Diabetes and oral health – final report

The aim of this C3 project, funded by the *Burdett Trust for Nursing,* was to reduce the prevalence of type 2 Diabetes (T2DM) and its associated complications and co-morbidities, by engaging and training nurses on the bi-directional relationship between T2DM and oral health. Additionally, the project explored barriers and facilitators to nurses addressing T2DM and oral health and co-produced recommendations for nurses addressing oral health to prevent T2DM.

The project objectives were to:

- increase nurses' knowledge and awareness of the bi-directional relationship between T2DM and oral health;
- explore how to enable nurses to enhance their role in addressing oral health;
- co-produce recommendations for nurses integrating oral health into T2DM prevention; and
- present these recommendations to UK policy makers, nurse leaders and nurse training institutions and develop a dialogue on the role of nurses in addressing oral health in T2DM prevention.

During this ten-month project, activity has included: convening an expert advisory group; collaborating with the organizations *Learn With Nurses* and the *Commonwealth Nurses and Midwives Federation* to design and deliver a series of online webinars; conducting a literature review; convening an expert roundtable and producing recommendations for integrating oral health into nurse practice.

Expert advisory group

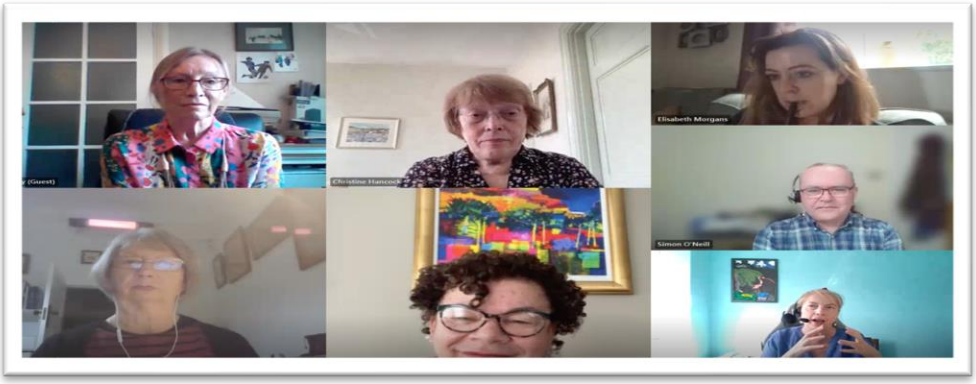
The expert advisory group met in August 2023 to discuss the issue of nurses addressing oral health in patients with T2DM. The group includes:

- Judy Downey, Diabetes Specialist Nurse
- Simon O'Neill, Health Intelligence and Professional Liaison, Diabetes UK
- Jill Iliffe, Executive Secretary at Commonwealth Nurses and Midwives Federation
- Professor Cynthia Pine, Emerita Professor of Dental Public Health at Barts & The London School of Medicine and Dentistry, Queen Mary University of London

Key points to emerge from this dynamic meeting included:

- That there is a very real need to consider oral health within diabetes care, which is supported by the research.
- Brief interventions can be very impactful, e.g. *did you know cleaning your teeth is really important for people with diabetes.*
- Nurses must have the confidence to ask questions around oral health.
- The importance of integrating oral health checks into annual diabetes checks.

- Professor Cynthia Pine talked about *Bringing the Mouth back into the Body.*
- Jill Iliffe said a campaign in Australia against charging for dental visits while eye tests are free had a slogan '*Watch while your teeth fall out*!'
- There are large numbers of dental nurses, hygienists, therapists – this work doesn't need dentists.
- Some dentists are doing blood glucose checks.
- The issue of oral health and diabetes in pregnancy; approximately 40 percent of women with gestational diabetes develop T2DM.



