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The relationship between dental care and perceived oral health impacts

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Background: Knowledge of the effect of dental care and dental visiting behavior on oral health impacts is important for effective resource allocation. ***Objective:*** To determine the association between dental care, including the reason for dental attendance and time since last dental visit, with perceived oral health impacts among Australian adults. ***Methods:*** Data were obtained from the Australian National Survey of Adult Oral Health 2004/06. Analysis was limited to 4,170 dentate adults who answered the Oral Health Impact Profile (OHIP-14) questions. Prevalence of frequent impacts was defined as the percentage of people reporting 'fairly often' or 'very often' to one or more of the OHIP-14 questions. ***Results:*** Over half the dentate Australians (63.0%) visited a dentist in the past year. Unadjusted analysis showed a statistically significant association between the prevalence of frequent impacts and receipt of: extractions (prevalence ratio=1.7, 95%CI=1.2-2.2), scale/clean (0.7, 0.5-0.8), and denture care (1.6 1.1-2.4). After adjustment for the usual reason for dental attendance there was no effect of any of the three treatments or the time since last visit on the prevalence of frequent impacts. ***Conclusion:*** The usual reason for dental attendance, and not the time since last visit or the type of dental care supplied, accounted for differences in perceived oral health impacts.

Key words: *dental care/utilization, dental health surveys, oral health, outcome assessment, health care, quality of life*

Introduction

Dental problems are one of Australia's commonest health problems (Crowley, *et al.,* 1992). Yet Bader (1992) asserts that "the dearth of answers to the appropriateness-of-care questions in dentistry is stunning." As demand for health care grows, decisions about resource allocation and priorities for the healthcare sector may fall under increasing scrutiny. Knowing which treatments and visiting behaviours are the most effective could assist dental clinicians assess the appropriateness of treatments, oral health promoters encourage dental visiting behaviour, and administrators evaluate competing programs.

Historically decisions about appropriateness of care have been based primarily on clinical indicators of disease. In recent decades health-related quality of life has become increasingly important as researchers realise that traditional disease measures do not measure the impact of the disease on the patient. There is now additional emphasis on patient-centred outcome measures, for example seeking patients' perspective on the impact of oral disease by measuring their perceived oral health impacts.

Decisions about appropriateness of care should be based on evidence from experimental study designs, with randomised controlled trials being the best. However, since allocation to a treatment group and non-treatment group is neither feasible nor ethically defensible except when it is not known if a treatment is effective, evidence has been gathered from observational studies.

Studies demonstrate that regularity of dental attendance and specific treatments, such as orthodontics and implant-retained dentures, are associated with an enhanced oral health-related quality of life, OHRQoL (McGrath and Bedi, 2001; Petersen and Nørtov, 1995). Longitudinal studies have investigated the association between routine dental care and OHRQoL but these were limited to older adults or those with an oral disadvantage (Fisher *et al.,* 2005; Fiske *et al.,* 1990; Petersen and Nørtov, 1995; Locker, 2001; Gagliardi *et al.,* 2008).

Regularity of attendance is likely to affect the dental service received for two reasons. First, regular attendees are less likely to suffer acute symptoms and require emergency treatment (Sheiham *et al.,* 1985; Todd and Lader, 1991; Murray, 1996; Kay, 1999). Second, the treating dental clinician when deciding on whether to undertake an intervention that is borderline in needing to be done, is more likely to "watch and wait" with a regular attender rather than one who usually attends with a problem ("problem visitors"). Australian "problem visitors" are more likely to have under 21 teeth, dentures, missing teeth, coronal and root caries, but less likely to have coronal restorations (Roberts-Thomson and Do, 2007).

Studies have associated dental attendance with subjective oral health. Gift and colleagues (1996) found that subjects in a population of US adults aged over 17 years who had visited the dentist in the last 2 years had better oral health-related quality of life (OHRQoL) than those who had not. A cross-sectional study of adults in Great Britain showed that dental attendance is positively associated with the perception of an enhanced quality of life (McGrath and Bedi, 2001). Kressin and colleagues (1996) in a study of US men aged over 46 found that problem-based dental visiting was associated with a poorer

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OHRQoL. Similar results were found among Australian, US and Canadian adults aged over 60 (Slade *et al*., 1996).

