THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

School of Dentistry Research Day 2024
Advancing Oral Health Innovation

Welcome

You are invited to The University of Queensland School of Dentistry's annual Research Day, highlighting the depth and breadth of our innovative research, from regenerative dentistry and clinical translation to oral epidemiology, dental public health and dental education.

Research Day showcases world-leading dental research carried out by our Honours, Doctor of Clinical Dentistry (DClinDent), Higher Degree Research (HDR) students and research staff. It's an exciting forum for our school to come together and share our research findings with a wider audience, enabling networking and collaboration.

Acknowledgements:

Event Information

Venue: UQ Oral Health Centre Auditorium Level 4 (ground floor), 288 Herston Road, Herston QLD,

Date and Time Friday 26 July 2024 8am–4pm Zoom:

Zoom link provided at registration.

Contact: dentistry.research@uq.edu.au

Continuing Professional Development (CPD)

Attendees will receive a certification for 7 hours of scientific Continuing Professional Development (CPD).

School Address

Professor Sas Sašo Ivanovski

Head of School

I am delighted to extend a warm welcome to the 2024 School of Dentistry Research Day. It's another year during which our school has experienced significant growth in our research initiatives, spanning various established and emerging areas.

This event provides us with a valuable opportunity to unite, celebrate our research achievements, disseminate our findings to a broader audience, and encourage feedback and collaboration. It also serves as a platform to acknowledge and reward exceptional research conducted by our students through a series of awards.

We take pride in the consistently high quality of our oral health research, contributing to the advancement of scientific knowledge on both local and international levels. This research plays a crucial role in addressing contemporary challenges in dentistry and offering effective solutions.

I extend my heartfelt congratulations to the students and staff participating in this year's Research Day, and I hope you find inspiration in discovering the outstanding research underway at the School of Dentistry.

Professor Loc Do

Director of Research

We would like to warmly welcome you to the School of Dentistry Research Day 2024. This year's theme 'Advancing Oral Health Innovation' encapsulates our vision and strategy to ensure our research has real world impact.

By focusing our research agenda through our three main research units - Population Health at UQ (POHUQ), the Centre for Orofacial Regeneration, Reconstruction and Rehabilitation (COR3) and our Clinical Research Units – we are producing world-class outcomes that are providing solutions to today's global dental health challenges.

We are fortunate to have two world-class keynote speakers at our Research Day, Professor Lauren Ball and Professor Paul Hodges. Their presentations will no doubt inspire research ideas and potential collaborations.

Our staff and students will also present on a wide range of research topics showcasing the depth, breadth and quality of the research being conducted at the School.

Keynote Speakers

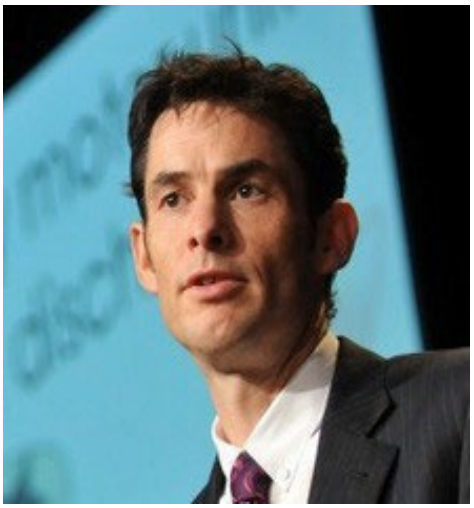
Professor Lauren Ball

Professor in Community Health & Wellbeing, UQ's School of Human Movement and Nutrition Sciences & the School of Public Health.

Chair of Community Health and Wellbeing at Springfield, QLD.

Professor Ball is an accomplished research leader capable of building multidisciplinary teams that develop innovative solutions to complex problems. Lauren has an international reputation for improving health of communities by creating knowledge, translating it into real-life scenarios and evaluating improvements for people, healthcare providers and funders. Her work spans primary care, community care, hospital services, allied health, health promotion and wellbeing and health policy.

Lauren has a clinical background as an Advanced Accredited Practising Dietitian and Exercise Physiologist. Her research career to date has been exemplary, as evidenced by multiple awards and accolades, including two NHMRC fellowships, a national award for excellence in PhD supervision, fellowships of learned societies and several awards for research excellence.



Professor Paul Hodges

Professor at UQ's School of Health & Rehabilitation Sciences & NHMRC Leadership Fellow (L3).

Director, Centre of Clinical Research Excellence in Spinal Pain, Injury & Health.

Professor Hodges is a recognised world leader in movement control, pain and rehabilitation. His unique comprehensive research approach from molecular biology to brain physiology and human function has led to discoveries that have transformed understanding of why people move differently in pain. For this outstanding research, Professor Hodges has been elected a Fellow of the Australian Academy of Science.

His innovative research has also led to discoveries of changes in neuromuscular function across a diverse range of conditions from incontinence to breathing disorders. These observations have been translated into effective treatments that have been tested and implemented internationally.

UQ Dentistry: Research Day 2024 – Program

Welcome		
8:00-8:30	Registration, Networking & Refreshments	30min
8:30-8:35	Welcome Address – Head of School, Prof Saso Ivanovski	5min
8:35-8:40	Welcome Address – Director of Research, Prof Loc Do	5min
Keynote Speaker		
8:40-9:20	**Professor Lauren Ball**, Community Health and Wellbeing, UQ Schl Human Movement & Nutrition	40min
SESSION 1	Chair: Dr Michael Foley	
9:20-9:30	**Lyndal Pritchard** Title: Implementation and Acceptance of Oral Health Assessment Tools in Residential Aged Care: A Scoping Review	10min
9:30-9:40	**Angelique Zamora** Title: Co-designing digital staff training for oral health assessment in residential aged care facilities	10min
9:40-9:50	**Stefan Danylak** Title: Posture and physical interventions: do loupes and chair design reduce musculo-skeletal disorder risk?	10min
9:50-10:00	**Chris Cheung, Trish Harijatna & Anna Zhuang** Tite: Adverse Childhood Events and Trajectory of Dental Caries Experience In Australian Children	10min
10:00-10:10	**Mim Griffiths, Andie Malawkin, Emily Hartfiel** Tite: Paediatric and Special Needs Dentists' Experiences Using Social Stories When Treating Autism Spectrum Disorder Patients	10min
10:10-10:15	**Industry Supporter: Colgate**	5min
10:15-10:35	**MORNING TEA**	20min
Keynote Speaker		
10:35-11:15	**Professor Paul Hodges**, UQ, NHMRC Leadership Fellow & Director of Clinical Research Excellence	40min
SESSION 2	Chair: Prof Ove Peters	
11:15-11:25	**Jackie Wui Kit Yiu** Title: Decontamination of titanium implant surface using novel nanoparticle activated by NIR laser	10min
11:25-11:35	**Jared Marks** Title: Evaluating Dental Monitoring effectiveness compared with conventional monitoring of clear aligner therapy using the Peer Assessment Rating index	10min
11:35-11:45	**Laura Truong** Title: Mesiodistal tip expression of lower anterior teeth in lower incisor extraction cases treated with Invisalign aligners	10min
11:45-11:55	**An Dao** Title: Strategies to Enhance the Socioeconomic Status Prediction for Dental Caries	10min
11:55-12:05	**Farzaneh Afkhami** Title: Revolutionizing pulp diagnostics: Microwave-based pulp vitality test	10min
12:05-12:10	**Industry Supporter: SDI**	5min
12:10-12:15	**Industry Supporter: Solventum**	5min
12:15-12:20	**Industry Supporter: GC Dental**	5min
12:20-1:20	**LUNCH (Networking & Supporter Displays)**	60min
SESSION 3	Chair: Dr Pingping Han	
1:20-1:30	**Man Bui** Title: Measurements of socioeconomic inequalities in oral health research - A scoping review	10min
1:30-1:40	**Amjad Almuqrin** Title: Evaluating the physicochemical properties, antimicrobial efficacy, and staining potential of nanoparticles in paediatric dental care	10min
1:40-1:50	**Shashini Navaratne** Title: Dental students' insights on using three silver fluoride types on extracted carious primary teeth	10min
1:50-2:00	**Yong Hong Kavvner Low, Wei Yi The & Suen Hong Chan** Title: Reliability of YouTubeTM videos on the clinical use of Silver Fluoride	10min