Screenshot of steering group meeting

The expert advisory group members were involved in planning the expert round table event, which was commissioned as part of the overall project, and contributed to the design of the session and its agenda. In addition, members provided suggestions for stakeholders to invite to the event, which was held in November 2023 at the Diabetes UK offices in London. Educational and training programme – online webinars

C3 collaborated with *Learn With Nurses* and the *Commonwealth Nurses and Midwives Federation* to deliver a series of training and engagement events for nurses, on oral health and T2DM. In total eight webinars were delivered by several expert nurses in diabetes and oral health. The speakers included:

- Jill Iliffe RGN BAS RM, MIntS, IDMHHRL. Jill is Executive Secretary of the Commonwealth Nurses and Midwives Federation, a nurse and midwife leader, and former National Secretary of the Australian Nursing and Midwifery Federation. Jill has worked with C3 to develop its oral health programme since 2021.
- Judy Downey RGN BSc (Hons). Judy is a Diabetes Specialist Nurse, working in secondary care, primary care and the pharmaceutical industry, and is an Associate Lecturer at Buckinghamshire New University.
- Michaela Nuttall RGN MSc is Founder and Director of Learn With Nurses and is a cardiovascular nurse specialist. In 2019 she was Deputy National Lead for CVD Prevention at Public Health England and now remains as a clinical advisor.
- Christine Hancock is C3's Founder and Director. She is a nurse leader with years of experience working in the Royal College of Nursing (RCN) and International Council of Nurses (ICN) as well as CEO roles in London's NHS. C3 has a global reputation within the NCD prevention community.

Educational content

Webinar: Why should nurses look in mouths?

Jill Iliffe discusses the importance of oral health and its link with general health and wellbeing and why nurses and midwives should engage in oral health promotion and disease prevention. The session also

includes details on the why, how and when of oral health assessment, an overview of the anatomy of the oral cavity, the prevalence of oral disease, and the shared risk factors for oral disease and NCD. Click here to watch on demand.

Webinar: Diabetes and oral health: A two-way relationship
This interactive session delivered by Judy Downey outlines the bi-directional relationship between diabetes and poor oral health and covers common oral health issues (e.g. cavity, gingivitis, periodontal gum disease), how diabetes and poor oral health are linked, and why it is important to assess and address oral health as part of diabetes care. Click here to watch on demand.

In-conversation: Advertising and its impact on our mouth
Michaela Nuttall and Jill Iliffe deliver an insightful discussion on the social determinants of health focusing on the influence of advertising and highlighting:

- The impact of inequalities on oral health – why oral health outcomes are unequal across populations.
- The impact of advertising on oral health – advertising of food, beverages, and oral hygiene products.
- Practical solutions to level the playing field and a role for nurses and midwives.

Click here to watch on demand.

In-conversation: Nurses discuss diabetes, oral health and general health relationship
In this in-conversation session Jill Iliffe and Judy Downey discuss the association of oral health with general health and diabetes. The session includes explanations as to the impact of oral disease leading to systemic complications and the risk of developing T2DM. Judy and Jill also discuss the unique position of nurses and midwives to raise awareness about the importance of oral health and provide oral health education to individuals, families and communities. Implementing preventative measures early will alleviate individual pain, discomfort and disfigurement and reduce the economic burden of oral diseases on individuals and the health system. Click here to watch on demand.

In-conversation: When and why should nurses look in mouths?
During this in-conversation session Judy Downey and Michaela Nuttall discuss mouth care and diabetes including what nurses should look for, and why nurses don't look in mouths. They also discuss the challenges and opportunities for promoting oral health and the risk of missing opportunities for diabetes management. Click here to watch on demand.

In-conversation: What about the kids
Michaela Nuttall and Jill Iliffe discuss the high incidence of dental caries in children and issues around oral health advertising. Click here to watch on demand.

In-conversation: Why doesn't everyone brush their teeth?
Christine Hancock is joined by Jill Iliffe to discuss why people don't brush their teeth. Click here to watch on demand.

