

## Perception of Oral Status as a Barrier to Oral Care for People with Spinal Cord Injuries

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### Introduction

According to the American Association of People with Disabilities, 19% of the American population (49 million) have a disability.<sup>1</sup> Of this population, approximately 255,702 sustained a spinal cord injury (SCI), with approximately 10,000 to 12,000 new SCIs per year.<sup>2,3</sup> According to the Mississippi Department of Health Spinal Cord and Traumatic Injury Registry, approximately 1,500 people with a SCI are living in Mississippi.<sup>4</sup> This incidence rate in Mississippi, calculated without including pre-hospital mortalities, is more than twice the national average.<sup>5</sup> Primary risk factors for new SCIs are largely attributed to Mississippi's high rate of motor vehicle crashes, low safety belt usage, poor road conditions, violence in high crime neighborhoods and falls.<sup>5-7</sup>

While the Surgeon General's report addresses the relationship between overall health and oral health,<sup>8</sup> very little research has been conducted on oral health among people with SCIs. The literature review provides an insight to the SCI individual's access to dental care dilemmas and perception of own oral health. The results may serve as a foundation for developing programs and policies to improve oral care for people with SCIs, such as special training, clinics that specifically address SCI oral needs, better usage of dental hygienists, provision of transportation, education and governmental economic support for oral health care among people with SCIs.

The hypothesis of this study states that people with SCIs perceive their oral health status as better than the dental experts' examination scores. More people with SCIs will think they

### Abstract

**Purpose:** The purpose of this study was to examine the oral health status of people with spinal cord injuries (SCIs) and determine if people with a SCI have an accurate perception of their oral status, and if this is potentially a barrier to oral care. Methods consisted of a survey and oral examination given to 92 willing participants of the Methodist Rehabilitation Center who sustained a SCI. The examination consisted of periodontal status using Periodontal Screen and Recording Index™ and dental status using Decayed, Missing, Filled Teeth index. Oral health score was also determined through questioning the participant. These scores, retrieved by the dental hygienist, were then compared to what the SCI individual's perception of their own oral health. Results indicate their perception of oral health was much better than dental assessment showed. Additionally, more than 18% of this population was completely unaware of decay which was found in over half of those studied, and more than 60% were unaware of periodontal disease that was exhibited in over 75% of those studied. This comparison evaluated a major awareness about the need for education and oral care among the SCI population.

**Keywords:** dental hygienists, spinal cord injuries, barriers to oral care

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have a healthy mouth ("Do you think your mouth is healthy?") compared to the actual Oral Health Score (OHS). Fewer people with SCIs will think they have cavities ("Do you think you have cavities?") compared to the actual Decayed, Missing, Filled Teeth (DMFT) score. Finally, fewer people with SCIs will think they have gingivitis ("Do you think you have gum disease?") compared to the actual Periodontal Screen and Recording Index™ (PSR).

SCIs can cause loss of movement (paralysis) and feeling below the site of the injury. Paralysis that involves the majority of the body, including the arms and legs, is called quadriplegia or tetraplegia. When SCIs affect only the lower body, the

condition is called paraplegia. In general, people with SCIs are more prone to develop diabetes, hypertension, obesity, bladder infections, depression and wounds, such as pressure ulcers.<sup>9</sup> Individuals with SCIs must also learn to control or respond to autonomic dysreflexia, psychosocial and quality of life issues. Their general needs include management of urinary tract, gastrointestinal tract, integumentary system (pressure sores), cardiovascular system and neurological system. Issues pertaining to these systems are taught and reinforced during rehabilitation.<sup>10</sup> More specifically, SCI patients with an injury lower than the seventh cervical vertebra (C7) should ideally be able to independently accomplish all activities of daily living with the exception of walking. In individuals with a C7 and higher SCI, the focus turns towards meeting primary goals such as self-care and bladder and bowel care.<sup>11</sup> Hence, the SCI population often has difficulty participating in activities of daily living. Foremost among these restrictions is the access of health care services.<sup>12</sup>

People with SCI often face greater barriers to care than those in the able population. In general, barriers that may limit maintenance of proper oral health include a lack of dental professionals on the rehabilitation team, fear, lack of transportation, lack of accessibility to the dental office and lack of financial assistance. Overcoming these potential barriers to oral health care among the SCI population requires a better understanding of their oral care, practices and perception of their dental status.