2:00-2:10	**Tian Xu** Title: Enhancing Periodontal Tissue Regeneration Through the Immunomodulatory Properties of Cerium-Doped ZIF-62 Nanomaterials	10min
2:10-2:20	**Nadeeka Udawatte** Title: Unraveling the impact of probiotic colonization on the makeup and functionality of the oral microbiome	10min
2:20-2:30	**Nilesh Torwane** Title: Cracking the 'X' Code: Water Fluoridation Sentiment Analysis with Cutting-Edge Machine Learning	10min
2:30-2:40	**Chun Liu** Title: Investigating the Role of Extracellular Vesicles in Periodontitis	10min
2:40-3:00	**AFTERNOON TEA**	20min
AWARDS SESSION	Prof Loc Do	
3:00-3:10	**Publication Awards** 1. Clinical Research & Regenerative Medicine 2. Dental Education & Public Health	10min
3:10-3:20	**Higher Degree Research (HDR) Research Grants x3**	10min
3:20-3:25	**Supervisor Awards** (Winner & Runner Up)	5min
3:25-3:45	**Presentation Awards** 1. Best Overall Presentation 2. Most Innovative & Impactful 3. Best Undergraduate (ie. Bachelor of Dental Science Students) 4. Best Postgraduate (x2) (ie. Doctor of Clinical Dentistry & HDR Students) **IADR Conference Awards (Junior & Senior)**	20min
	CLOSE (Congratulations to all participants)	

The School of Dentistry gratefully acknowledges our industry supporters:

dentistry.research@uq.edu.au

Research Day Awards 2024 (Awarded at event conclusion)

Presentation Awards

1. Best Overall Presentation
2. Most innovative & impactful
3. Best Undergraduate (BDSc students)
4. Best Postgraduate (x2) (DClinDent & HDR students)

Thank you to the judges: Dr Sobia Zafar, Dr Yinghong Zhou & Dr Jaya Seneviratne

Publication Awards

Journal publications accepted from 1 June 2023 to 31 May 2024:

1. Clinical & Regenerative Medicine
2. Education & Public Health

Thank you to the judges: Dr Sandleen Feroz, Dr Pingping Han, Dr Reuben Staples & Dr Jaya Seneviratne

IADR Conference Awards

Attendance costs for the IADR Annual Scientific Meet, Cairns, September 2024
(Junior & Senior winners)

Thank you to the judges: Dr Sobia Zafar, Dr Yinghong Zhou & Dr Jaya Seneviratne

HDR Student Research Grants

3 x $1500 grants to assist with research expenses

Thank you to the judges: Dr Karan Gulati, Dr Pingping Han, Dr Sandleen Feroz, Dr Jaya Seneviratne, Dr Reuben Staples & Dr Sandra March

Staff Supervisor Award

For outstanding research supervision in 2023/24
(Winner & Runner Up)

Thank you to the judges: A/Prof Ratilal Lalloo & Dr Sandra March

Research Day 2023 Awardees

Presentation Awards 2023

1. Best Overall: Kush Ohri
2. Most Innovative: Stefan Danylak

Publication Awards 2023

1. Clinical Research: Caitlin Stephens
2. Ed & Public Health: Shenna Yu En Ho
3. Regenerative Dentistry: Anjana Jayasree

IADR Conference Awards 2023

Senior Winner: Lydia See Senior
Runner Up: Chris Sexton
Junior Winner: Liam Cassidy, Sungho Lee, Wan-William Ki (group presentation)
Junior Runner Up: Anjana Jayasree

Staff Supervisor Award 2023

Winner : Dr Sobia Zafar
Runner Up: Dr Karan Gulati

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Publication & Presentation Abstracts

Publications – Publication Awards

Clinical Research & Regenerative Medicine

Farzaneh Afkhami, Patricia Wright, Philip Yuan-Ho Chien, Chun Xu, Laurence Walsh, Ove Peters
Exploring approaches to pulp vitality assessment: A scoping review of nontraditional methods
https://onlinelibrary.wiley.com/doi/10.1111/iej.14073

Andrew Liaw, Chun Liu, Mark Bartold, Sašo Ivanovski, Pingping Han
Effect of non-surgical periodontal therapy on salivary histone deacetylases expression: A prospective clinical study
https://onlinelibrary.wiley.com/doi/10.1111/jcpe.13973

Chun Liu, Pingping Han
Immunoaffinity-enriched salivary small extracellular vesicles in periodontitis
https://www.oaepublish.com/articles/evcna.2023.48

Yvonne Lai, J Downs, S Leishman, HM Leonard, Laurence Walsh, Sobia Zafar
qPCR assay optimisation for a clinical study comparing oral health risk in Rett syndrome
Available online shortly: European Archives of Paediatric Dentistry: https://doi.org/10.1007/s40368-024-00912-8

Lydia See, Sobia Zafar, Claudia Lopez
Tooth Discoloration from 2 Silver Fluorides Used in Adults with Special Needs: A Randomized Trial
https://journals.sagepub.com/doi/10.1177/23800844241246199

Divya Chopra, Tianqi Guo, Anjana Jayasree, Karan Gulati, Sašo Ivanovski
Bioinspired, Bioactive, and Bactericidal: Anodized Nanotextured Dental Implants
https://onlinelibrary.wiley.com/doi/10.1002/adfm.202314031

Dental Education & Public Health

Hazel Swift, Tina Farhang, Maribelle George, Ratial Lalloo
Learning on the country: Motivating dental students to attend a rural placement
https://onlinelibrary.wiley.com/doi/epdf/10.1002/jdd.13468

Manal Masood, Laurence Walsh, Sobia Zafar
Awareness of dental complications with oral piercings
https://onlinelibrary.wiley.com/doi/epdf/10.1111/odi.14908

Stefan Danylak, Laurence Walsh, Sobia Zafar
Measuring ergonomic interventions and prevention programs for reducing musculoskeletal injury risk in the dental workforce: A systematic review
https://onlinelibrary.wiley.com/doi/10.1002/jdd.13403

Presentation Awards - Abstracts

Implementation and Acceptance of Oral Health Assessment Tools in Residential Aged Care: A Scoping Review

Researchers

Lyndal Pritchard (1), Burden K (2), Carlson-Jones W(3),

Supervisors: Stormon N (1,4), Do L(1)

1. The University of Queensland, School of Dentistry, UQ Oral Health Centre, Herston Rd, Brisbane, QLD, 4006, Australia
2. The University of Newcastle, School of Health Sciences, Newcastle, NSW, 2308, Australia
3. University of Sydney, Sydney Dental School, Faculty of Medicine and Health, NSW, 2006, Australia
4. Queensland Health, Metro North Hospital and Health Services, Community and Oral Health, Hornibrook Hwy, Brighton, QLD, 4017, Australia

Background

The global demographic shift towards an older population has led to an expansion in Residential Aged Care (RAC). The WHO anticipates a significant rise in people aged 60 and above by 2050, presenting challenges like healthcare demand, system strain, and the necessity for policies tackling age-related complexities.

Objectives

The aim of this scoping review is to assess how oral health assessment tools are implemented in RAC, identifying the key challenges and facilitators impacting their usage and acceptance by non-dental health professionals.

Methods

The review employs the JBI scoping review methodology and the PICOS framework. A comprehensive search across databases and grey literature, free of publication date restrictions, was conducted. The PARIHS framework guided data extraction and analysis.

Results

Findings indicate suboptimal integration of oral health assessment tools in RAC, signalling a lack of organisational readiness. Inadequate training of non-dental professionals and resident-related behavioural and knowledge barriers are highlighted, alongside insufficient facilitation strategies to support long-term sustainability.

Conclusions

Despite the acknowledged importance of oral health assessment tools, their integration in RAC is hindered by both systemic limitations and facilitation deficits. To overcome these barriers, there is a need for tailored intervention strategies and comprehensive educational programs. These are fundamental not only to advance the consistent execution of oral health assessments but also to improve quality of life outcomes among the elderly. The review emphasises the strategic inclusion of implementation science theories and frameworks to steer these interventions, ensuring both the immediate adoption and enduring integration of oral health assessment practices in RAC settings.

Co-designing digital staff training for oral health assessment in residential aged care facilities

Researchers

Angelique Zamora

Supervisors: Loc Do, Kristiana Ludlow, Lori Delaney,

School of Dentistry, The University of Queensland

Objectives

To co-design a digital training program on oral health assessment in residential aged care for non-dental staff members.

There is a lack of appropriate training for staff members regarding oral health assessments with older adults living in residential aged care facilities (RACFs). This can result in delayed detection and treatment of oral health problems, thus impacting residents' physical health and wellbeing [1-2]. Non-dental staff members (e.g., nurses and personal care workers) make up the majority of the Australian RACF workforce and have the most contact with residents in terms of care hours. Further, these staff members often form relationships with residents that facilitates trust with residents and provides them with unique knowledge of residents' care needs and behaviours [1]. This optimally positions non-dental staff to conduct oral health assessments with residents.