In-conversation: Oral Health - should we leave it all to the dentists?
In this session Michaela Nuttall and Judy Downey talk about why oral health should be everyone's business and discuss barriers to nurses implementing oral health such as nurses' workload and capacity. Discussion also touches on whether dentists look for diabetes. Click here to watch on demand.

Learn with nurse's report and evaluation:

As part of the education and training programme *Learn with nurses* (LWN) provided an evaluation report on the webinars and training resources. 444 people attended the webinars in total, with 212 providing feedback.

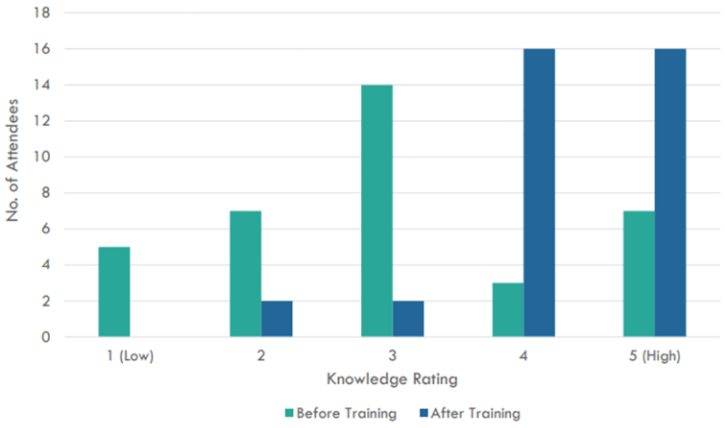
Participants also provided additional feedback information which can be found in appendix four.
Below are the key findings and feedback from the webinars:

KNOWLEDGE OF TOPIC

Learn With Nurses

72% Of participants rated their **knowledge** at **3 or lower, before training**

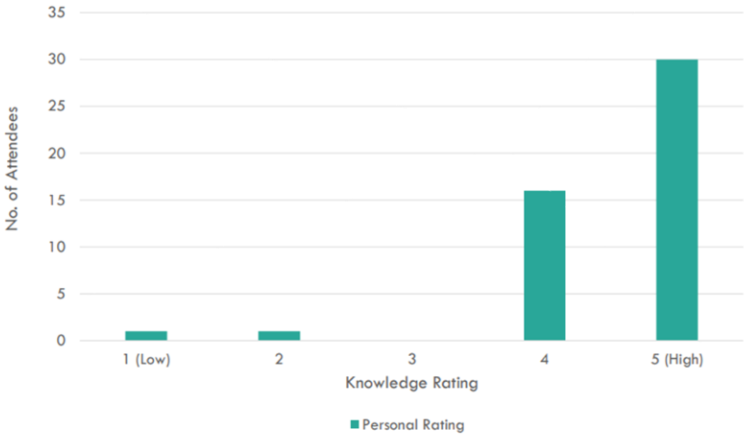
89% Of participants rated their **knowledge** at **4 or higher, after training**



KNOWLEDGE OF TOPIC

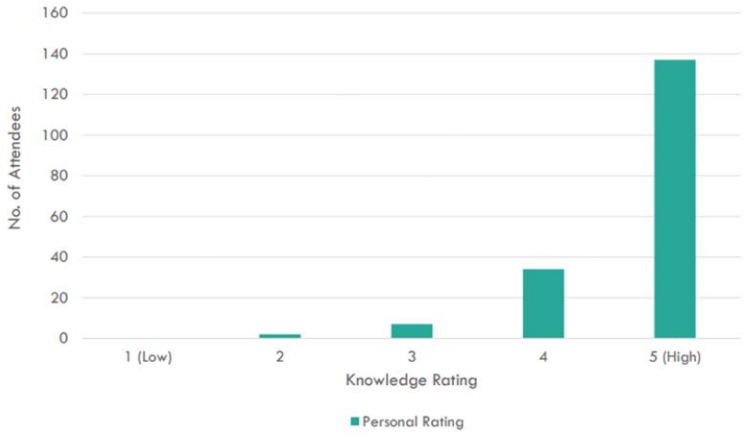
Learn With Nurses

96% Of participants rated their **likelihood of using what they had learned to make a difference** as **4** or **5**