Dental professionals are typically not members of a rehabilitation team and dental clinics are not a part of rehabilitation centers.<sup>13</sup> It is a dental professional who will more likely recognize gingival conditions and/or dental decay compared to all other caregivers.<sup>14</sup> Dental care should be coordinated with other health care professionals.<sup>15</sup> Dental care is less complex while the disabled is still in a rehabilitation facility that includes an on-site dentist rather than waiting until the patient is home relying on a caregiver, although most caregivers are the ones who are instrumental in taking the disabled to the dentist.<sup>16</sup> Modifications to routine procedures may also be indicated, such as proper airway position and wheelchair transfers. This coordination would be more easily accessible in rehabilitation centers which can include the appropriate professionals all in one setting.<sup>17</sup>

Persons with disabilities report a high level of fear, anxiety and nervousness towards dental visits.<sup>18,19</sup> Although it may be thought that this is true among the entire population and not just

those with a disability, only 20% of the overall population reported being nervous versus 34% of the special needs population.<sup>19</sup> Perhaps this is due to the lack of regular dental care that has not been easy to access, or perhaps it is due to an unpleasant past dental experience. The point is that many more dental appointments would be kept if sedation were offered to those who were anxious.<sup>20</sup>

Within the environment of the dental office are several factors which contribute to the barriers of dental care. Scheduling and keeping appointments, enduring wait times, dealing with dental staff, feeling rushed, gaining access, filing insurance and coping with the actual dental chair or cubicle space are among some of these office barriers. Excessive wait times, while an inconvenience to most, create special problems for SCI clients. The reports of excessive wait times were generally dealing with Medicaid patients as opposed to those paying with cash.<sup>21</sup> This can be a serious problem for the fact that most SCI patients have bladder, bowel and pressure ulcer issues and they will need to be treated in a timely manner. Also, if wait times are minimal, this leaves less time for the client to be nervous. Some patients perceived the office personnel as being rude, disrespectful, judgmental and insensitive to their disability or the fact that they had Medicaid.<sup>21</sup> Others report after waiting for long periods of time that the dentist was rushed and did not spend adequate time treating them. These experiences create strong barriers for some and discourage dental care in general.<sup>21,22</sup> Although transportation is provided through social services for those who do not own or cannot drive a car, this service was considered unreliable and inconvenient. The 2 barriers of transportation and scheduling appointments, when combined, make the possibility for being late or not making the appointment at all a strong likelihood.<sup>21</sup>

Dental offices must follow the guidelines provided by the Americans with Disabilities Act. Dentists are required to make reasonable modifications to facilitate access into the dental office by providing wheelchair ramps, spacious washrooms with grab bars at the correct level, raised toilets, widened paths and doorways and parking.<sup>23,24</sup> Dental professionals can also learn certain techniques to help transfer the SCI patient into the dental chair.<sup>25,26</sup> Dental offices must become more accessible to the physically challenged.<sup>27</sup>

Underutilized dental services are not surprising, due to the fact that many people who sustain SCIs are deprived socioeconomically. Most den-

tal care that is provided is paid by the SCI individual's personal insurance. Since personal insurance is often provided through work, many of these individuals simply do not have insurance. However, even SCI individuals fortunate enough to have their own private insurance reported difficulty with the insurance filings.<sup>19</sup> Although having insurance was not a significant variable in receiving rehabilitation services,<sup>28</sup> payors and the lack of finances are a very important reason why those with SCIs may have difficulty accessing dental care. People with SCIs reported the greatest occurrence of difficulty accessing needed services, with the most frequently cited reason for this difficulty was the provider did not take Medicaid.<sup>12</sup> Those that have SCIs are eligible for Medicaid, but it is difficult to find a dentist willing to take this form of payment.<sup>21</sup> In addition, there are certain criteria used to determine when or if SCI individuals are eligible for this federal assistance.

Until recently, literature was not available specifically on the oral health of those with SCIs. The general foundation for the above literature review which spawned this study was supported by extrapolating data from studies pertaining to those with special needs and making the link to those with SCIs. Since this study's completion, a few new studies specifically related to oral health of those with SCIs have been released. These studies also support the above literature review stating that half the people with SCIs report current oral problems, have barriers to oral care, are less likely to have had dental cleanings than the general population and potentially have more dental caries.<sup>29-31</sup>

Table I: Descriptive Statistics of SCI Subjects (n=92)

