

Correlation between upper limb function and oral health impact in stroke survivors

FERNANDA C. DA SILVA, MSc¹⁾, DANIELA F. T. DA SILVA, PhD²⁾, RAQUEL A. MESQUITA-FERRARI, PhD³⁾, KRISTIANNE P. S. FERNANDES, PhD³⁾, SANDRA K. BUSSADORI, PhD³⁾*

¹⁾ Postgraduate Program in Rehabilitation Sciences, Nove de Julho University (UNINOVE), Brazil

²⁾ Postgraduate program in Biophotonics Applied to Health Sciences, Nove de Julho University (UNINOVE), Brazil

³⁾ Postgraduate Program in Rehabilitation Sciences and Postgraduate Program in Biophotonics Applied to Health Sciences, Nove de Julho University (UNINOVE): Rua Vergueiro 235, Brazil

Abstract. [Purpose] The aim of the present study was to evaluate the relationship between upper limb impairment and oral health impact in individuals with hemiparesis stemming from a stroke. [Subjects and Methods] The study subjects were conducted with a sample of 27 stroke survivors with complete or partial hemiparesis with brachial or crural predominance. The 14-item short version of the Oral Health Impact Profile was used to evaluate perceptions of oral health. The Brazilian version of the Stroke Specific Quality of Life Scale was used to evaluate perceptions regarding quality of life. [Results] A statistically significant association was found between the upper extremity function subscale of the SSQOL-Brazil and the impact of oral health evaluated using the OHIP-14, with a strong correlation found for the physical pain subscale, moderate correlations with the functional limitation, psychological discomfort, physical disability, social disability and social handicap subscales as well as a weak correlation with the psychological disability subscale. Analyzing the OHIP-14 scores with regard to the impact of oral health on quality of life, the most frequent classification was weak impact, with small rates of moderate and strong impact. [Conclusion] Compromised upper limb function and self-perceived poor oral health, whether due to cultural resignation or functional disability, exert a negative impact on the quality of life of individuals with hemiparesis stemming from a stroke.

Key words: Quality of life, Oral Health, Stroke

(This article was submitted Jan. 8, 2015, and was accepted Mar. 24, 2015)

INTRODUCTION

Cerebrovascular accident (stroke) is an important health problem worldwide. It is the most common reason for neurological disability in the world¹⁾. Stroke is characterized by a sudden, non-convulsive, focal neurological deficit caused by a brain lesion stemming from a non-traumatic vascular mechanism due to arterial or venous embolism leading to cerebral ischemia or hemorrhage²⁾.

The most common manifestations of stroke are sensory, cognitive and motor impairments, such as hemiparesis, spasticity, an abnormal movement pattern³⁾ and physical deconditioning^{4, 5)}. Any force exerted on the jaws should be identified as a triggering factor of a functional imbalance in the masticatory system⁶⁾. According to Saliba et al.⁷⁾, upper limb impairment is one of the most common complaints of stroke survivors with hemiparesis. It is estimated that 70% of

such individuals suffer residual disability that compromises dexterity during activities of daily living⁸⁾. Individuals with hemiparesis exhibit slow movements during activities that involve the upper limbs, such as reaching and grasping, due to limited range of motion, segmented movements and a lack of coordination among the joints^{4, 9)}.

Normal upper limb function involves the capacity for directed reach, grasping and manipulation of objects, which make up the motor skills required for the performance of activities of daily living⁶⁾ that allow an individual to lead an independent life with self-esteem⁸⁾. The execution of proper oral hygiene, for example, requires adequate motor control of the upper limbs⁹⁾. Compromised upper limb function exerts an impact on the degree of disability experienced by stroke survivors, with a significant influence on functional performance and negative consequences regarding personal, familial and social relationships as well as quality of life¹⁰⁾.

