Periodontal disease, tooth loss and daily life in older adults in South Australia: a longitudinal study

by

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List of Abbreviations

AAP-CDC	The American Association of Periodontology and the U.S. Centres for Disease Control and Prevention
AD	Alzheimer's Disease
ADTP	The Australasian Digital Theses Program
ALOSS	Attachment Loss
BMI	Body Mass Index
CAL	Clinical Attachment Level
CDT	Clock-Drawing Test
CHD	Coronary heart disease
COPD	Chronic obstructive pulmonary disease
CI	Cognitive impairment
CIs	Confidence intervals
CRP	C-reactive protein
CVD	Cardiovascular diseases
EFP	The European Federation of Periodontology
FL	Functional limitation
GCF	Gingival crevicular fluid
GDS	The Global Deterioration Scale
GR	Gingival Recession
Hs-CRP	High-sensitive C-reactive protein
IADL	Instrumental Activities of Daily Living
ID	Identity Number
IFG	Impaired fasting glucose
IL-1ß	Interleukin-1 beta
IR	Incidence (rate) density
IRR	Incidence (rate) density ratio
MI	Myocardial infarction
MMSE	The Mini-Mental State Examination
MSMs	The marginal structural models
NCHS	The US National Centre for Health Statistics
NSAOH	The National Survey of Adult Oral Health
OR	Odds Ratio
PGE2	Prostaglandin-E2

PPD	Probing Pocket Depth
PR	Prevalence Ratio
RA	Rheumatoid arthritis
SADLS	The South Australian Dental Longitudinal Study
SD	Standard deviation
SES	Socio-economic status
TIA	A stroke or a small stroke
TNF- α	Tumour necrosis factor- α

List of Symbols

%	Percentage
-	Not available
N	Sample size
i.e.	For example
Δ	Change

Research outcome

Dissemination of these research findings has already commenced in order to create discussion and debate, and to inform agencies with influence over oral health policy. Oral and poster presentations to local, national and international audiences, and funding bodies associated with this study, are listed below.

Oral and poster presentations during time of candidature

10th July 2015: **Ju X,** Do LG, Mejia GC and Spencer AJ, The effect of cognitive impairment on the periodontal disease progression among older Australians, Research Day, School of Dentistry, Adelaide Convention Centre, Adelaide.

1st May 2015: **Ju X,** Do LG, Mejia GC and Spencer AJ, The effect of functional limitations on periodontal disease progression, Research meeting, ARCPOH, School of Dentistry, Adelaide.

27th June 2014: **Ju X,** Do LG, Mejia GC and Spencer AJ, Systemic diseases predict the progression of periodontal attachment loss: a longitudinal study, 92nd General Session and Exhibition of the International Association for Dental Research (IADR), Cape Town, South Africa. (Poster)

24th April 2014: **Ju X,** Do LG, Mejia GC and Spencer AJ, Do systemic diseases predict the progression of periodontal attachment loss: a longitudinal study, Research Meeting, ARCPOH, School of Dentistry, Adelaide.

23rd March 2013: **Ju X,** Do LG and Spencer AJ, Suitability of periodontal disease case definitions for longitudinal data?, 91st General Session and Exhibition of the International Association for Dental Research (IADR), Seattle, Washington, USA.

30th November 2012: **Ju X,** Do LG and Spencer AJ, Prevalence and incidence of periodontal disease: a longitudinal study, Research Meeting, ARCPOH, School of Dentistry, Adelaide.

17th August 2012: **Ju X,** Do LG and Spencer AJ, Tooth loss among older South Australians: a longitudinal study, Research Day, School of Dentistry, Adelaide Convention Centre, The University of Adelaide, Adelaide.

4th May 2012: **Ju X,** Do LG and Spencer AJ, Periodontal disease, tooth loss and daily life in older adults: a longitudinal study- Preliminary descriptive analysis, Research Meeting, ARCPOH, School of Dentistry, Adelaide.