Age	Range: 18–71 Mean: 41
Age of SCI occurrence	Range: 15 to 69 Mean: 33
Race	Caucasian: 55% African American: 45%
Gender	Male: 72% Female: 28%
County	Rural: 46% Urban: 54%
Income	Don't know: 25% \$14,000 or less: 35% \$15,000 to \$34,999: 16% \$35,000 to \$64,999: 17% \$65,000 and above: 7%
Education	Not completed high school: 30% High school graduate: 57% College/ technical graduate: 13%
Living situation	Institutionalized: 17% Live in partner/spouse: 65% Self/alone: 17%
Upper extremity function	Can't bring hand to mouth: 18% (17% cervical injury) Able to bring 1 hand to the mouth: 82%
Independence for Oral Health	Can't do without help: 15% Needs help with set up or supervision: 12% Needs a special device or extra time: 8% Can brush w/o help: 65%
Daily oral habits	Brush: 84% Floss: 14% Mouth rinse: 48% Tobacco use: 33% Mouthstick use: 13%
Dental insurance	None: 50% Medicare/Medicaid: 26% Private: 24%
Health insurance	None: 2% Medicare: 5% Medicaid: 35% Private: 22% More than 1 of the above: 35% Workman's comp: 1%

Although many barriers pose a huge problem, lack of the actual perceived need appears to be the biggest barrier among people with special needs.<sup>32</sup> Research is still very limited on this topic. This study will add to the current literature on the perception people with SCIs have of their own oral health. Preventive services have contributed to the decrease in the incidence of dental disease over the years, therefore, this perception of perceived need must be changed.<sup>33</sup>

Table II: Oral Health Status Levels Determined By Oral Health Score (OHS) (n=92)

Descriptive Statistics of OHS					
		Frequency	%	Valid %	Cumulative %
Valid	91 to 100 – Good	17	18.5	18.5	18.5
	81 to 90 – Not that bad	27	29.3	29.3	47.8
	70 to 80 – Oral care and treatment is needed	19	20.7	20.7	68.5
	Below 70 – Oral cavity should be sorted out immediately	29	31.5	31.5	100.0
	Total	92	100	100	

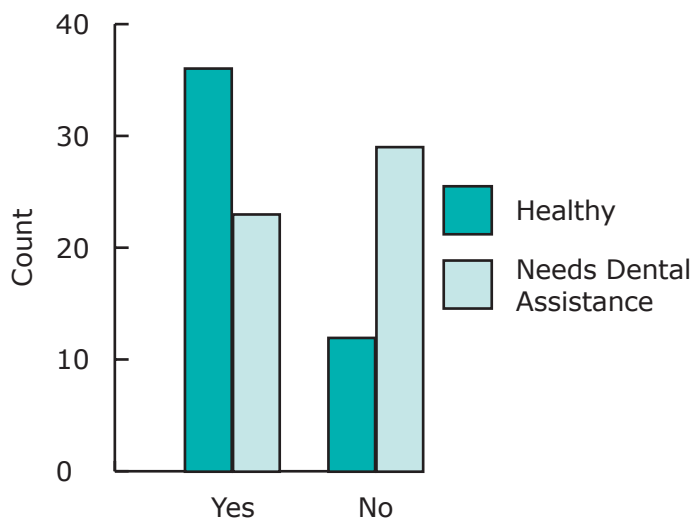
## Methods and Materials

People with SCIs who received care at Mississippi Methodist Rehabilitation Center were asked to participate in a study to examine oral health status among Mississippians with SCIs. Only those who had obtained the spinal injury over 6 months prior to the exam were used. Approval for the research project was obtained through the institutional review boards of the University of Mississippi and Methodist Rehabilitation Center. People with SCIs having any heart/valve conditions following the 2007 American Heart Association guidelines were excluded from the study. Even though traditional dental treatment was not being provided to these individuals, placing a periodontal probe below the gingiva could cause unnecessary bacteria to enter into the bloodstream. In addition, individuals with SCIs and an artificial joint replacement within the last 2 years were also excluded from the study per the advisory statement issued by the American Dental Association and American Academy of Orthopedic Surgeons.<sup>34,35</sup> Exclusion criteria for this study were chosen to ensure the safety of participants and ensure that antibiotics were not used unnecessarily. For safety reasons, medical records were reviewed by the dental hygienist upon request. After informed consent was gathered, an oral survey and dental examination was given to a total of 92 individuals with SCI.