Methods

Co-design is an approach that regards end-users as lived experience experts and partners with them in the design process [3] (Figure 1). Participants include dental professionals and non-dental RACF staff members. The participants will take an active role in the research and will be supported to make decisions about the content, aesthetics, functionality, and implementation strategies of the digital training program [3].

This presentation will focus on how to meaningfully engage end-users in co-design. Co-design enables a sense of ownership and inclusion which is likely to facilitate acceptance, usability, and translation of training into practice

Results

This study is currently ongoing. Findings from this study will inform the content, design, functionality, and delivery of the digital training program.

Conclusions

Co-designing a digital training program for non-dental staff members on oral health assessments in RACFs will address the current lack of appropriate training, with implications for better identification of oral health problems and referral processes to dental treatment.

References

1. Patterson Norrie, T., et al., Oral health in residential aged care: Perceptions of nurses and management staff. Nurs Open, 2020. 7(2): p. 536-546.
2. Ástvaldsdóttir, Á., et al., Oral health and dental care of older persons—A systematic map of systematic reviews. Gerodontology, 2018. 35(4): p. 290-304.
3. Slattery P, Saeri AK, Bragge P. Research co-design in health: A rapid overview of reviews. Health Res Policy Syst. 2020;18(1):17-17. doi:10.1186/s12961-020-0528-9

Figure 1: Co-designing an oral health assessment digital training program with dental professionals and non dental aged care staff members

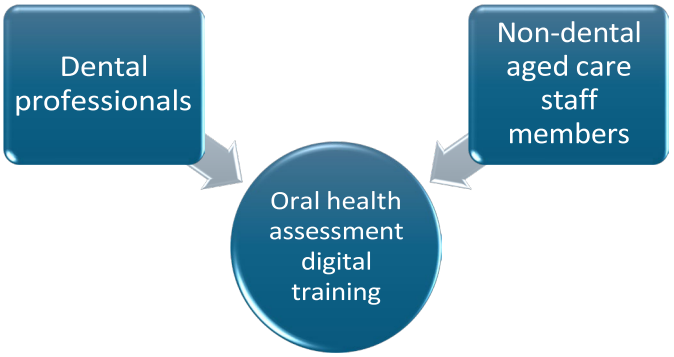


Figure1. Co-designing an oral health assessment digital training program with dental professionals and non-dental aged care staff members

Posture and physical interventions: do loupes and chair design reduce musculo-skeletal disorder risk?

Researchers

Stefan Danylak (1)

Supervisors: Alastair Sloan (2), Laurence Walsh (1), Sobia Zafar (1)

1. The University of Queensland School of Dentistry, Brisbane, QLD, Australia
2. University of Melbourne, Faculty of Medicine, Dentistry and Health Sciences, Melbourne Dental School, Parkville, Australia

Objectives

The prevalence of musculo-skeletal disorder (MSD) in dentists estimated at 85%, with the neck and upper back being the most common sites for pain. Dental loupe usage and chair design to improve posture and lower risk of MSD in dental clinicians is uncertain. Dental school curricula contain limited content on loupe selection and training. More recent advances in loupe design need evaluation, therefore, this study aimed to assess the impact of loupe and dentist chair types on postural risk in dental students and dentists.

Methods

This comparative observational study used a standardised photographic evaluation method to assess the posture of 146 dental students across years 1-4, and a comparison group of 30 dentists. Subjects undertook an identical task either in the simulation laboratory or a dental clinic. The three primary body segment angles of forward head tilt, torso lean, and upper leg/lower leg angles were measured. Loupe type was classified as nil, Galilean, straight prismatic, or refractive prismatic. Outcomes were graded into low, medium, and high-risk posture. Subjects were interviewed to determine the selection criteria used when selecting loupes.

Results

Students in years 1 and 2 did not wear loupes and showed high to moderate neck posture risk. In other subjects, wearing refractive prismatic loupes gave the lowest risk neck posture, while Galilean loupes have a worse neck posture risk than wearing no loupes. Optimal posture was most common in dentist who wore refractive loupes and used saddle seats. Most students had poor levels of knowledge regarding loupe types.

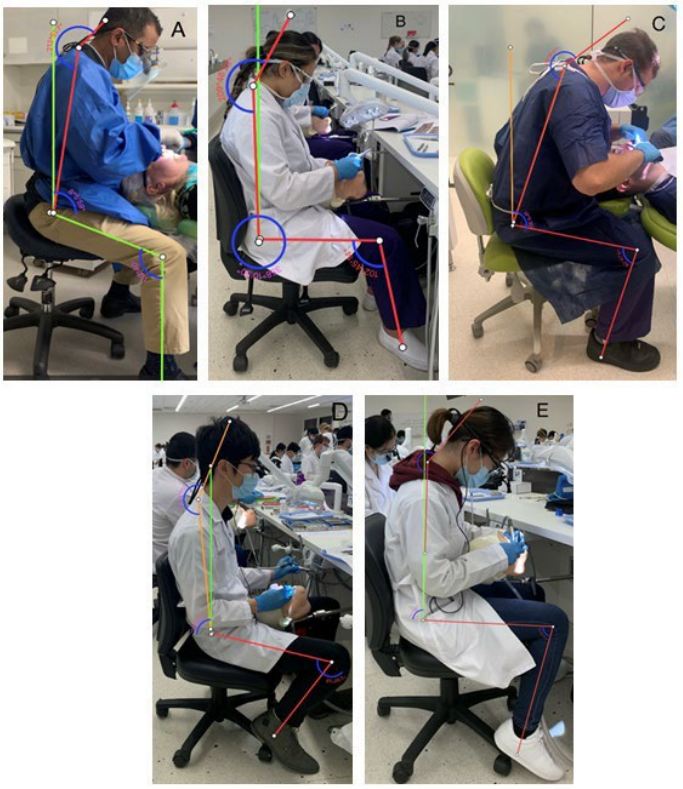


Figure 1. Assessment of posture based on three body segments. A: Graduate dentist with Galilean loupes. B: Year 1 student with no loupe. C: Year 2 student with no loupe. D: Year 3 student with refractive loupes. E: Year 4 student with Galilean loupes.

Conclusions

Optimal neck posture was associated with refractive loupes, especially when combined with saddle chairs rather than conventional operator stools. Galilean loupes did not provide postural benefits. Further studies of how loupe selection influences the risk of developing musculoskeletal disorders are warranted.

Adverse Childhood Events and Trajectory of Dental Caries Experience In Australian Children

Researchers

Christopher Cheung, Trisha Harijatna, Anna Zhuang

Supervisors: Nicole Stormon & Christopher Sexton

School of Dentistry, The University of Queensland

Community and Oral Health, Metro North Hospital and Health Service, Queensland Health

Objectives

Adverse Childhood Events (ACE) are any traumatic experiences during childhood such as parental separation, incarceration, mental health, substance abuse, domestic violence and neglect. These events have been recognised by the New South Wales Health's First 2000 Days Framework to have a major impact on a child's development. Exposure to ACEs puts a child at an increased risk of unfavourable physical and mental health outcomes later in life. This study investigates how ACEs affect children's dental health, in particular aiming to identify trends between the number of ACEs and their caries experience throughout their adolescent years.

Methods

The analysis uses data from the Longitudinal Study of Australian Children (LSAC), an ongoing study of 5109 participants and their families from 2004 onwards. Indicators of adverse events measured participant exposure to ACEs by the age of 5. Dental health outcomes were examined using parent-reported decay, fillings and extractions from age five to 20.

Results

A total of 3587 (75.3%) participants were recorded to have experienced at least one ACE by the age of 5. Parent-reported caries experience was recorded for 997 (23.5%) by age 5, and this increased to 2304 (48.1%) participants at the current wave at age 20. Analysis of data is currently ongoing but preliminary trends indicate that there is limited evidence that the number of ACEs experienced during the first five years is associated with poorer dental health outcomes.

Conclusions

The first five years of a child's life is a critical period of development that can be impacted by ACEs. This period is predictive of or linked to school performance, future general health, social behaviour and substance misuse. The multifactorial nature of dental health outcomes may explain the similarity found between ACE and non-ACE groups, and further exploration of ACEs on other important factors like diet and dental attendance is warranted.