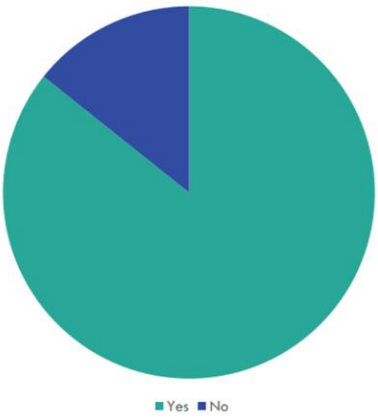
QUALITY OF THE TRAINER DELIVERY

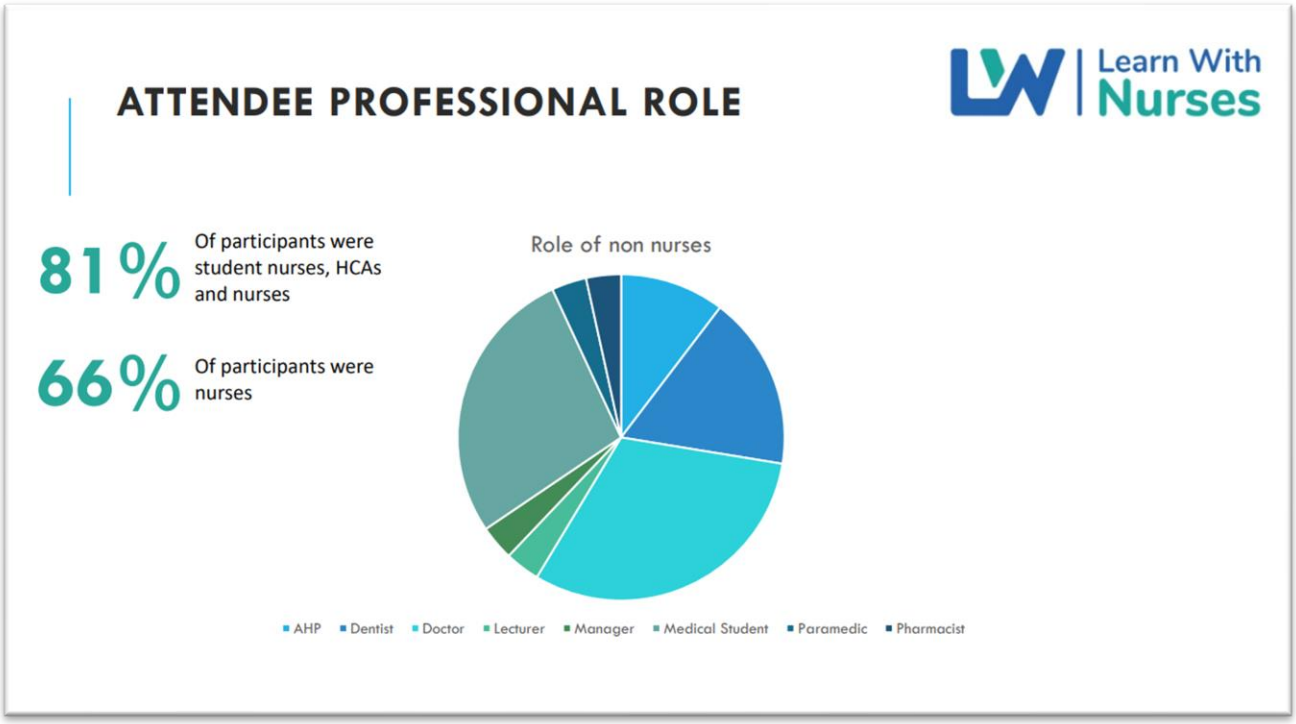
95% Of participants rated the **trainer delivery** as **4** or **5** with an average rating of **4.7**