The debate continues with a Cochrane Report (Beirne *et al.,* 2005) finding of insufficient evidence regarding the practice of 6-monthly dental check-ups. The review included only one study and that provided limited data for dental caries outcomes and economic cost outcomes – HRQoL was not measured. Hence the need to extend this inquiry to consider the joint effects of the process in seeking care in addition to the specific treatments provided.

This study investigates the association between Australian adults' dental care, their usual reason for dental attendance and the time since last dental visit, with perceived oral health impacts.

Methods

Data were obtained from the National Survey of Adult Oral Health 2004/06 (NSAOH); a cross-sectional study of a clustered stratified random sample of dentate Australians aged over 14 (Slade *et al.,* 2007). Subjects were randomly sampled from an electronic database of phone numbers and interviewed by telephone then dentate subjects were asked to undergo a standardised dental examination conducted in a local clinic by one of 30 survey trained dentists. Participants were then asked to complete a self-administered questionnaire. For this study, data were analysed from the computer-assisted telephone interview (treatment received and participant characteristics) and the questionnaire (perceived oral health impacts). Oral health impacts were evaluated with the Oral Health Impact Profile (OHIP-14) (Slade, 1997) with its seven dimensions: "functional limitations", "physical pain", "psychological discomfort", "physical disability", "psychological disability", "social disability" and "handicap." The dependent variable was the prevalence of frequent OHIP-14 impacts as measured by the percentage of respondents who reported one or more of the 14 items as occurring "fairly often" or "very often" during the preceding year (Slade, 1997): higher scores indicating poorer oral health outcomes. Others have reported that summation scoring methods for the OHIP are as efficient as more sophisticated ones that used weights (Allen and Locker, 1997).

Two independent variables were used as indicators of the pattern of dental care: time since last visit is a key indicator of access to dental care (Spencer and Harford, 2007) assessed by asking 'How long ago did you last visit a dental professional about your teeth, dentures or gums?' Available responses were: 'Less than 12 months', '1-2 years', '2-5 years', '5-10 years', 'Never visited', and 'Don't know'. Responses were dichotomised into whether or not a person reported having visited a dentist in the last 12 months.

The usual reason for visiting a dentist characterises the long-term pattern of visiting (Spencer and Harford, 2007). People were asked 'Is your usual reason for visiting a dental professional for check-ups or when you have a dental problem?'

If participants had visited a dentist in the last year they were asked if they had received treatment in the following seven categories during the year: extractions, dentures, periodontal treatment, x-rays, dental restorations, crowns and bridges, and scale and cleans. Also, if dentate, they were asked if they received denture(s) in the last year. Hence the definition of each form of treatment received was that perceived by the participant.

Additional covariates were self-reported number of natural teeth, age, gender and household income. Participants were asked: "There are 16 teeth, including wisdom teeth in the upper jaw. How many teeth do you have remaining in your upper jaw?" A similar question was asked for the lower jaw and the two responses added to give the participant's total number of natural teeth. Having fewer than 21 permanent teeth was used as an indicator of an inadequate dentition. The literature has found that 20 natural teeth were sufficient for satisfactory chewing function (Elias and Sheiham, 1998) and diet and nutritional status (Sheiham *et al.,* 2002). On the other hand, adults with fewer than 21 teeth were more likely to suffer impaired OHRQoL compared to adults with more teeth (McGrath and Bedi, 2002). Responses to the age question were categorised as 15-24 and 25-54 to indicate different ages of the 'post-fluoride generation', 55-64 to indicate the post second world war 'baby boomers' with their high dental caries prevalence and tooth restoration rate, and over 64 to indicate the older, high dental caries prevalence group often treated by tooth extraction. Age was included as a putative confounder because Steele *et al.,* (2004) found age was associated with the prevalence of frequent OHIP-14 impacts with those aged over 65 reporting a better OHRQoL arguably on account of their lower expectations. Gender was included as a covariable because males are more likely than females to suffer complete tooth loss, have fewer than 21 teeth, have missing teeth, and have more decayed tooth surfaces but less likely to have filled tooth surfaces, to suffer from periodontal disease and to have tooth wear on their lower incisors (Roberts-Thomson and Do, 2007).