Paediatric and Special Needs Dentists' Experiences Using Social Stories When Treating Autism Spectrum Disorder Patients

Researchers

Mim Griffiths, Emily Hartfiel, Andie Malawkin

Supervisors: Claudia Lopez-Silva, Sobia Zafar

School of Dentistry, The University of Queensland

Objectives

Social stories are customised pictorial tools created for individuals with autism spectrum disorder (ASD) to accustom them to new experiences. The purpose of this study was to investigate and compare the experiences of specialists' in paediatric dentistry and special needs dentistry (SND) using social stories as a management tool in the dental treatment of patients with ASD.

Methods

A 34-item questionnaire was designed, piloted, and distributed to specialists in paediatric dentistry and SND in Queensland via the online program QualtricsXM (Qualtrics, Provo, Utah, USA). The questionnaire had three categories: (1) demographics; (2) role and confidence in treating patients with ASD; and (3) knowledge and prior use of social stories. Univariate analysis was conducted using Jamovi (version 2.3.24) and graphed using GraphPad PRISM (GraphPad Software, San Diego, Calif., USA).

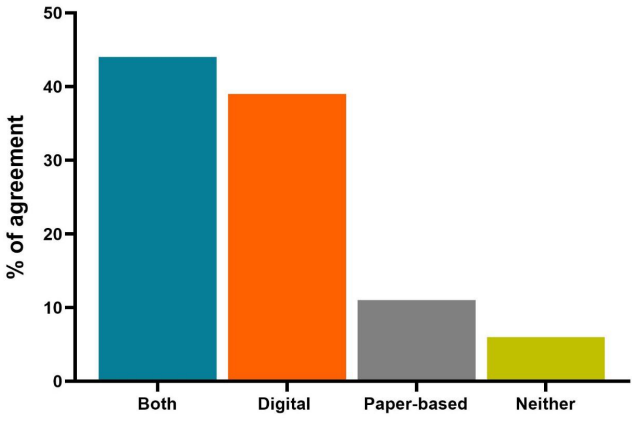
Results

A total of 21 responses were received; however, three responses were excluded due to incompletion. Hence the total response rate was 64%: 58% (14/24) for paediatric dentists, and 80% (4/5) for SND. Results showed that 72% of participants agreed with the statement that "social stories are useful when treating patients with ASD". More respondents reported using paper based social stories (44%) than app-based (33%), however 61% of participants responded they were more likely to use an app-based social story. Fisher's exact test showed there was no statistically significant association between perception of social story usefulness and type of speciality ($p=0.627$). As ASD severity increased, there was a decrease in perceived benefits of social stories (94% for ASD level 1 vs 44% for ASD level 3).

Conclusions

This study showed that both Queensland specialists in paediatric dentistry and SND find social stories to be a useful tool in the management of patients with ASD. Further research would enable greater insights into the perception of social stories amongst dental specialists across Australia.

Figure 1: Specialists preferences of social story format



Decontamination of titanium implant surface using novel nanoparticle activated by NIR laser

Researchers

Jackie Wui Kit Yiu

Supervisors: Ryan Lee

School of Dentistry, The University of Queensland

Objectives

Decontamination of dental titanium implant surface is clinically challenging and often unpredictable. Photodynamic therapy may provide unique advantages over conventional decontamination methods, due to their ability to reach bacteria sheltered in irregular implant surfaces. A novel layered double hydroxide based nanoparticle with indocyanine green could offer unique advantages as a photosensitiser. The aim of this study was to evaluate the decontamination efficiency of adjunctive photodynamic therapy using NIR-activated LDH-ICG nanoparticles and compare it to mechanical and chemical decontamination methods on biofilm contaminated SLA titanium surface.

Methods

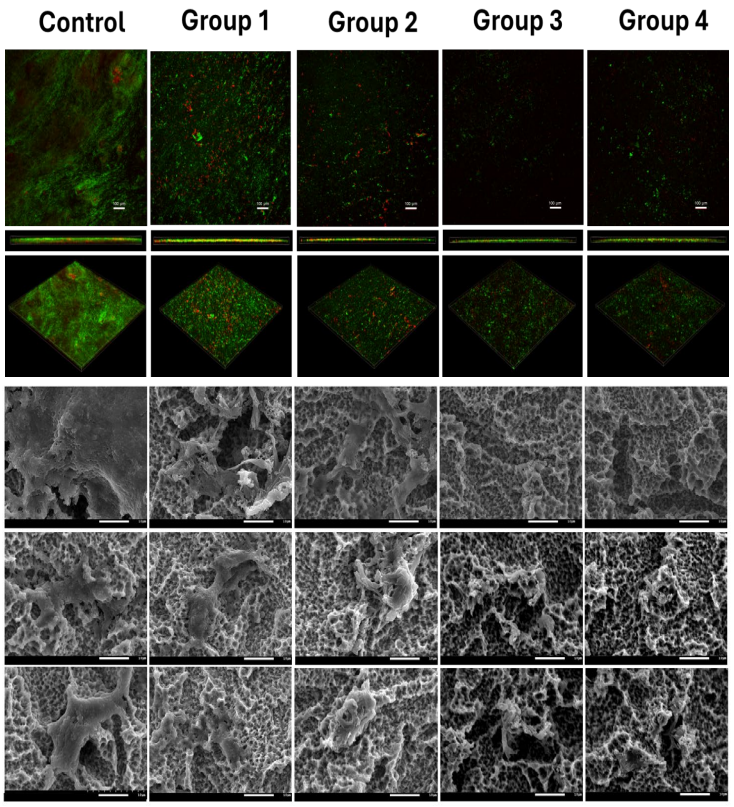
Titanium discs with SLA surfaces were contaminated with saliva-derived biofilm. Contaminated discs were first treated mechanically using a chitosan fiber brush. This is followed by adjunctive decontamination with chemical (EDTA), or photodynamic therapy using LDH-ICG nanoparticles of different durations. Decontamination outcome in terms of residual biofilm were evaluated by CV assay, XTT assay, SEM and live/dead staining. The influence on inflammatory mediators expression by macrophage were measured using qPCR.

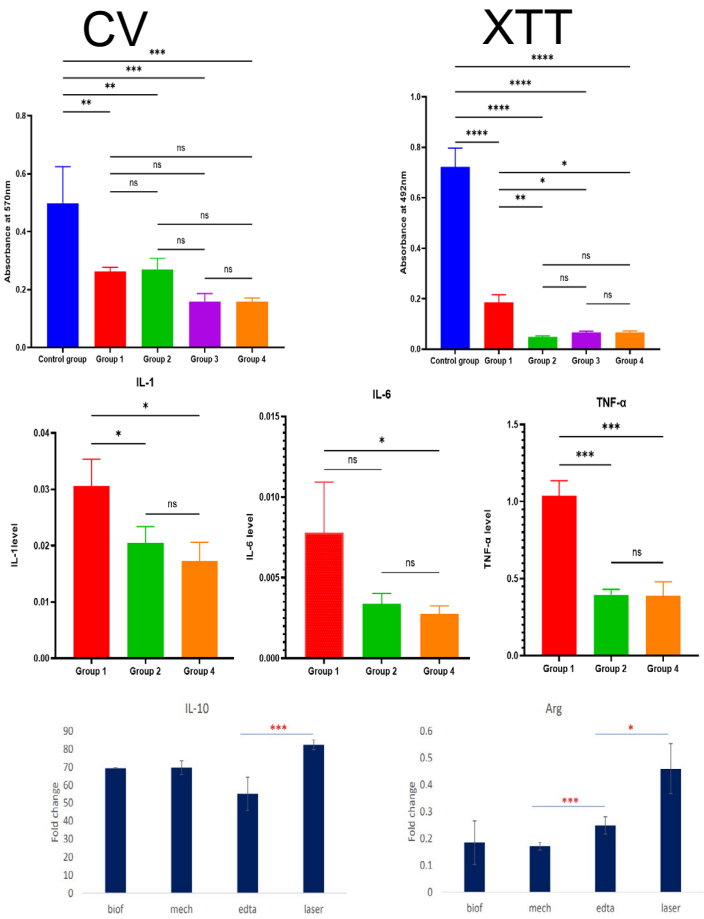
Results

Adjunctive chemical and photodynamic therapy using LDH-ICG nanoparticles further reduced residual biofilm when compared to mechanical decontamination alone. No treatment modality, however, resulted in the complete elimination of biofilm. The application of LDH-ICG photodynamic therapy on contaminated titanium surface may result in a more favorable cytokine expression by macrophages.