Indices used for dental evaluation were OHS, PSR™ and DMFT. The OHS consisted of 8 questions, each scored 0 to 20 points, that calculated a numerical measure of a patient's oral health status. Some questions were worth up to 20 points, while some a maximum of only 10 points. The total score ranged from 0 to 100 points. Each of the following categories were set according to the OHS guidelines provided by Denplan Excel practices (widely used in the United Kingdom) described as:

- Good (scores totaling over 90)
- "Not that bad" (scores ranging from 80 to 90)
- Treatment needed (scores ranging from 70 to 80)

Figure 1: Cross tabulation of people with SCI who thought their mouth was healthy, versus those who actually had a healthy mouth (n=92)



Yes: Those who thought their mouth was healthy  
 No: Those who did not think their mouth was healthy

Table III: Hard Tissue Status Determined By Decayed, Missing, Filled Teeth DMFT (n=92)

Descriptive Statistics of DMFT					
	n	Minimum	Maximum	Mean	Standard Deviation
D score	92	0	24	2.83	4.571
M score	92	0	32	7.84	8.979
F score	92	0	22	4.14	4.985
DMFT	92	0	32	14.97	9.332

- Immediate care necessary (scores below 70)<sup>36</sup>

Raw OHS were also gathered and compared. Information gathered for OHS included patient comfort, assessment of caries (decay), assessment of wear, assessment of periodontal status, assessment of occlusion, assessment of mucosa and a general assessment of dentures if applicable. This outcome measure was selected because it included the pa-

tient's perception, provided a valid representation of oral health, granted easy use and required minimal training for administration.<sup>36</sup>

The DMFT score represents the number of teeth that exhibit caries in adults. To arrive at the overall DMFT score each tooth received a D for decay, an M for missing or an F for filled.<sup>37</sup> Scoring was based on 32 teeth with only 1 letter representing each tooth. If a tooth had been restored yet had additional decay the tooth was classified as a D. Scores were averaged and each participant received an average D score, M score and F score, as well as DMF score. The DMFT does not represent the extent of disease and is preferred for prevalence studies. Therefore, D, M and F were each measured independently.

Periodontal disease was measured by using the American Dental Association's PSR™, a modified community periodontal index of treatment needs, which measures gingival condition using a scoring scale of: healthy (0), presence of bleeding (1), presence of calculus deposits (2), presence of shallow pockets (3), presence of deep pockets (4), any abnormalities (such as recession above 3.5 mm, mobility and mucogingival involvement) (5, typically noted as PSR™'s asterisk) and edentulous patients (6, typically noted as PSR's x). Scores are calculated by using the worst or highest number per sextant (the oral cavity is divided into 6 portions). The need is then categorized into: no periodontal treatment is needed (0), oral hygiene is needed (1), professional cleaning is needed (2), oral hygiene instructions and professional cleaning are needed (3) and complex treatment (such as deep scaling by dental hygienist or referral to periodontist) is needed (4 and 5). A score of 6 that was given to those few patients that were completely edentulous indicated it was too late for periodontal treatment. This score was calculated by using the worst or highest score of all the sextants combined.<sup>38</sup>

In addition to the examination, a short survey asking demographic information and specifically

Figure 2: SCI patients who thought their mouth was healthy compared to Denplan categories (n=92)

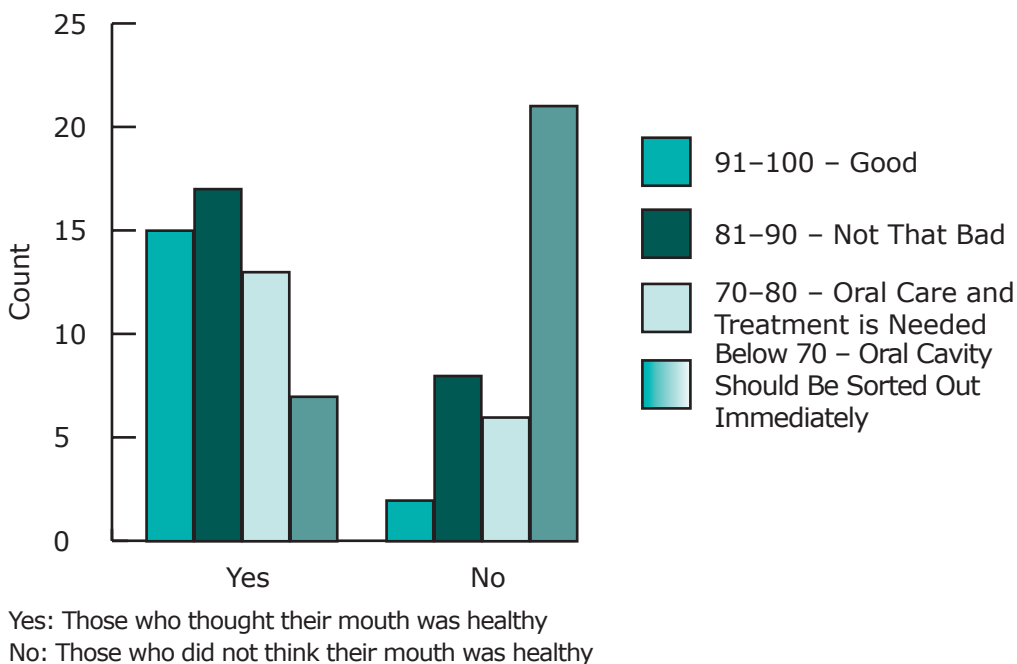


Figure 3: Compares how many SCI patients thought they had cavities to how many actually had cavities (n=92)