Despite the gradual return of motor function resulting from a combination of spontaneous recovery and physical therapy, the use of the paretic limb is often less than its normal potential in daily living¹¹⁾. Depending on the degree of upper limb impairment, the maintenance of adequate oral health among stroke survivors can be hindered^{3, 8)}. Moreover, inadequate oral hygiene can compromise both oral health and quality of life.

*Corresponding author. Sandra K. Bussadori (E-mail: sandrakalil@uninove.br)

Considering the high prevalence rates of functional limitations to the paretic arm⁷⁾, the aim of the present study was to evaluate the relationship between upper limb impairment and oral health impact in individuals with hemiparesis stemming from a stroke.

SUBJECTS AND METHODS

This study received approval from the local human research ethics committee under process number 259.239. All participants received an explanation about the study and authorized participation by signing a statement of informed consent in compliance with Resolution 466/2012 of the Brazilian National Board of Health. The participants were recruited from the Physical Therapy Clinic of Nove de Julho University (Brazil).

A descriptive, cross-sectional study was conducted of a sample of 27 stroke survivors with complete or partial hemiparesis with brachial or crural predominance. Control of the trunk was an additional inclusion criterion. Individuals with cognitive deficit, those with dentofacial deformities, those receiving dental treatment and those with sensitivity abnormalities or quadriplegia were excluded from the study.

The 14-item short version of the Oral Health Impact Profile (OHIP-14)¹²⁾ was used to evaluate perceptions of oral health¹³⁾. This questionnaire has seven subscales, each with two questions: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and social handicap. The OHIP-14 was developed as a self-administered questionnaire. However, to eliminate limitations related to the function of the paretic upper limb, the questionnaire was administered in interview form (the researchers read the questions aloud and marked the respondents' answers).

The Brazilian version of the Stroke Specific Quality of Life Scale (SSQOL-Brazil)^{14, 15)} was used to evaluate perceptions regarding quality of life. This scale has 49 items distributed among 12 subscales (energy, family roles, language, mobility, mood, personality, self care, social roles, reasoning, upper extremity function, vision and work/productivity). Each item has five response options referring to function in the previous week. The score of each item ranges from 1 to 5 points and the total ranges from 49 (worst perception of quality of life) to 245 (best perception). In the present study, only the upper extremity function subscale was employed to analyze its association with oral health impact. Although upper extremity function on this questionnaire is evaluated based on actions such as fastening a button and opening/closing a zipper, SSQOL-Brazil was chosen for use in the present study due to the lack of specific questionnaires in the literature for the evaluation of upper limb function in relation to oral self-care and even the function of feeding oneself.

Statistical analysis was performed using the SPSS program version 20.0. The Shapiro-Wilk's test was used to determine whether or not the data had a normal distribution. Parametric data are expressed as the mean and standard deviation (SD). Nonparametric data are expressed as the median and interquartile range. Pearson's correlation coefficients were calculated to determine the magnitude, direction

Table 1. Correlations between the upper extremity function (UEF) subscale of SSQOL-B and OHIP-14 scales among individuals with hemiparesis stemming from a stroke

UEF (SSQOL) X OHIP-14	n	r
Functional limitation	27	-0.502*
Physical pain	27	-0.707*
Psychological discomfort	27	-0.474*
Physical disability	27	-0.461*
Psychological disability	27	-0.393*
Social disability	27	-0.549*
Social handicap	27	-0.555*
OHIP-14	27	-0.722*

and significance of associations between variables related to upper limb function and oral health impact. The strength of the associations was classified as weak (correlation coefficient: 0.1 to 0.3), moderate (correlation coefficient: 0.4 to 0.6) or strong (correlation coefficient: 0.7 to 1). A level of significance of 5% ($p < 0.05$) was used in all analyses.