Conclusions

Within the limitation of this in vitro study, mechanical cleaning with adjunctive photodynamic therapy using novel LDH-ICG nanoparticles is as effective as adjunctive chemical decontamination. The use of adjunctive decontamination measures is more effective in removal of biofilm than mechanical cleaning alone. However, no method of decontamination resulted in complete elimination of biofilm. Further investigations in vitro and in vivo studies are needed to evaluate the efficacy of LDH-ICG nanoparticles in decontamination and cytocompatibility following its usage.





Evaluating Dental Monitoring effectiveness compared with conventional monitoring of clear aligner therapy using the Peer Assessment Rating index

Researchers

Jared Marks (a)

Supervisors: Elissa Freer (b), Desmond Ong (c), Jonathan Lam (d) and Peter Miles (e)

a Orthodontic Resident. BDS (Wits) Bcom-Accg (Maq)
b Head of Department. BDSc (Hons)(UQ), MDSc (UQ)
c Clinical Academic; Senior Lecturer Orthodontics, University of Queensland. BDSc(Hons)(UQ), MDSc(UQ)
d Private practice, Balgowlah, NSW, Australia. BDSc (CSU) FRACDS DClinDent
e Private practice, Caloundra, Queensland Australia. BDSc (Hons)(UQ) MDS (UPitt) MRACDS (Orth)

Objectives

The aim of this study was to evaluate the effectiveness of Dental Monitoring (DM) compared to conventional monitoring (CM) during active orthodontic treatment

Methods

The Peer Assessment Rating (PAR) index was used to evaluate the pretreatment and posttreatment records of 51 patients, with 26 in the CM group and 25 in the DM group. The change in weighted PAR (WPAR) was analysed to assess the effectiveness of treatment.

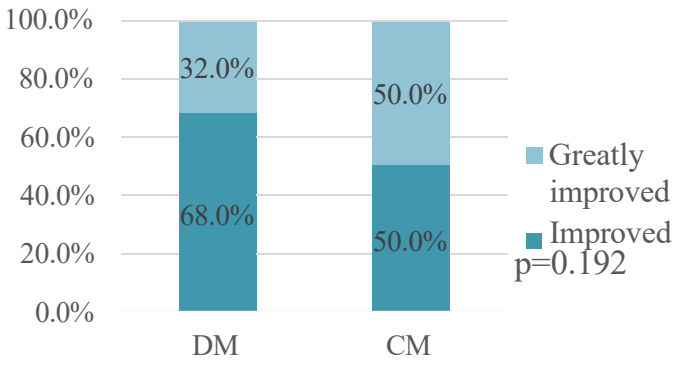
Results

The chi-squared test revealed that the CM group had a higher percentage of patients in the “great improvement” category when compared to the DM group. However, this difference was not statistically significant ($p=0.192$). A repeated measures general linear model demonstrated significant improvement over time ($p<0.001$), with no statistically significant group differences noted between CM and DM ($p=0.181$) and no statistically significant time-by-group interaction ($p=0.299$).

Conclusions

Both CM and DM showed significant improvements in WPAR scores, but no statistically significant difference is present between the two groups.

Figure 1: Percentage of improved and greatly improved within CM and DM groups



Mesiodistal tip expression of lower anterior teeth in lower incisor extraction cases treated with Invisalign aligners

Researchers

Dr Laura Truong

Supervisors: Tony Weir (2), Hien Nguyen (3), Elissa Freer (4) & Desmond Ong (5)

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Objectives

Extraction of a single lower incisor may be prescribed in conjunction with clear aligner orthodontic treatment. The accuracy of therapeutic mesiodistal tooth positioning for the remaining lower anterior teeth for such patients has not been comprehensively evaluated. This retrospective study compared the predicted and achieved mesiodistal tooth movements in the lower anterior region for patients treated with Invisalign, along with the influence of aligner attachments and the frequency of aligner change.

Methods

A sample of 83 subjects who had undergone Invisalign treatment with a single lower incisor extraction was collected from an existing database. The pre-treatment tooth positions, the predicted mesiodistal tooth movement, and the achieved outcomes were measured the remaining lower anterior teeth using Geomagic® Control X™ metrology software. The predicted and achieved mesiodistal tip movements were analysed and compared.

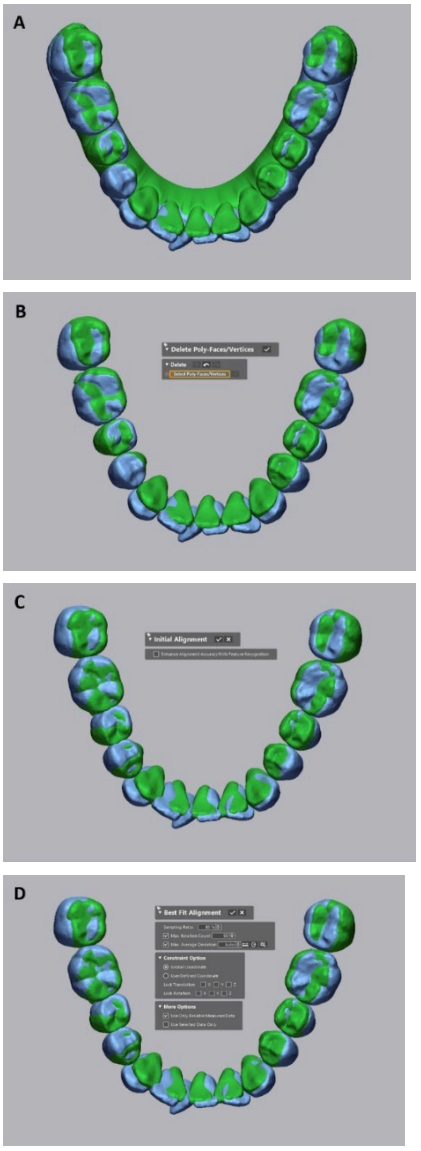
Results

Regression analysis revealed significant differences ($p < 0.001$) between the predicted and achieved mesiodistal tooth positioning for incisors and canines. For every degree of predicted incisor mesiodistal tip, 78.89% of this tip was achieved ($R2 = 0.4901$). For every degree of predicted canine tip, 54.16% was clinically expressed ($R2 = 0.5965$). The accuracy of mesiodistal tip expression was not significantly affected by the prescribed number of aligners, 1-week versus 2-week aligner change protocols, or the presence of attachments ($p > 0.05$). In addition, incisors were less likely to express the correct direction of mesiodistal tip predicted than canines ($p = 0.020$).

Conclusions

A shortfall between the predicted and clinically achieved expression of mesiodistal tooth movement with Invisalign was found for the anterior teeth following a lower incisor extraction. The number of aligners, duration of aligner wear and specific attachment designs were not found to significantly influence the accuracy of the achieved mesiodistal tip movements.

Figure 1 Method of model superimposition: A Initial and predicted models imported into Geomagic® software. B Gingiva was deleted from each model. C The models registered using initial alignment. D Best fit alignment with 50-iterations and 80% point count.



Strategies to Enhance the Socioeconomic Status Prediction for Dental Caries.

Researchers

An Dao

Supervisors: Loc Do, Nicole Stormon & Diep Ha

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Background

Principal Component Analysis (PCA) is widely used in Socioeconomic Status (SES) studies, with its first loading component typically representing the SES construct. However, PCA struggles to select relevant indicators for constructing predictive SES components predictive of specific outcomes. Decision Tree Analysis (DTA) can address this issue but has limitations in predicting health outcomes, as it prioritises using SES indicators individually.

Objectives

This study hypothesised that combining DTA and PCA would enhance the predictive power of SES components compared to either method alone. It also investigated whether an SES composite derived from significantly loading indicators of the first component could predict outcomes more effectively than using the entire first component.

Methods

The study analysed twelve SES indicators measured at the baseline of the Study of Mothers' and Infants' Life Events (SMILE), a longitudinal study involving 2181 children. Five SES composites were created using different statistical approaches. These included one composite by summing values of indicators identified solely by DTA and two pairs of composites using predictor values from either the entire first component or only significant loading indicators of the first component, with and without DTA. Five zero-inflated regression models using these SES composites were fitted and validated through k-fold cross-validation to predict dental caries at age five. The primary indicator for determining the most predictive SES composite was the Root Mean Square Error (RMSE).

Results

Models using SES composites created by combining PCA and DTA exhibited lower RMSE values compared to those using either method alone. The SES composite using DTA and PCA combination with only significant loading indicators of the first component had the lowest RMSE.

Conclusions

Combining DTA and PCA, especially when incorporating significant loading indicators of the first component, offers superior predictive power for creating SES composites aimed at specific outcomes.