IF THIS SESSION WAS A PODCAST. WOULD YOU LISTEN TO IT

85% Of participants said that they would listen to the session as a podcast





Nursing symposium

Nurses on the front line making a difference to non-communicable disease

In September 2023 *C3 Collaborating for Health* and the *Burdett Trust for Nursing* collaborated on hosting an in-person event for nurses to discuss NCD, and what nurses are doing in tackling them. C3's Associate in Nursing, Michaela Nuttall, presented at a round table event about the Diabetes and Oral health project, and C3's Director, Christine Hancock, outlined the scale of the issue worldwide.



C3's Director Christine Hancock outlining the global issue of NCD



C3's Michaela Nuttall showcasing C3's Diabetes prevention work

Literature review

A literature review exploring the issue of oral health, T2DM and the role of nurses can be found in appendix 2, with a full list of references.

Other resources

A list of several resources referenced throughout this project by key stakeholders and experts to support both nurses and individuals living with T2DM can be found in appendix 3.

Communications

The project has a web page on C3's website with links to all resources and the project has been promoted across C3's social media channels.

Webpage

C3 created a dedicated Diabetes and Oral Health webpage on the C3 website to promote the programme, and to provide vital information and access to the training webinars and reources. The full webpage and links to resources can be viewed by clicking here. Below are screenshots of the webpage.



Social media

C3 Collaborating for Health promoted the programme by creating and reposting about the resources offered on our social media (X and Linkedin), examples below:



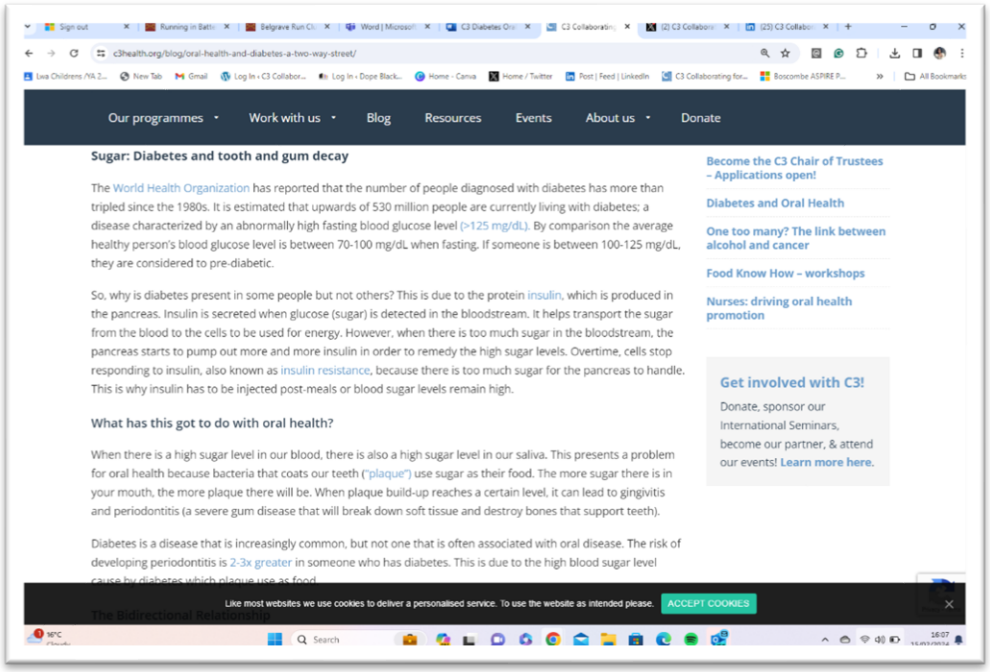

You reposted
Learn With Nurses @LWNurses · Jul 27, 2023
New #Diabetes & #OralHealth Series
2.8.23 12pm
@DowneyJude2757
Diabetes & Oral Health: A two way relationship
Certificate via @MedAllApp
learnwithnurses.org/event/diabetes... @WeNurses
@WeStudentNurse
@Gpnsnn
@WeGPNs
@WeLDnurses...
Show more
Diabetes and Oral Health:
A two way relationship
Delivered by Judy Downe RGN BSc (Hons)y
FREE 40 minute bite-sized webinar
Learn With Nurses
Commonwealth Nurses and Midwives Federation
COLLABORATING FOR HEALTH
Burdett Trust for Nursing
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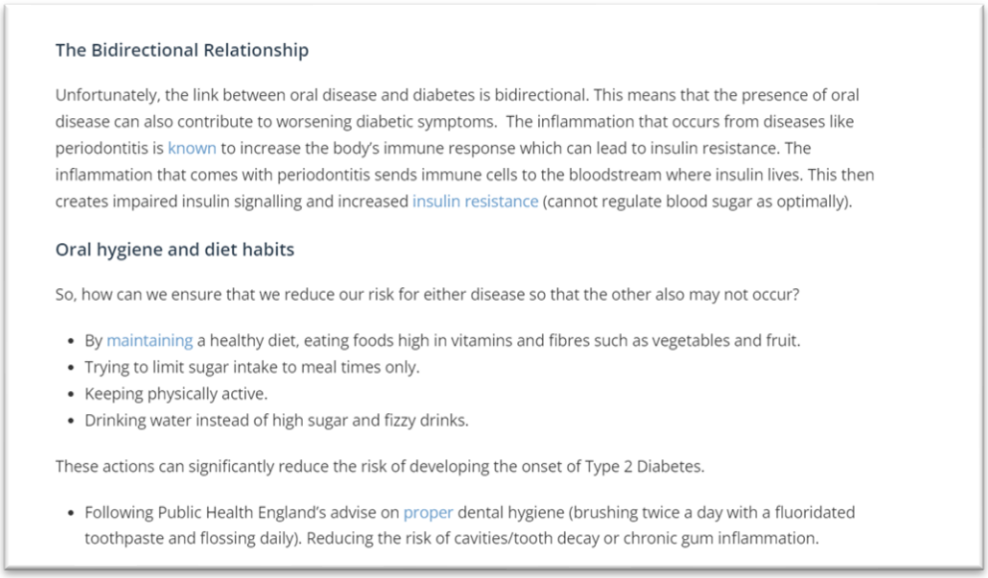

C3 Collaborating for Health
1,077 followers
now
In this webinar we discuss the impact of inequalities and advertising on oral health and how they link to diabetes.
This session is part of an initiative funded by the Burdett Trust for Nursing and presented by learn with nurses, the Commonwealth Nurses and Midwives Federation, and C3 Collaborating for Health.
https://lnkd.in/eVJt9Mqt
Advertising and its impact in our mouths
Delivered by Michaela Nuttall RGN MSc & Jill Iliffe CNMF
FREE 40 minute bite-sized webinar
Learn With Nurses
in Conversation
Commonwealth Nurses and Midwives Federation
COLLABORATING FOR HEALTH
Burdett Trust for Nursing
Advertising and its impact in our mouths
app.medall.org • 1 min read
Like
Comment
Repost
Send
Add a comment...



Blog

C3 Collaborating for Health published a blog that explored the bi-directional relationship between Diabetes and Oral Health (screenshots below). You can read the full blog here.





The Bidirectional Relationship

Unfortunately, the link between oral disease and diabetes is bidirectional. This means that the presence of oral disease can also contribute to worsening diabetic symptoms. The inflammation that occurs from diseases like periodontitis is known to increase the body's immune response which can lead to insulin resistance. The inflammation that comes with periodontitis sends immune cells to the bloodstream where insulin lives. This then creates impaired insulin signalling and increased insulin resistance (cannot regulate blood sugar as optimally).

Oral hygiene and diet habits

So, how can we ensure that we reduce our risk for either disease so that the other also may not occur?