RESULTS

Twenty-seven individuals with hemiparesis stemming from a stroke participated in the present study. The female accounted for 37.1% ($n = 10$) of the sample and the male accounted for 62.9% ($n = 17$). The mean age of the subjects was 60.5 ± 12.7 years (range: 30 to 85 years) and the mean time since the occurrence of stroke was 28.5 ± 29.6 months (range: 2 to 108 months). A total of 51.8% of the sample ($n = 14$) had right side hemiparesis and 48.2% had left side hemiparesis; 63% ($n = 17$) had complete hemiparesis and 37% ($n = 10$) had partial hemiparesis; 55.5% ($n = 15$) had brachial predominance and 44.4% ($n = 12$) had crural predominance.

A statistically significant association was found between the upper extremity function subscale of the SSQOL-Brazil and the impact of oral health evaluated using the OHIP-14, with a strong correlation found for the physical pain subscale (-0.707), moderate correlations with the functional limitation (-0.502), psychological discomfort (-0.474), physical disability (-0.461), social disability (-0.549) and social handicap (-0.555) subscales, as well as a weak correlation with the psychological disability subscale (-0.393). All correlations were negative (Table 1).

For the evaluation of oral health impact on quality of life, the responses received codes, which were multiplied by the respective weight of the question: 0 = never or "I don't know"; 1 = hardly ever; 2 = occasionally; 3 = fairly often; and 4 = very often. Thus, the maximum score for each dimension was 4 points and the impact of each dimension was classified as weak, moderate or strong. The total score ranged from 0 to 28. A score of 0 to 9 indicated weak impact, 10 to 18 indicated moderate impact and 19 to 28 indicated strong impact (i.e., higher scores denoted greater negative oral health impact on quality of life). The same was true for each dimension, for which the scores ranged from 0 to 4.

Among the 27 individuals in the present sample, the mean

Table 2. Distribution of impact of oral health conditions per OHIP-14 subscale among individuals with hemiparesis

Subscale	Mean	SD	Impact
Functional limitation	0.74	1.2	Weak
Physical pain	0.66	1.1	Weak
Psychological discomfort	1.06	1.3	Weak
Physical disability	0.57	0.9	Weak
Psychological disability	0.67	1.0	Weak
Social disability	0.47	1.1	Weak
Social handicap	0.45	1.0	Weak
Sum of subscales	4.63	6.6	Weak

overall OHIP-14 score was 4.63 with a standard deviation (SD) of 6.6 (range: 0.00 to 24.27). Oral health status exerted a weak impact on the quality of life of the subjects (Table 2).

Analyzing the OHIP-14 scores with regard to the impact of oral health on quality of life, the most frequent classification was weak impact ($n = 24$; 88.8%), with small rates of moderate ($n = 1$; 3.70%) and strong ($n = 2$; 7.40%) impact (Table 3).

DISCUSSION

In the present study, we found that compromised upper limb function exerts an impact on the degree of disability experienced by stroke survivors. In the present study, hemiparesis with brachial predominance affected 55.5% of the sample, which may explain the strong association found between physical pain and upper limb function. Hemiparesis leads to instability in movements of the trunk and limbs, thereby compromising performance of activities of daily living, such as oral hygiene, which depend on adequate motor control of the upper limbs^{16–19}. Hemiplegia may impact on a person's ability to carry out oral care procedures and reduce mobility after stroke²⁰.

Age is another factor that may have influenced the subjects' ability to perform self-care in the present sample, as the mean age was 60.5 years. Silvestre et al.²¹ reported approximately 40% of individuals aged 60 years or older need some type of assistance to perform at least one instrumental activity of daily living and 10% need assistance to perform basic tasks, such as bathing, dressing and other aspects of self-care. According to Hunt et al.²² and Slade et al.¹², older adults experience greater functional limitation and psychological discomfort. The combination of the negative consequences of ageing and stroke leads to a substantial reduction in quality of life.