Participants gave their total household income in Australian dollars as being in one of the bands and were given the choices <$12,000, $12-<20,000, $20-<30,000, $30-<40,000, $40-<60,000, $60-<80,000, $80-<100,000 and $100,000+. For the current study, household income was grouped into < $20,000 (low), $20,000-<$40,000 and $40,000-<$80,000 (different levels of middle incomes), and $80,000+ (high). This parameter was included because in Australians higher household incomes are more likely to have made a recent dental visit, to visit a private provider, to visit for a check-up and to visit at least once per year than people from households from lower incomes (Harford and Spencer, 2004).

Unit record weights for this survey were calculated to reflect probabilities of selection and to adjust for different participation rates across postcodes and among age and gender categories. As the survey was restricted to dentate people aged over 14, estimates of the Australian dentate population were derived from the telephone interview survey and used to calculate final weights. Contingency tables were used to assess bivariate associations between prevalence of frequent OHIP-14 impacts and time since last visit, the usual reason for dental attendance, and the dental treatment received. Prevalence ratios and 95% confidence intervals (95%CIs) were calculated and the null hypothesis of no association was rejected if the

95%CI excluded the number one. The statistically significant unadjusted findings were then adjusted for the usual reason for dental attendance and dental treatment received. Adjustment was achieved with stratified analysis. Interactions between the prevalence of frequent impacts by the dental treatment received and usual reason for dental attendance were calculated using Poisson regression. Age, the number of natural teeth, and household income were tested for confounding of the effect on quality of life of visiting behaviours and treatment received. Poisson regression with robust variance estimator was used to calculate multivariate-adjusted estimates of prevalence ratios.

SUDAAN (Research Triangle Institute, Research Triangle Park, NC) was used to adjust for complex analytical design and to weight for sampling probability and non-response. The survey was reviewed and approved by The University of Adelaide's Human Research Ethics Committee.

Results

This analysis used data from 4,170 dentate people who completed the interview and questionnaire, comprising nearly a third (33.1%) of interviewed dentate people in scope. The prevalence of frequent impacts was 18.5%. Over a third of the people (38.8%) usually visited a dentist for treatment of a problem and over half (63.0%) had visited a dentist in the last year.

People who usually visit a dentist for a problem had a significantly higher prevalence of frequent impacts than those attending for a check-up (Prevalence ratio 2.4, 95%CI 1.9-2.9) but there was no association between visiting a dentist in the last year and prevalence of frequent impacts (0.9, 0.7-1.1). The usual reason for dental attendance was therefore used in subsequent stratified analysis.

Among the dentate people who had visited a dentist in the last year, only 2.9% said they had received new or repaired dentures whilst 67.7% had scale/clean treatments (Table 1). Extractions and dentures were associated with higher prevalence of frequent impacts while scale/clean treatments were associated with lower prevalence. These findings prompted further investigation of their effect in stratified analysis. Other dental treatments investigated such as fillings and gum treatment, were not associated with the prevalence of frequent impacts. A higher prevalence of frequent OHIP-14 impacts were associated with the usual reason for dental attendance, being female, being younger, having less than 21 teeth, and having a lower income (Table 2).

Whether the subject had an extraction, a scale/clean, or a denture or not, was not associated with the prevalence of frequent impacts for people within the stratum who usually attended a dentist for a check-up. Whether the subject had either any of the three treatments or not, was not associated with the prevalence of frequent impacts for people within the other stratum, "problem visitors". There were no significant interactions between the type of dental treatment received, usual reason for dental attendance and prevalence of frequent OHIP-14 impacts.

Although not presented in the tables, stratification for age, gender, the number of teeth, and household income indicated that the usual reason for dental attendance did not alter crude OHIP-14 prevalence ratios for any of the treatments.

Multivariate regression analysis showed that the usual reason for dental attendance had a large effect on the prevalence of frequent impacts (2.2, 1.7-2.9, Table 3). However, the type of dental treatment was no longer associated with the prevalence of frequent impacts. Dentate people with fewer than 21 teeth had a higher prevalence of frequent impacts than those more teeth. Age was associated with the prevalence of frequent impacts with those over 65 years of age having a lower prevalence of frequent impacts. Similarly; lower household income was associated with higher prevalence of frequent impacts.