Conclusions

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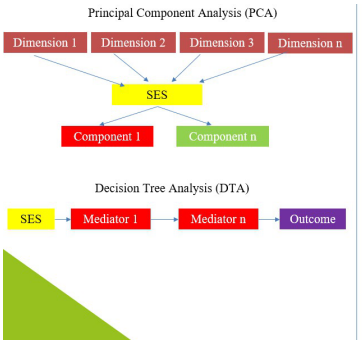

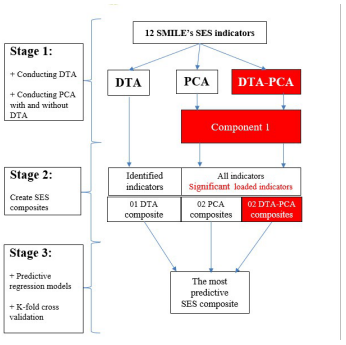

Revolutionizing pulp diagnostics: Microwave-based pulp vitality test

Researchers

Farzaneh Afkhami

Supervisors: Ove Peters

School of Dentistry, The University of Queensland

Objectives

Our recently published scoping review revealed that none of the current techniques for assessing pulp vitality have been successfully integrated into clinical practice, highlighting the ongoing challenge in this area [1]. Therefore, this project aims to explore the potential of Microwave Sensing and Imaging (MSI) as a diagnostic tool in assessing pulp conditions.

Methods

Proof-of-concept studies to understand the interaction of electromagnetic waves with dental tissues were conducted. A 3D model of a human molar was created using CST Microwave Studio, simulating healthy and diseased pulp conditions by varying permittivity values. Then pulp phantoms with different water contents (0%, 35%, 50%, 75%, and 92%) were used to quantify how variations in water content inside a tooth affect its permittivity. Each sample underwent five measurement cycles to ensure accuracy, producing dielectric datasets for each water concentration.

Results

The 3D modeling showed significant changes in wave propagation characteristics between healthy and diseased pulp, indicating MSI's potential to detect pulp conditions. Experimental results indicated that changes in water content within the tooth significantly affect permittivity, supporting the feasibility of MSI for pulp condition assessment.

Conclusions

The preliminary results demonstrate that MSI is a promising technique for non-invasive dental diagnostics. The project's findings suggest that MSI can accurately detect changes in pulp conditions, offering a valuable tool for pulp vitality assessment.

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Measurements of socioeconomic inequalities in oral health research – A scoping review

Researchers

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Background

It is important to measure socioeconomic inequalities in oral health and compare it between populations and over time.

Objectives

This scoping review aimed to explore how inequality indexes were used to measure inequalities in dental research.

Methods

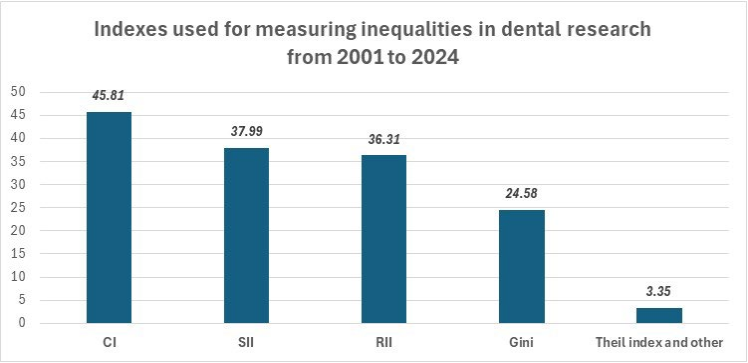
The review was conducted following Asksey and O'MALLEY'S five-stage framework and PRISMA-ScR guidelines. A systematic search was conducted in six databases: Pubmed, Scopus, Web of Science, CINAHL, Embase and Cochrane Library. The search strategy was developed for Pubmed and then depending on each database, the search strategy was adapted and used in the other databases. All studies were imported to Covidence for screening and extracting information by two reviewers.

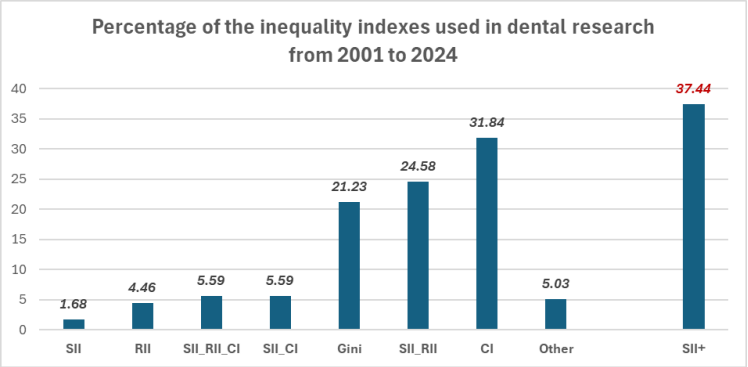
Results

A total of 1245 articles were screened at the tittle and abstract level and 189 full-text studies accessed for eligibility. The 179 studies were included from more than 185 different countries from 2001 to 2024. Concentration index (CI) was used mostly with 45,81%, followed by slope index of inequality (SII) and relative index of inequality (RII) with 37,99% and 36,31% respectively. Gini index was used in 24,58% of the including articles and Theil index and other was found in 3,35% of the 179 studies. SII and RII combined was found in approximately 24,6% most relevance in measuring oral health inequalities. Research mostly done in Brazil, followed by Iran and US. The studies were conducted in measuring inequality mostly in adult populations using education and household income as disparity variables. Only a few studies focused on inequality in ethnicity, occupational social class and geographical status.

Conclusions

The findings indicate that slope index of inequality, relative index of inequality and concentration index were used mostly in measuring inequality in dental research, in particular socioeconomic inequality.





Evaluating the physicochemical properties, antimicrobial efficacy, and staining potential of nanoparticles in paediatric dental care

Researchers

Amjad Almuqrin

Supervisors: Chaminda Jayampath Seneviratne, Laurence Walsh, Sobia Zafar

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Objectives

Globally, early childhood caries is the most prevalent childhood illness and is the leading cause of preventable hospital admissions. Silver fluoride topical solutions are effective in arresting dental caries in young children who may not be cooperate with conventional treatments, thus reducing the need for extensive interventions. Due to parental concerns over black tooth discoloration from silver fluoride, this study aimed to generate antimicrobial silver and selenium nanoparticles with eco-friendly stabilisers and examine their physicochemical properties, antimicrobial potencies, and staining actions.

Methods

Silver (Ag) nanoparticles (Ag1:Casein-capped; Ag2:Bovine-Serum-Albumin-capped; AgL1:Citrate-capped; AgL2:Citrate-tannic acid-capped) and selenium (Se) nanoparticles (Se1:Chitosan-capped; Se2:BSA-capped) were chemically synthesised using natural capping agents, and characterised. The biofilm growth inhibition assays using crystal violet were performed using single and dual-species biofilms of Streptococcus mutans and Candida albicans and compared to controls. Discolouration assessment was conducted by the application of nanoparticles on prepared dentine slices, with pre-and post-application imaging to detect staining over 30 days.

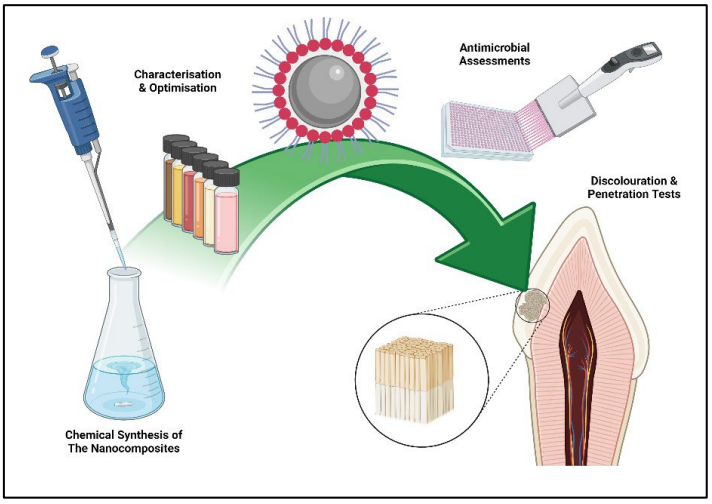
Results

The biofilm growth inhibition assays showed that the synthesised nanoparticles inhibited both single and mixed species. Ag-based nanoparticles had higher antimicrobial potency than Se-based nanoparticles. Ag1 and AgL1 had the most effective concentrations, i.e. 28.7 µg/ml and 121.6 µg/ml against dual-species biofilms, with 91% and 94% inhibition, respectively. They were comparable to control silver nitrate (15.625 µg/ml and 89% inhibition) and Riva star Aqua™ (7.81 µg/ml and 94% inhibition). The discolouration assessment revealed that the synthesised antimicrobial nanoparticles did not stain dentine, unlike silver fluoride controls.