- By maintaining a healthy diet, eating foods high in vitamins and fibres such as vegetables and fruit.
- Trying to limit sugar intake to meal times only.
- Keeping physically active.
- Drinking water instead of high sugar and fizzy drinks.

These actions can significantly reduce the risk of developing the onset of Type 2 Diabetes.

- Following Public Health England's advise on proper dental hygiene (brushing twice a day with a fluoridated toothpaste and flossing daily). Reducing the risk of cavities/tooth decay or chronic gum inflammation.

Roundtable

In November 2023 C3 convened a roundtable discussion at the headquarters of Diabetes UK in London to discuss issues around integrating oral health checks into routine diabetes checks, and embedding oral health into nursing education. This needs to be across the life course from maternity, infants and early childhood to school age children's health and throughout life so that consideration of oral health becomes part of all health care interactions. The list of attendees can be found in appendix one.

The round table discussion was framed around three questions:

- How do we make oral health everyone's business?
- Why does oral health matter for people living with type 2 diabetes?
- How do we influence policy?

The two-hour discussion featured commentary around several themes outlined below under the sub-headings: Making oral health everyone's business; Education; Resources; and Systems in primary care.

Making oral health everyone's business

Oral health care needs to be part of routine health contacts for people at all ages. Dental extraction is shockingly the most common reason for children to have a general anesthetic (British Society of Paediatric Dentistry: A policy document on dental neglect in children).

As dentists are surgeons, it is generally the broader dental team (dental nurses and hygienists) whohave the time and the skills to provide educational interventions about good oral health, but they are limited in number and capacity and oral health needs to be seen as part of routine health care and not specific to the dental practices. Nurses, as the largest healthcare workforce, have a key role and need to be able to deliver key basic oral health messages. These do not need to be over complicated: brush twice daily and control sugar – the same messages for controlling obesity and diabetes.

Practice nurses, whocare for people across their life course, are key because oral disease can start years before its signs and symptoms manifest. There are some oral health questions included on the diabetes Ardens[1] template used by practice nurses in primary care but there should be more than a 'tick box' on a

form to properly integrate oral health checks into routine patient care. It also needs to be part of wider health care interactions.
Health visitors, with a post registration Specialist Community Public Health Nurse qualification, are also key as they see all families, regardless of circumstance or need. As such, they provide universal messaging from the antenatal period onwards about oral health to prevent future dental disease and poor oral health. As part of the antenatal contact health visitors can support mothers to understand the importance of oral health during pregnancy, accessing the dentist and that they have free dental care. Health visitors see all babies and children before they see a dentist and therefore can support families with oral health advice and how and when to access dental care. They can also support mothers and the wider family to discuss health, diets and physical activity to help prevent T2DM.
School nurses are also often Specialist Community Public Health Nurses and can include key public health messages to children in school, including dental hygiene and giving out toothbrushes.

It's important that 'new' information doesn't put off nurses from asking questions about oral health if they don't feel equipped to advise effectively or don't feel like an expert. This can be an issue when introducing new topics for nurses and other healthcare professionals (HCPs) to include – they feel they must be an expert and have all the answers.
Nurses and HCPs need to be reassured that it's OK not to know everything but should feel confident signposting patients appropriately when they don't know. For patients with T2DM the answer is not always to see a dentist but perhaps to go to the *Diabetes UK* website for a fact sheet.

- Primary care generally, practice nurses alongside Health Visitors, School nurses, dieticians, and community pharmacists are key parts of the health workforce to advocate and advise on oral health and should also be involved.
- There could be an opportunity to embed oral health assessment and advice into health checks generally and *Making Every Contact Count* (MECC).

Education

Undergraduate nurse training delivers very little regarding oral care. The small amount that is covered pertains to patients in intensive care settings and mouthcare with sponges for patients with endotracheal tubes. Even so the nurses delivering this oral care likely lack knowledge and understanding of the bi-directional relationship between oral health and T2DM.
If healthcare professionals realise and understand why oral health is important then they are more likely to integrate it into their daily clinical practice. Currently there is a disconnect and they wouldn't necessarily make the connection between oral health, and general health, and specifically T2DM. To change practice and behaviours student nurses need to witness nurses performing oral health assessment and management on clinical placements.