The total OHIP-14 score in the present study was low (4.6 points). In contrast, Reed et al.²³ found that 137 older adults at an extended care facility had a poor perception of their oral health status. Many older adults seem not to be bothered by poor oral health, which demonstrates a certain cultural resignation²⁴. Indeed, oral problems are often minimized in comparison to other adverse health conditions²⁵. Numerous clinical conditions, such as poor posture and malocclusion may be related to the muscles of mastication, the temporomandibular joint and associated structures, and may change

Table 3. Classification of answers to OHIP-14 questionnaire according to the general impact of oral health on quality of life

Impact	n	%
Weak	24	88.8
Moderate	1	3.70
Strong	2	7.40
Total	27	100

orofacial functions²⁶. Thus, when evaluating quality of life, older adults often perceive poor oral health as normal or acceptable for someone at an advanced age. Despite this resigned attitude, the association between oral health and quality of life indicates that oral problems exert a negative impact on the emotional well being of this population. In the present study, a negative correlation was found between social disability (OHIP-14) and quality of life (SSQOL-B), as individuals with higher social disability scores stemming from oral problems had lower quality of life scores. These findings are in agreement with data reported by Marinõ et al.²⁷ and Tatematsu et al.²⁸, who stated oral pain and problems with eating, chewing, smiling and speaking tend to affect an individual's wellbeing substantially.

For individuals with hemiparesis, adequate oral health may mean reintegration into society and a significant improvement in quality of life. Therefore, the rehabilitation of the paretic upper limb and orofacial function can lead to an improvement in the quality of life of such individuals.

Compromised upper limb function and self-perceived poor oral health, whether due to cultural resignation or functional disability, exert a negative impact on the quality of life of individuals with hemiparesis stemming from a stroke.

REFERENCES

- 1) Pontes-Neto OM, Silva GS, Feitosa MR, et al.: Stroke awareness in Brazil: alarming results in a community-based study. *Stroke*, 2008, 39: 292–296. [Medline] [CrossRef]
- 2) Canning CG, Ada L, O'Dwyer NJ: Abnormal muscle activation characteristics associated with loss of dexterity after stroke. *J Neurol Sci*, 2000, 176: 45–56. [Medline] [CrossRef]
- 3) Doucet BM, Griffin L: Variable stimulation patterns for poststroke hemiplegia. *Muscle Nerve*, 2009, 39: 54–62. [Medline] [CrossRef]
- 4) Allen DG: Fatigue in working muscles. *J Appl Physiol* 1985, 2009, 106: 358–359. [Medline] [CrossRef]
- 5) Kelly-Hayes M, Robertson JT, Broderick JP, et al.: The American Heart Association Stroke Outcome Classification. *Stroke*, 1998, 29: 1274–1280. [Medline] [CrossRef]
- 6) Bortoletto CC, Cordeiro da Silva F, Silva PF, et al.: Evaluation of cranio-cervical posture in children with bruxism before and after bite plate therapy: a pilot project. *J Phys Ther Sci*, 2014, 26: 1125–1128. [Medline] [CrossRef]
- 7) Saliba VA, Júnior IP, Faria CD, et al.: Propriedades Psicométricas da Motor Activity Log: uma revisão sistemática da literatura. *Rev Fisioter Mov*, 2008, 21: 59–67.
- 8) Harris JE, Eng JJ: Paretic upper-limb strength best explains arm activity in people with stroke. *Phys Ther*, 2007, 87: 88–97. [Medline] [CrossRef]
- 9) Zackowski KM, Dromerick AW, Sahrman SA, et al.: How do strength, sensation, spasticity and joint individuation relate to the reaching deficits of people with chronic hemiparesis? *Brain*, 2004, 127: 1035–1046. [Medline] [CrossRef]
- 10) Shumway-Cook A, Woollacott MH: Controle motor: teoria e aplicações práticas, 2nd ed. Barueri: Manole, 2003, pp 179–208.