Conclusions

These results demonstrate the successful eco-friendly synthesis of selenium and silver nanocomposites, which showed significant antimicrobial efficacy against dual species biofilm at minimal concentrations without causing dentine discoloration. Further studies are needed to validate their effectiveness and penetration into tooth structures to address parental concerns and expand options for managing dental caries in young children.

Figure 1: Diagrammatic abstract



Dental students' insights on using three silver fluoride types on extracted carious primary teeth

Researchers

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2 Faculty of Dental Sciences, University of Peradeniya, Sri Lanka

Objectives

Modern dentistry increasingly embraces minimally interventive approaches, with Silver Fluoride (SF) materials playing an emerging role. Training in SF is critical for preparing future dentists to effectively administer these treatments, particularly to paediatric and special needs patients. This study aimed to evaluate dental students' knowledge and handling of various SF products available within Australia and Sri Laka.

Methods

All students enrolled in year 4 of the Bachelor of Dentistry program at the University of Peradeniya, Sri Lanka participated in a self-administered questionnaire before and after the use of three silver fluoride products on extracted carious primary teeth. The products included Riva Star (SDI Limited Inc), Riva Star Aqua (SDI Limited Inc) and Silver Diamine Fluoride (SDF; E-Denta-India). The questionnaire collected information regarding participants demographics, knowledge, experience and application of SF/SDF. Jamovi and GraphPad Prism were used for data analysis and creation of graphs.

Results

A total of 74 students completed the questionnaire giving a response rate of 100%. All participants either strongly agreed (79.7%) or agreed (20.3%) that the workshop assisted their SF learning. 85% of the participants strongly agreed that the SF workshop added value to training, 80% participants strongly agreed/agreed that they felt more familiarised with the SF brands after workshop. Furthermore, 97.3% strongly agreed/agreed that the workshop provided a realistic experience, increasing their propensity (77%) to use SF materials clinically where appropriate. 65% of participants found SDF (Kids-e-Dental) the easiest to apply and quickest, while Riva Star Aqua was deemed the most aesthetically pleasing (54%), though SDF (Kids-e-Dental) was rated the least.

Conclusions

The SF workshop added value for the undergraduate dental training program by enhancing students' understanding of SF materials and their clinical applications.

Reliability of YouTube TM Videos on Clinical Use of Silver Fluoride

Researchers

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Supervisors: Sobai Zafar & Laurence Walch

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Introduction

Silver diamine fluoride (SDF) offers a minimally invasive approach to caries treatment, particularly in populations with an uncooperative nature. However, the lack of formal guidelines for SDF usage in Australia creates a non-standardised approach for clinical SDF usage amongst dental professionals. Given the popularity of YouTube™ as a source of dental information, this study investigated the reliability of YouTube™ videos on the clinical application of SDF for this audience.

Objective

This study aimed to assess the reliability of YouTube™ videos on the clinical usage of SDF.

Methods

A descriptive cross-sectional study analyzed the top 100 search results for "Silver Fluoride" and "Silver Diamine Fluoride" respectively on YouTube™. Videos were categorized by source (university, professional organization, dental professional, commercial brand, individual user). Reliability was assessed using the modified DISCERN (mDISCERN) index and the percentage of manufacturer's Instructions for Use (IFU) steps followed in videos demonstrating clinical usage. Descriptive statistics were used to analyze video characteristics and assess differences by source.

Results

A total of 85 videos were analyzed. The median video length was short (2.82 minutes), with low engagement (median views: 1179, likes: 16, comments: 0). The median mDISCERN score (3.67) indicated moderate reliability. Videos from universities and professional organizations had higher median mDISCERN scores and engagement metrics compared to other sources. Videos with higher mDISCERN scores tended to follow a higher percentage of IFU steps.

Conclusions

YouTube™ videos on SDF clinical usage are generally unreliable and lack comprehensiveness. Videos from universities and professional organizations showed some promise, but formal guidelines remain crucial for reliable information. The mDISCERN tool may have limitations for assessing clinical information accuracy. Future research could focus on coming up with a better tool to assess clinical reliability of videos.

Enhancing Periodontal Tissue Regeneration Through the Immunomodulatory Properties of Cerium-Doped ZIF-62 Nanomaterials

Researchers

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Objectives

Periodontitis, characterised by infection-induced inflammation, results in the destruction of periodontal tissues and is the leading cause of adult tooth loss. Dysregulation of the local immune response reduces the regenerative capacity of the periodontium, underscoring the importance of immune modulation to restore periodontal function (1). The advancement of immunomodulatory biomaterials has facilitated the repair and regeneration of damaged periodontal tissues. ZIF-62, a type of zeolitic imidazolate framework (ZIF), exhibits a remarkably large accessible pore area and notable stability, enhancing its ion-releasing capacity. Studies have demonstrated that the release of Zn2+ from ZIFs exhibits both antibacterial and pro- osteogenic effects, making ZIF-62 a promising candidate for periodontitis treatment (2).

However, nanomaterials can induce the generation of reactive oxygen species (ROS), triggering inflammatory responses that hinder new bone formation. Cerium is known for its ability to reduce ROS through free radical scavenging and immune modulation (3). Therefore, combining ZIF-62 with cerium ions could lead to innovative therapies for periodontitis. We hypothesise that cerium-doped ZIF-62 can regulate immune responses and promote a pro-regenerative microenvironment for periodontal tissue regeneration

Methods

Ce-ZIF-62 was fabricated through hydrothermal methods and subjected to characterisation using SEM, TEM, EDX, ICP-MS, and THz/Far-IR. The biocompatibility and immunomodulatory effects of Ce-ZIF-62 on murine macrophages were evaluated by Alamar blue assay, RT-qPCR and immunofluorescence staining. The antibacterial properties against oral biofilms were investigated using crystal violet assay and Live-Dead assay. Furthermore, the pro-regenerative properties of Ce-ZIF-62 on periodontal ligament cells were examined by alkaline phosphatase, Alizarin Red S staining, and RT-qPCR.

Results

Ce-ZIF-62 was successfully fabricated, displaying a smooth, rounded morphology with a uniform dispersion of zinc and cerium ions. Beyond supporting regular cell growth, Ce-ZIF-62 showed potential in reducing pro-inflammatory cytokines, inhibiting the growth of bacteria associated with periodontitis, and demonstrating pro-osteogenic properties.

Conclusions

This study underscores the effective modulation of inflammatory responses in periodontal disease through the development of novel Ce-ZIF-62 materials. It offers crucial insights into advancing functional materials for periodontal tissue regeneration, holding significant implications for periodontal therapy.

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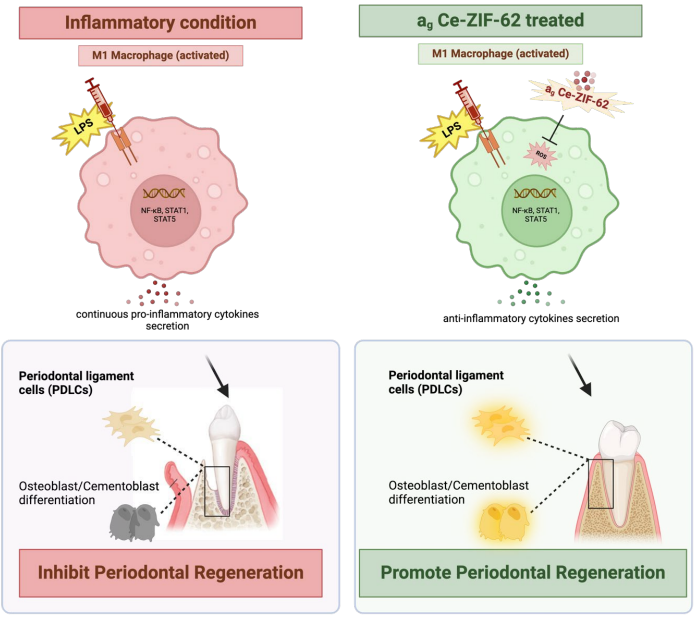
The potential mechanism for ag Ce-ZIF-62 inflammation modulation and periodontal regeneration. ag Ce-ZIF-62 sustains the release of ions through the bioactive, stable framework provided by ZIF-62. The ROS scavenging property of cerium helps regulate innate immune responses, while the release of zinc and cerium ions stimulates a regeneration-promoting microenvironment for periodontal tissue regeneration.