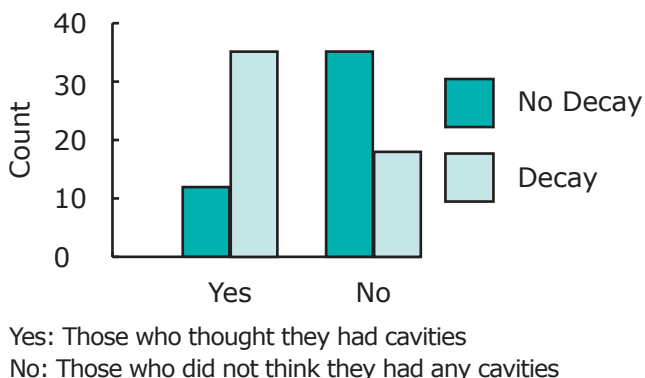
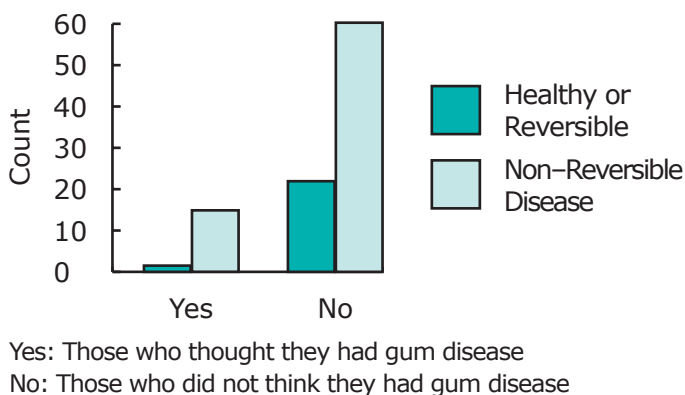


Figure 4: Cross tabulation that compares those with SCIs that thought they had gum disease to those who actually did have periodontal disease (n=92)



asking 3 perception questions was given. Questions were: do you think your mouth is healthy, do you think you have cavities and do you think you have gum disease? The survey questionnaire was deemed valid through a consensus of experts including a dentist, dental hygienist, rehabilitation researcher, rehabilitation nurse, occupational therapist and a statistician. From the survey, the hypothesis focused on how the SCI individual perceived their own dental health. Answers to each perception question were compared to OHS, DMFT, PSR™ and scores. This indicated the validity of SCI individuals' perception of oral health compared to dental professionals' assessments. Since perception is stated as one of the biggest barriers to dental care, such a comparison evaluated an awareness about the need for oral care among the SCI population.<sup>32</sup>

All data was uploaded into SPSS 16.0 for Windows and carefully examined. Frequencies, crosstabs and chi-squared were used to compare perceived oral status to the dependent variables of OHS, DMFT and PSR™. Records were kept anonymous and confidential.