- 11) Uswatte G, Taub E, Morris D, et al.: Reliability and validity of the upper-extremity Motor Activity Log-14 for measuring real-world arm use. *Stroke*, 2005, 36: 2493–2496. [[Medline](#)] [[CrossRef](#)]
- 12) Slade GD, Spencer AJ: Development and evaluation of the Oral Health Impact Profile. *Community Dent Health*, 1994, 11: 3–11. [[Medline](#)]
- 13) Lai SM, Perera S, Duncan PW, et al.: Physical and social functioning after stroke: comparison of the Stroke Impact Scale and Short Form-36. *Stroke*, 2003, 34: 488–493. [[Medline](#)] [[CrossRef](#)]
- 14) Hsueh IP, Jeng JS, Lee Y, et al.: Construct validity of the stroke-specific quality of life questionnaire in ischemic stroke patients. *Arch Phys Med Rehabil*, 2011, 92: 1113–1118. [[Medline](#)] [[CrossRef](#)]
- 15) Geyh S, Cieza A, Kollerits B, et al.: Content comparison of health-related quality of life measures used in stroke based on the international classification of functioning, disability and health (ICF): a systematic review. *Qual Life Res*, 2007, 16: 833–851. [[Medline](#)] [[CrossRef](#)]
- 16) Lockette KF, Keyes M: *Conditioning with physical disabilities*. Chicago: Rehabilitation Institute of Chicago, 1994, p 433.
- 17) Chagas EF, Tavares MC: Simetria e transferência de peso do hemiplégico: relação dessa condição com o desempenho de suas atividades funcionais. *Rev Fisioter Univ*, 2001, 8: 40–50.
- 18) Nakayama H, Jørgensen HS, Raaschou HO, et al.: Compensation in recovery of upper extremity function after stroke: the Copenhagen stroke study. *Arch Phys Med Rehabil*, 1994, 75: 852–857. [[Medline](#)] [[CrossRef](#)]
- 19) Hunter S, Crome P: Hand function and stroke. *Rev Clin Gerontol*, 2002, 12: 68–81. [[CrossRef](#)]
- 20) Terroni LM, Leite CC, Tinone G, et al.: Poststroke depression: risk factors and antidepressant treatment. *Rev Assoc Med Bras*, 2003, 49: 450–459. [[Medline](#)] [[CrossRef](#)]
- 21) da Silva SR, Castellanos Fernandes RA: Self-perception of oral health status by the elderly. *Rev Saude Publica*, 2001, 35: 349–355. [[Medline](#)]
- 22) Hunt RJ, Slade GD, Strauss RP: Differences between racial groups in the impact of oral disorders among older adults in North Carolina. *J Public Health Dent*, 1995, 55: 205–209. [[Medline](#)] [[CrossRef](#)]
- 23) Reed R, Broder HL, Jenkins G, et al.: Oral health promotion among older persons and their care providers in a nursing home facility. *Gerodontology*, 2006, 23: 73–78. [[Medline](#)] [[CrossRef](#)]
- 24) Haikal DS, Paula AM, Martins AM, et al.: Self-perception of oral health and impact on quality of life among the elderly: a quantitative-qualitative approach. *Cien Saude Colet*, 2011, 16: 3317–3329. [[Medline](#)] [[CrossRef](#)]
- 25) Reisine S, Miller J: A longitudinal study of work loss related to dental diseases. *Soc Sci Med*, 1985, 21: 1309–1314. [[Medline](#)] [[CrossRef](#)]
- 26) Dahl KE, Wang NJ, Holst D, et al.: Oral health-related quality of life among adults 68–77 years old in Nord-Trøndelag, Norway. *Int J Dent Hyg*, 2011, 9: 87–92. [[Medline](#)] [[CrossRef](#)]
- 27) Mariño R, Schofield M, Wright C, et al.: Self-reported and clinically determined oral health status predictors for quality of life in dentate older migrant adults. *Community Dent Oral Epidemiol*, 2008, 36: 85–94. [[Medline](#)]
- 28) Tatematsu M, Mori T, Kawaguchi T, et al.: Masticatory performance in 80-year-old individuals. *Gerodontology*, 2004, 21: 112–119. [[Medline](#)] [[CrossRef](#)]