3rd June 2011: **Ju X,** Do LG and Spencer AJ, Periodontal disease, tooth loss and daily life in older adults: a longitudinal study, Research Proposal Day, School of Dentistry, The University of Adelaide, Adelaide.

Grants and awards received

June 2014: J. Morita Junior investigation Award for Geriatric Oral Research (Second Prize) in the 92nd General Session and Exhibition of the International Association for Dental Research (IADR), 25-28 June 2014, Cape Town, South Africa.

March 2013: Travel Grant to attend 91st General Session and Exhibition of the International Association for Dental Research (IADR), 20-23 March 2013, Seattle, Washington, USA.

January 2011: Australian Postgraduate Award, the University of Adelaide.

Preface

This thesis reports on research which was conducted during the time of my candidature for the degree of Doctor of Philosophy (PhD) at the School of Dentistry, the University of Adelaide from January 2011 to July 2015. It relates to the incidence and progression of periodontal disease and daily life, which includes systemic illness, functional limitation, and cognitive impairment.

Abstract

Background: Periodontal disease is highly prevalent among older adults. The purpose of the current study was to improve the measurement of the incidence and progression of periodontal disease in older population with a high level of tooth loss, and to evaluate the relationship between daily life conditions (systemic diseases, functional limitation and cognitive impairment) and periodontal disease.

Methods: Data were from the South Australian Dental Longitudinal Study (SADLS). All participants were 60+ years. Data collection started in 1991/1992 and repeated 2, 5 and 11 years later. This study investigated the measurement of periodontal disease first by the use of periodontal disease case definitions; then the calculation of individual incidence density of periodontal attachment loss (ALOSS ≥ 3mm) events. The role of systemic diseases in predicting the incidence and progression of periodontal disease was estimated after adjusting for social demographic, dental characteristics and health-related behaviour covariates using Poisson regression with robust standard errors. Marginal structural models (MSMs) with stabilised inverse-probability weights were used to estimate the direct effect of functional limitations and/or cognitive impairment on the incidence and progression of periodontal disease while controlling for other risk factors such as systemic diseases and dental behaviours.

Results: Of the 801 dentate participants examined at baseline (response rate: 66.5%), 596, 365 and 234 were re-examined at the 2, 5 and 11-year follow-up respectively. Large discrepancies in the prevalence of periodontal disease were found based on three different case definitions with the same population at different time points. Both the incidence and reversal of periodontal disease were associated with the number of teeth lost at baseline and across the follow-up intervals.

The mean individual incidence density of ALOSS new events was 8.3 per 1,000 tooth-years with imputed missing values due to tooth loss and loss of participants to follow-up. The individual incidence density of ALOSS new events was 2 times higher in the ‘tooth loss’ groups under the different scenarios, compared to ‘no tooth loss’ group.

The predictive analyses showed that among older adults who suffered from diabetes and chronic obstructive pulmonary disease (COPD), the average ALOSS events per 1,000 tooth-years was 1.3 and 1.2 times higher respectively than for those without these diseases.

The estimated direct effect of people with functional limitation increased the risk of periodontal disease progression around 1.6 times, compared with those without functional limitation; people with cognitive impairment had nearly 1.7 times greater progression of periodontal disease than those who did not have cognitive impairment; and having both functional limitations and cognitive impairment raised the progression of periodontal disease to 1.8 times compared to those who did not have functional limitation or cognitive impairment.

Conclusion: Individual-level incidence density of ALOSS new events was more appropriate to estimate the incidence and progression of periodontal disease in a population with a high level of tooth loss. Diabetes and COPD were risk predictors of the incidence and progression of periodontal attachment loss, and daily life (including functional limitation and/or cognitive impairment) had a direct effect on incidence and progression of periodontal disease that was not mediated by dental behaviours or systemic diseases.

Declaration

This work contains no material which has been accepted for the award of any other degree in any university or any tertiary institution. To the best of my knowledge and belief, this work contains no material previously published or written by any other person, except where due reference has been made in the text.

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Date

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