Temporal Dynamics of Probiotic SsK12 Colonization on composition and functionality of oral microbiome

Researchers

Nadeeka Udawatte

Supervisors: Jaya Seneviratne

School of Dentistry, The University of Queensland

Community and Oral Health, Metro North Hospital and Health Service, Queensland Health

Objectives

Probiotic bacteria offer human health benefits, which have catalyzed a billion-dollar global industry . Probiotics have evidence for alleviating various oral diseases and promoting oral health. A major limitation of probiotics is their transient nature, as they do not permanently incorporate into the microbial community. In the present study, we seek to evaluate the temporal dynamics of niche-specific oral probiotic bacteria using an ex vivo oral microbiome model.

Methods

In a time-dependent study, we evaluated the colonization potential of probiotic Ssk12 bacteria in salivary biofilm from healthy persons (PPD ≤ 3 mm, BOP < 10%) cultured on a clinically reprehensible 3D MEW-PCL model over 10 days (baseline -day 0, days 4, 7, and 10). At each time point, strain-specific probes were used to quantify the SsK12 by confocal imaging and RT-qPCR. In addition, biofilm biomass was quantified using the crystal violet (CV) assay. 16S amplicon-sequencing and RNAseq techniques were used to examine the microbiome composition and functional transcriptome, respectively.

Results

The colonization of SsK12 in the salivary biofilm was observed until day 7, but it disappeared by day 10. Though overall microbiome diversity remained constant, notable clustering of microbiome composition was identified at day 4 by genera Streptococcus, Lactobacillus, and Rothia, and at day 10 by Biofidobacterium and Staphylococcus. Day 4 functional genes are primarily involved in homeostatic activities such as transcription and translation, protein trafficking, oxidative phosphorylation, and oxocarboxylic acid metabolism, whereas day 10 unique clustering is primarily enriched in posttranslational modification, nucleotide transport and metabolism, replication, recombination, host immune response, and oxidative stress.

Conclusions

This finding suggests that the colonization of probiotic Ssk12 bacteria has a substantial impact on the composition and fundamental microbial activities for a limited-period of time.

Cracking the 'X' Code: Water Fluoridation Sentiment Analysis with Cutting-Edge Machine Learning

Researchers

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Supervisors: Loc Do, Ratilal Lalloo, Diep Ha

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Objectives

This study aims to analyse public sentiment towards water fluoridation using data from the social media platform 'X' (formerly Twitter) over a decade, employing machine learning techniques to gain insights into public opinions and their evolution over time.

Methods

We conducted a sentiment analysis on English-language tweets related to water fluoridation from 2014 to 2024. Data was collected using the 'X' API and processed with Python libraries, excluding non-English tweets. Sentiment scores were generated using the SentimentIntensityAnalyzer from the Natural Language Toolkit (NLTK). We implemented various machine learning models (Logistic Regression, Decision Tree, Naive Bayes, and Random Forest) to evaluate sentiment trends and patterns, engagement metrics, and topic modelling.

Results

A total of 72,309 tweets were analysed. The sentiment analysis revealed that 37.4% of tweets expressed negative sentiments, 34.4% positive, and 28.2% neutral sentiments towards water fluoridation. Engagement metrics indicated a gradual decline in tweet frequency with significant variability in retweets and likes over the years. The Logistic Regression model outperformed other models with an accuracy of 88.83% and an AUC value of 0.95. Topic modelling identified recurring themes such as health benefits and safety concerns, with notable shifts in public discourse during key events in 2016, 2018, and 2020.

Conclusions

Our findings highlight the fluctuating nature of public sentiment towards water fluoridation on social media. Negative sentiments often peaked in response to adverse events, while positive sentiments showed resilience. The study underscores the importance of real-time monitoring and effective public health communication strategies to address misinformation and enhance public awareness of water fluoridation benefits.

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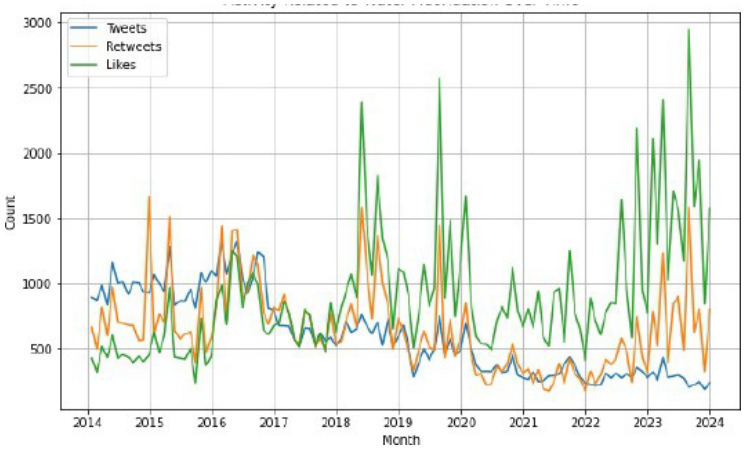
Figure 1: Water fluoridation tweet sentiment trends and engagement metrics from 2014 to 2024.



Investigating the Role of Extracellular Vesicles in Periodontitis

Researchers

Chun Liu

Supervisors: Jaya Seneviratne, Saso Ivanovski, Pingping Han

School of Dentistry, The University of Queensland

Objectives

Extracellular vesicles (EVs) are nanoscaled lipid bilayered particles derived from most cells of different species, including host and bacterial derived EVs (BEVs) [1]. Oral bacterial derived BEVs contain a variety of microbial molecules, including enzymes, toxins, and microbial-associated molecular patterns (MAMP) [1], that can be transported to recipient host cells locally and systematically to cause periodontitis or other systemic diseases [1, 2]. In terms of host response, host derived EVs with encapsulated pro-inflammatory cytokines may contribute to the modulation of immune and inflammatory processes in oral disease pathogenesis [3]. This study aims to a) understand the BEV component by comparing 16S sequencing profiles from 3D-mimicking saliva biofilm and b) assess the potential of immunoaffinity-enriched host EVs from saliva as diagnostic markers for periodontitis.

Methods

For BEV profiling, BEVs were isolated from saliva biofilm cultured on elctrowritten (MEW) medical-grade polycaprolactone (mPCL) scaffolds and tissue culture plastic (TCP) using size exclusion chromatography (SEC). The isolated BEVs were characterized, followed by genomic DNA qPCR and 16S rRNA gene sequencing. Host derived EVs were enriched from 12 non-periodontitis and 20 periodontitis patients' saliva using SEC and bead-based immunoaffinity capture. Inflammatory cytokines (IL-6, IL-1β, IL-8 and IL-10) in host EVs were compared between 12 non-periodontitis and 20 periodontitis.

Results

6s sequencing results suggest that BEVs exhibit strong enrichment ability and sensitivity with genera Capnocytophaga, porphyromonas and veillonella, phylum Firmicutes and Bacteroidota, and species Alloprevotella_tannerae, Capnocytophaga_sputigena etc. Moreover, immunoaffinity-enriched salivary EVs from periodontitis patients displayed increased pro-inflammatory cytokines IL-6, IL-8 and reduced anti-inflammatory IL-10 compared to non-periodontitis individuals.

Conclusions

Investigating BEVs from oral biofilm and cytokine signatures in salivary host EVs could enhance our understanding of periodontitis, potentially leading to more accurate diagnosis and targeted therapeutic interventions in the future.

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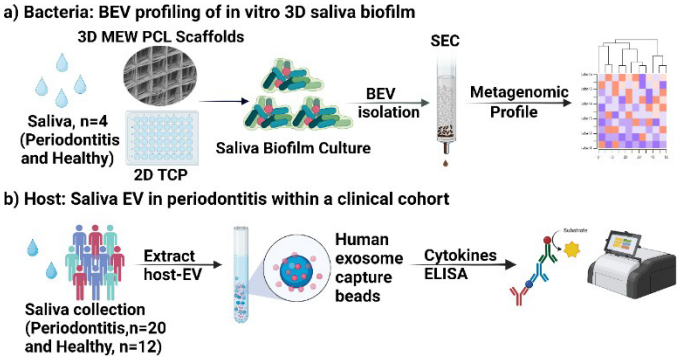
Figure 1. Schematic showing the proposed project aims. a) Periodontally healthy saliva biofilm derived BEVs were isolated by SEC and explored by 16s sequencing. b) Inflammatory cytokines (IL-6, IL-8, IL-1β and IL-10) in host EVs were compared between 12 non-periodontitis and 20 periodontitis by ELISA.



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