Table 1. Relationships between dental treatments and the prevalence of OHIP-14 frequency of impacts of those who visited a dentist in the past year

Dental Service		*% Distribution*	*Prevalence of frequency impacts*	*Prevalence Ratio*	*(95% CIs)*
Extraction	Yes	13.5	26.7	1.7	(1.2-2.2)
	No	86.5	16.3	Reference	
Denture	Yes	2.9	28.2	1.6	(1.1-2.4)
	No	97.1	17.1	Reference	
Gum Treatment	Yes	4.5	21.7	1.3	(0.8-2.0)
	No	95.5	17.2	Reference	
X-Rays	Yes	44.9	19.6	1.2	(1.0-1.5)
	No	55.1	15.9	Reference	
Filling	Yes	41.2	19.6	1.2	(0.9-1.5)
	No	58.8	16.5	Reference	
Crown & Bridge	Yes	6.8	19.5	1.7	(0.8-1.7)
	No	93.2	17.2	Reference	
Scale/clean	Yes	67.7	15.4	0.7	(0.5-0.8)
	No	32.3	22.6	Reference	

Table 2. Relationships between patient characteristics and the prevalence of OHIP-14 frequency of impacts of those who visited a dentist in the past year

Patient Factor		*% Distribution*	*Prevalence of frequency Impacts*	*Prevalence Ratio*	*(95% CIs)*
Usual reason for visit	Problem	38.8	27.2	2.4	(1.9-2.9)
	Check-up	61.2	12.8	Ref.	
Gender	Male	46.9	14.4	0.7	(0.5-0.9)
	Female	53.1	20.7	Ref.	
Age	15-24 years	14.7	14.5	1.3	(0.8-2.1)
	25-54 years	56.3	20.4	1.8	(1.3-2.5)
	55-64 years	15.0	17.5	1.6	(1.2-2.3)
	65+ years	14.0	11.1	Ref.	
Number of Teeth	≥21 teeth	78.0	16.5	0.7	(0.6-0.9)
	<21 teeth	22.0	22.2	Ref.	
Household Income	<$20,000	12.5	31.3	Ref.	
	$20-<40,000	20.6	18.3	0.8	(0.5-1.2)
	$40-<80,000	36.1	16.5	0.6	(0.4-0.9)
	$80,000+	30.8	12.7	0.4	(0.2-0.6)

Table 3. Poisson regression adjusted prevalence ratios of frequent OHIP-14 impacts

	Category	*Reference category*	*Prevalence Ratio (95%CI)*	
Usual reason for visit	Problem	Check-up	2.2	(1.7-2.9)
Scale/clean	Yes	No scale/clean	1.0	(0.8-1.3)
Extraction	Yes	No extractions	1.3	(1.0-1.7)
Denture	Yes	No dentures	1.2	(0.8-1.9)
Number of natural teeth	≥21	<21 teeth	0.7	(0.5-0.9)
Age group	15-24 years	≥65 years	1.9	(0.9-3.8)
	25-54 years		2.5	(1.8-3.5)
	55-64 years		1.8	(1.2-2.6)
Annual household income	$20-<40,000	<$20,000	0.7	(0.5-0.9)
	$40-<80,000		0.5	(0.3-0.7)
	$80,000+		0.4	(0.3-0.6)

Discussion

The principal finding from this study was that while unadjusted analysis indicated some dental treatments received were associated with the prevalence of frequent impacts, this effect was removed in the multivariate analysis by the influence of the usual reason for dental attendance.

The prevalence of frequent impacts (18.5%, 95%CI 16.7-20.2) was similar to that found in an earlier study by Slade *et al.,* (2005) (18.2%, 95%CI 16.2-20.2) and indicated that self-perceived oral health impacts had not changed in the Australian population between 1999 and 2004-06.

Brennan and Spencer (2005) found that OHIP-14 was associated with the reason for dental attendance with more frequent impacts being associated with emergency visits. Similarly, cross-sectional data from a New Zealand study showed self-perceived oral health impacts was positively related to asymptomatic dental visits and negatively to symptomatic dental visits among adults (Chen and Hunter, 1996). Similarly, these results confirm those of a US study (Kressin *et al.,* 1996) and a study of Rio de Janeiro university employees (Afonso-Souza *et al.,* 2007) which found not visiting the dentist for a routine dental check increased the chance of reporting one's own oral health as bad. The current study advances our knowledge in that the effect of dental care was explained by the usual reason for dental attendance rather than the type of clinical dental treatment received.

