *n*=58), Control Group, *n*=26)

Characteristics	Patient Group Frequency	Control Group Frequency
Gender (Male)	62%	58%
Age (+55)	95%	92%
Time since stroke	10 weeks	N/A*

*Not applicable

Independent *t*-test results

The data obtained from the OHAT tool for the patient and control groups were compared. The two groups did not differ in terms of age ($p<.001$) or gender ($p<.001$). The results of the differences for the sub-dimensions of OHAT and the total OHAT score are reported. There was a significant difference between the groups for the lips, tongue, gums and mucosa, teeth, dentures, oral hygiene, and dental pain sub-dimensions ($p<0.001$). No significant differences were found for the saliva sub-dimension between the two groups ($p=.10$). It was determined that there was a significant difference between the patient group and the control group in the OHAT total score. The patient group achieved statistically significantly higher scores than the control group ($p<0.001$). Independent *t*-test scores, means, and standard deviation values of OHAT sub-dimensions and total scores are reported in Table 2.

Table 2: Independent *t*-test results between patient group (*n*=58) and control group (*n*=26)

	Group	$\overline{X}$	SS	*t*	*p*
Lips	Patient	0.47	0.5	3.696	**0.000***
	Control	0.08	0.27		
Tongue	Patient	0.5	0.57	4.014	**0.000***
	Control	0.04	0.19		
Gums and mucosa	Patient	0.53	0.6	4.537	**0.000***
	Control	0	0		
Saliva	Patient	0.28	0.45	1.632	0.107
	Control	0.12	0.33		
Teeth	Patient	0.86	0.85	5.172	**0.000***
	Control	0	0		
Dentures	Patient	0.57	0.84	2.911	**0.005***
	Control	0.07	0.27		
Oral hygiene	Patient	1.05	0.78	5.867	**0.000***
	Control	0.12	0.33		
Dental pain	Patient	0.21	0.41	2.573	**0.000***
	Control	0	0		
Total	Patient	4.38	1.97	21.52	**0.000***
	Control	0.38	0.64		

(*$p<0.001$)

Discussion and Conclusion

In this study, the oral health status of stroke patients was compared to that of healthy, age-matched individuals. The hypothesis of the present study was that the oral health of patients

who had a stroke would be adversely affected, and this hypothesis was supported in terms of general scores and all parameters except the saliva sub-dimension. Dai et al. (2015) conducted a meta-analysis examining the oral health status of post-stroke patients. According to the results of this meta-analysis, tooth loss, dental cavities, and gum problems are more common in stroke patients compared to controls. Another meta-analysis was conducted by Kothari et al. (2017) on brain-injured patients. Results of this meta-analysis showed that the majority of oral health studies were conducted on stroke patients, and similar to the Dai et al. (2015) study results, these patients had issues with tooth loss, decay, and gums. In the findings of our study, stroke patients obtained more negative scores in the sub-dimensions of gums, teeth, dentures, and dental pain of the OHAT compared to the individuals in the control group. Moreover, the results of the present study are in concordance with previous studies and meta-analyses on the oral health status of post-stroke patients. Furthermore, to our knowledge this is the first study conducted in Turkey comparing the oral health status of post-stroke in a rehabilitation hospital with an age-matched control group. This is an important contribution to the literature as cross-cultural differences in oral hygiene practices may be present at both an individual level as well as across healthcare institutions. These findings may be helpful for developing care standards for post-stroke patients receiving services in inpatient hospitals.

Gerreth et al. (2020) state in their case-control study of sub-acute stroke patients that salivary secretion is problematic in post-stroke patients in terms of both content and function. However, there was no significant difference in the salivary sub-dimension between the patient and control groups in the present study. It is possible that salivary production and function may not be affected with the same severity in every stroke patient. The results may also be related to the sample size. A larger number of patients may reveal a different effect. It is worth noting that although no statistically significant difference exists in the saliva sub-dimension, the mean scores of stroke patients are nevertheless higher than those of the control group. Therefore, it can be stated that the patient group's scores are negatively affected compared to the control group, although this difference does not reach statistical significance.

In their scoping review, Ajwani et al. (2017) included recommendations for speech and language therapists and nurses to work together with patients on oral health. Another study suggests that dentists should also play a primary role in oral health and cooperate with other disciplines (Gerreth et al., 2021). In the present study, an oral health assessment was completed by speech and language therapists. This topic is of particular interest to speech and language therapists as they are the primary rehabilitation specialists in speech, language, and swallowing

services. As such, oral health monitoring is of critical importance for services provided by speech and language therapists. However, it is possible to say that oral health is related to many disciplines. Considering that oral health is related to many areas such as cognition, swallowing, and dental health, interdisciplinary cooperation is inevitable. Furthermore, the relationship between oral health and aspiration pneumonia has been well-documented in the literature. Elderly individuals with poor oral health are at a much higher risk of aspiration pneumonia, adverse health outcomes, and mortality due to oral pathogens entering the lungs (Müller, 2015).

The significant difference between the control group and the patient group in the present study shows that the oral health of stroke patients is at risk. The importance of monitoring oral health in the acute or rehabilitation period of post-stroke patients is once again emphasized in this study. In summary, the oral health status of post-stroke patients is more negatively affected in the areas of "lips, tongue, gums and mucosa, teeth, dentures, oral hygiene, and dental pain" compared to age-matched individuals who are healthy and have not had a stroke.

Limitations and Future Directions

Our study has some limitations. The first of these is sample size. Fifty-eight participants were included in the patient group and 26 participants were included in the control group. Although these numbers do not adversely affect the power of the study, results from a larger sample can be encouraged, especially for investigating the saliva component. Another limitation of our study is the heterogeneity between the duration of the disease in stroke patients. In the acute period, after discharge, or during the rehabilitation period, there may be noteworthy changes in the oral health of the patients. Therefore, future studies can group patients according to their time since stroke. Additional information such as patient characteristics, comorbid medical conditions, and pre-stroke hygiene practices should also be considered for delineating factors contributing to oral health status. Comparative studies between the oral health of stroke patients with other diseases (e.g., multiple sclerosis, traumatic brain injury, etc.) may be the subject of further research.

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