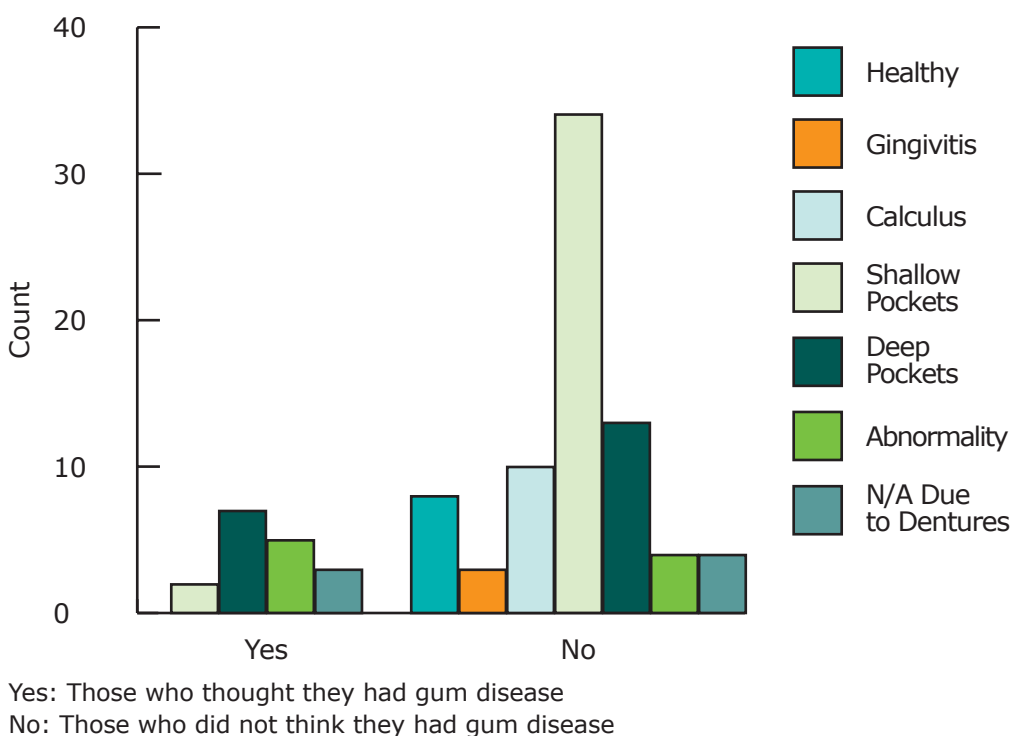
## Results

The study included 92 people with SCIs ages 18 to 71 who sustained their spinal injury a minimum of 6 months prior to appointment (Table I). People with SCIs perceived that their oral health status was better than it actually was (determined from examination scores by dental professional).

Table IV: Periodontal Status Determined By Periodontal Screen And Recording Index™ (PSR™) (n=92)

Descriptive Statistics of PSR					
		Frequency	%	Valid %	Cumulative %
Valid	Healthy	8	8.7	8.9	
	Gingivitis	2	2.2	2.2	8.9
	Calculus	11	12.0	12.2	11.1
	Shallow pockets	40	43.5	44.4	23.3
	Deep pockets	19	20.7	21.1	67.8
	Abnormality	6	6.5	6.7	88.9
	Not applicable due to dentures	4	4.3	4.4	95.6
	Total	90	97.8	100.0	100.0
Missing	System	2	2.2		
	Total	92	100.0		

Figure 5: Compares those with SCI that thought they had gum disease to individual categories within the PSR (n=92)



Of those surveyed, 59% perceived their mouth as healthy. However, according to the actual scores from the OHS index (Table II), only 47.8% were considered good to healthy (a score above 80). Of the 59% who perceived their mouth as healthy, only 36% actually were considered good to healthy. Using a cross tabulation and chi-square to analyze this data revealed that 23% of those who needed dental assistance thought their mouth was already healthy (Figures 1, 2).

Next, fewer people with SCIs thought they had caries (“Do you think you have cavities?”) when compared to the actual decayed portion to the DMFT score (Table III). Only 47% thought they had cavities, whereas 53% actually had decay observed visually without the use of radiographs, concluding that 18% were completely unaware they had clinically visual decay (Figure 3).

Finally, fewer people with SCIs thought they had gingivitis (“Do you think you have gum disease?”) than the actual PSR™ revealed. Only 16% thought they had gum disease, while over 75% actually had calculus, periodontal disease and/or gingivitis present (Table IV). Approximately 60% of those who thought they had no gum disease were already experiencing periodontal disease (Figures 4, 5).

## Discussion

This study provides a snapshot of the oral health status of people with SCIs in Mississippi. In all cases (perception of oral health, cavities and periodontal disease), people with SCIs thought their oral health was better than it was determined to be by a dental professional. One reason that guided this hypothesis was the assumption that people with SCIs may have other priorities than oral health. Indeed, functions endorsed as most relevant to SCI people include regaining arm and hand function, followed by sexual function, then bladder function and finally ability to exercise.<sup>39</sup> Most likely these functions were not met in the majority of our participants, leading to less emphasis on oral health and impaired judgment about seriousness of oral problems.

Little is known of how people actually perceive oral health. Among the general population, those who perceived their oral health as better are younger, more educated, of higher income, partial-less/denture-less, oral pain-free, symptom-free from dental problems and had visited the dental office

within the past year.<sup>40</sup> Future studies should include why people with SCIs perceive their oral health as better than it actually is.