This finding is important because in recent years a shift has taken place in public health and health promotion policy (Watt, 2002). The emphasis is increasingly on reducing the variations in health and its social impacts through action on changing the determinants of health. The usual reason for dental attendance, whether for a problem or a check-up, is consistent with the current emphasis on upstream factors. It shows that longer term indicators of attendance, such as usual reason for dental attendance, have a greater social impact than more proximal measures, such as those related to a recent visit. This finding is another step in our understanding of the reason for the variation in oral health and its social impact.

The reason why regularly visiting a dentist for a check-up rather than a problem was associated with better OHRQoL cannot be determined from this study due to the cross-sectional nature of the data. Survey participants with dental problems may have been more likely to be problem attenders than check-up attenders. Better OHRQoL may also reflect an individual's value placed on oral health, leading to more preventive use of dental care (Kressin *et al.,* 1996).

The fact that time since last visit was not associated with measures of OHIP-14 is consistent with the findings from a previous cross-sectional study (Chen and Hunter, 1996). Time since last visit indicates only what happened at one point in time and may not be related to many other factors such as the frequency of visits, nor the usual reason for dental attendance.

A similar concern occurs in asking time since last visit when asking the reason for the last visit, but asking the usual reason for visiting a dentist captures long term behaviour whilst the treatment received occurred in year prior to the survey captures short-term behaviour. Although not presented, the multivariate regression analysis was redone substituting the reason for the last visit to the dentist for the usual reason for dental attendance. The results were replicated negating the time argument.

Limitations of this study included reliance on the recall of the study participants to self-report treatment received over the previous year . However, since the survey participants were only asked to report presence or absence of treatments in broad categories, such as extractions or fillings, this was likely to be recalled more accurately than, for example, questions about numbers of services in more specific categories.

The participants determined if they were dentate, and if so, the number of teeth they had. This may lead to an either over- or under-estimation of the number of teeth. However, a previous study (Savoca *et al.*, 2010) has shown a high correlation between the self-reported and examination values for number of teeth. Although people may not know the amount of dental disease they have, something as large as a tooth could be expected to be noticed. According to Elias and Sheiham (1998) to obtain an "adequate dentition" the 20 necessary teeth should be "well-distributed."

The inherent lack of temporal information in the cross-sectional survey makes cause and effect decisions difficult. Asking the usual reason for dental attendance captured longer-term patterns of attendance compared to reason for last visit which could be atypical. The survey did not indicate the reason for an extraction, if the extracted tooth was replaced, or how. Nor did it indicate the duration or severity of symptoms, if any, prior to the extraction.

A potential source of bias is that dentate people who completed the interview and questionnaire may be different from those who did not complete both. For example, NSAOH may have overestimated the frequency of favourable dental attendance, although the degree of variation was found by Mejia *et al.* (2007) to be 3% or less for most oral health indicators. They measured bias due to non-participation in both the interview and examination, and concluded that the degree of non-participation bias was small.

The greatest asset of this study is that the sample sizes were large and representative of the Australian population (Mejia *et al.,* 2007). The statistical analysis allowed for the complex analytical design and weighted for sampling probability and non-response. Hence the results from this analysis can be generalised to the Australian adult dentate population.

This paper indicates that encouraging regular check-ups and attempting to reduce the incidence of problem-based dental visiting behaviour could be useful in reducing poor oral health impacts in the community. Hence, dental clinicians, oral health administrators and oral health promoters should encourage regular dental check-ups.

There is a need for research investigating the association between dental care and self-perceived oral health impacts that is prospective in order to demonstrate temporal sequence, that is based on a population sample for representativeness, and that relates to a wide range of dental clinical treatment options to be generalisable.

Conclusions

The usual reason for dental attendance, but not the time since last visit, had a large effect on the prevalence of frequent OHIP-14 impacts. The effect of dental treatment received was explained by the usual reason for dental attendance.

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