Since people with SCIs do perceive their oral health as better than it actually is, health care providers need to do a better job of screening and relaying oral status to this population. Interdisciplinary collaboration must be incorporated.<sup>41</sup> Many nurses, occupational therapists, physical therapists and speech therapists are already screening the oral cavity and giving oral hygiene instructions. Where are the trained dental professionals/hygienists? In Mississippi, dental hygienists are not allowed to perform these duties without the direct supervision of a dentist. When compared to other states, Mississippi has one of the lowest dental hygiene professional practice index scores, which indicates that a revision to the dental hygiene practice statute is necessary to ensure better access to dental care.<sup>42</sup>

## Conclusion

This research has confirmed that people with SCIs need to be made aware of their dental status and educated on habits to promote oral health. Once again, preventive services that are usually provided by a dental hygienist contribute to a decrease in dental disease.<sup>33</sup> Once dental hygienists in this state and all states are allowed to provide services and/or screenings that they are trained to do, it will not be difficult to fight dental disease in people with SCIs.

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## References

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1. American Association of People with Disabilities. Disability rights community sobered on ADA anniversary. Disability rights community sobered by loss of movement leader supreme court decisions on ADA's 12th anniversary. DIMENET [Internet]. 2002. Available from: <http://www.dimenet.com/hotnews/archive.php?mode=N&id=2389>
2. Early PJ. Spinal cord injuries – and treatment – can change lives. Healthlink [Internet]. 2003 [cited 2010 July 6]. Available from: <http://healthlink.mcw.edu/article/1031002247.html>
3. National Spinal Cord Injury Statistical Center. Spinal cord injury: facts and figures at a glance. Spinal Cord Injury Information Network [Internet]. 2008. Available from: [www.spinalcord.uab.edu](http://www.spinalcord.uab.edu)
4. Mississippi Department of Health. Spinal Cord and Traumatic Brain Injury Registry. NEDSS/PHIN, Office of Health Informatics, MS Department of Health. 2009.
5. Surkin J, Smith M, Penman A, Currier M, Harkey HL 3rd, Chang YF. Spinal cord injury incidence in Mississippi: A capture-recapture approach. *J Trauma*. 1998;45(3):502–504.
6. Surkin J, Gilbert BJ, Harkey HL 3rd, Sniezek J, Currier M. Spinal cord injury in Mississippi. *Spine (Phila Pa 1976)*. 2000;25(6):716–721.
7. Nobunaga AI, Go BK, Karunas RB. Recent demographic and injury trends in people served by the Model Spinal Cord Injury Systems. *Arch Phys Med Rehabil*. 1999;80(11):1372–1382.
8. U. S. Department of Health and Human Services. Oral Health in America: A Report of the Surgeon General—Executive Summary. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health. 2000.
9. Galea M, Tumminia J, Garback LM. Telerehabilitation in spinal cord injury persons: A novel approach. *Telemed J E Health*. 2006;12(2):160–162.
10. Johnson K, Lammertse DP. Primary care for individuals with spinal cord injury. *CNI Review*. 1998;9:1–8.
11. Schönherr MC, Groothoff JW, Mulder GA, Eisma WH. Functional outcome of patients with spinal cord injury: Rehabilitation outcome study. *Clin Rehabil*. 1999;13(6):457–463.
12. Shigaki CL, Hagglund KJ, Clark M, Conforti K. Access to health care services among people with rehabilitation needs receiving Medicaid. *Rehabilitation Psychology*. 2002;47(2):204–218.
13. Lawton L. Providing dental care for special patients: Tips for the general dentist. *J Am Dent Assoc*. 2002;133(12):1666–1671.
14. Glassman P, Miller CE, Lechowick J. A dental school's role in developing a rural, community-based, dental care delivery system for individual with developmental disabilities. *Spec Care Dent*. 1996;16(5):188–193.
15. Mouradian WE, Corbin SB. Addressing health disparities through dental–medical collaborations, part II. Cross-cutting themes in the care of special populations. *J Dent Educ*. 2003;67(12):1320–1326.
16. Cumella S, Ransford N, Lyons J, Burnham H. Needs for oral care among people with intellectual disability not in contact with community dental services. *J Intellect Disabil Res*. 2000;44(Pt 1):45–52.
17. Wile KE, Ferguson FS. Social work in a dental program for the developmentally disabled. *Spec Care Dent*. 1992;12(1):30–32.
18. Stiefel DJ, Truelove EL, Martin MD, Mandel LS. Comparison of incoming dental school patients with and without disabilities. *Spec Care Dent*. 1997;17(5):161–168.
19. Stiefel DJ, Truelove EL, Persson RS, Chin MM, Mandel LS. A comparison of oral health in spinal cord injury and other disability groups. *Spec Care Dent*. 1993;13(6):29–35.
20. Gordon SM, Dionne RA, Snyder J. Dental fear and anxiety as a barrier to accessing oral health care among patients with special health care needs. *Spec Care Dent*. 1998;18(2):88–93.
21. Mofidi M, Rozier RG, King RS. Problems with access to dental care for Medicaid–insured children: What caregivers think. *Am J Public Health*. 2002;92(1):53–58.



22. Al Agili DE, Roseman J, Pass MA, Thornton JB, Chavers LS. Access to dental care in Alabama for children with special needs: Parent's perspectives. *J Am Dent Assoc.* 2004;135(4):490-495.
23. Tesini DA, Fenton SJ. Oral health needs of persons with physical or mental disabilities. *Dent Clin North Am.* 1994;38(3):483-498.
24. Shuman SK, Bebeau MJ. Ethical and legal issues in special patient care. *Dent Clin North Am.* 1994;38(3):553-575.
25. Felder RS, Gillette VM, Leseberg K. Wheelchair transfer techniques for the dental office. *Spec Care Dentist.* 1998;8:256-259.
26. Spencer PR. Techniques for transporting the handicapped patient in the dental setting. *Dent Assist.* 1988;57(1):16-18.
27. Mouradian WE, Corbin SB. Addressing health disparities through dental-medical collaborations, part II. Cross-cutting themes in the care of special populations. *J Dent Educ.* 2003;67(12):1320-1326.
28. Tate DG, Forchheimer M, Daugherty J. Insurance benefits coverage: Does it affect rehabilitation outcomes? *Journal of Rehabilitation.* 1993;59:6-10.
29. Yuen HK, Shotwell MS, Magruder KM, Slate EH, Salinas CF. Factors associated with oral problems among adults with spinal cord injury. *J Spinal Cord Med.* 2009;32(4):408-415.
30. Yuen HK, Wolf BJ, Bandyopadhyay D, Magruder KM, Selassie AW, Salinas CF. Factors that limit adults with spinal cord injury. *Spec Care Dent.* 2010;30(4):151-156.
31. Lavela SI, Weaver FM, Smith B, Chen KE. Disease prevalence and use of preventive services: Comparison of female veterans in general and those with spinal cord injuries. *J Womens Health (Larchmt).* 2006;15(3):301-311.
32. Lester V, Ashley FP, Gibbons DE. Reported dental attendance and perceived barriers to care in frail and functionally dependent older adults. *Br Dent J.* 1998;184(6):282.
33. Sharon SC, Connolly IM, Murphree KR. A review of the literature: The economic impact of preventive dental hygiene services. *J Dent Hyg.* 2005;79(1):1-11.
34. American Heart Association. Prevention of infective endocarditis. *Circulation* [Internet]. 2007. Available from: <http://circ.ahajournals.org/content/116/15/1736.full?sid=220e60d4-559b-42cf-ba39-bcef7a59cf88>
35. American Dental Association, American Academy of Orthopedic Surgeons. Antibiotic prophylaxis for dental patients with total joint replacements. *J Am Dent Assoc.* 2003;134(7):895-899.
36. Burke FJ, Busby M, McHugh S, Delargy S, Mullins A, Matthews R. Evaluation of an oral health scoring system by dentists in general practice. *Br Dent J.* 2003;194(4):215-218.
37. Anaise JZ. Measurement of dental caries experience—modification of the DMFT index. *Community Dent Oral Epidemiol.* 1984;12(1):43-46.
38. Ainamo J, Barmes D, Beagrie G, Cutress T, Martin J, Sardo-Infirri J. Development of the World Health Organization (WHO) Community Periodontal Index of Treatment Needs. *Int Dent J.* 1982;32(3):281-288.
39. Andersson P, Westergren A, Karlsson S, Rahm Hallberg I, Renvert S. Oral health and nutritional status in a group of geriatric rehabilitation patients. *Scand J Caring Sci.* 2002;16(3):311-318.
40. Atchison KA, Gift HC. Perceived oral health in a diverse sample. *Adv Dent Res.* 1997;11(2):272-280.
41. Pyle MA, Stoller EP. Oral health disparities among the elderly: Interdisciplinary challenges for the future. *J Dent Educ.* 2003;67(12):1327-1336.
42. Wing P, Langelier MH, Continelli TA, Battrell A. A dental hygiene professional practice index (DHPPI) and access to oral health status and service use in the United States. *J Dent Hyg.* 2005;79(2):1-10.