Pre-registration training for nurses and doctors is a crowded space. Stand-alone modules on oral health can reinforce a separation of oral health and systemic health i.e., the mouth ***and*** the body, and therefore it's important that oral health is embedded into pre-registration curriculums rather than bolted-on as an additional module. There are many touch points for integrating oral health into pre-registration training so it should be incorporated into teaching throughout the life courses through pregnancy, early infancy, and children's health and development and elderly care. Recognising the impact poor oral health can have. For example, people may present with a lack of appetite if they are in pain or their teeth or dentures not fitted.

- The consensus was that once one university starts to offer training on oral health, others will follow.
- There is also an educational opportunity for dentists who may appreciate the issue of periodontal disease in individuals with T2DM but not know about the bi-directional relationship.
- The direction of travel for post graduate training has shifted away from accredited courses to more bite-size brief and accessible training opportunities across multiple platforms.

Resources

When discussing resources, it's important to distinguish between:

1. resources for nurses and HCPS
2. resources for the general public (including children and parents)
3. resources for people living with T2DM.

Brevity of resources for nurses and HCPs is important. Nurses and HCPs want brief CPD interventions and training opportunities, across a range of platforms, including digital ones, such as TikTok. There are more technical resources that provide guidance already out there so care must be taken not to 'reinvent the wheel'. E.g., *Commissioning Standard: Dental Care for People with Diabetes* (2019) by NHS England and NHS Improvement and NHS improvement, discusses cross commissioning and collaborative working and redesigning of services by local dental networks and associated managed clinical networks to redesign services where required. This report is a potential vehicle to start to exert political influence. However, just because they exist, this doesn't equate to implementation of recommended guidance or pathways.

Practical demonstrations on oral health care such as brushing and flossing are likely to be more helpful than fact sheets for training nurses and for educating patients. Traditionally *Diabetes UK* is the main source of information for patients living with T2DM.

- Oral health information prescription from Diabetes UK could be a quick win; nurses and HCP are more likely to talk about oral health with their patients with T2DM if they've got something from *Diabetes UK* to back them up.
- Education and information resources need to be available in various formats and languages to meet diverse needs. Many patients and parents will access health information on social media platforms such as Tic Toc or You Tube but digital platforms need to be used in balance with other approaches to accommodate those who are unable to use digital platforms.

Systems in primary care

Primary care can become very focused on *Quality and Outcomes Framework* (QOF) targets and it is easy to forget to ask other questions. The QOF is a voluntary annual reward and incentive program for all GP practices in England, detailing practice achievement results. QOF can dictate and drive how the care process happens. It can however also be a barrier to implementing other advice, including oral health checks.

There can be a disconnect between what people living with diabetes say, and what *Diabetes UK* say and what the QOF targets set out in addition to the NICE guidelines.

There is poor communication of information between primary care and dental services. Capturing information in primary care such as who is registered with a dentist could start conversations about oral health. But framing the question carefully is important as there are multiple issues. Asking about being registered with a dentist is a service issue, and there are significant capacity issues within the system.

Asking if someone brushes their teeth is an oral health behaviour issue. Brushing is only one aspect of oral health, there are other factors such as, flossing, fluoride mouth washes, different toothbrushes but for families struggling with cost of living it's important to keep the question simple such as: 'Do you brush your teeth twice a day' or 'Do you know why oral health is important?' These questions remove judgement about not being able to see a dentist.

The NHS is constantly changing but dental access is likely not to change in the foreseeable future. Key stakeholders that can influence policy need to be identified to continue this work. Integrated Care Services and Integrated Care Boards (which are now commissioning dentistry) are now the key organizations in England but NHS systems are constantly evolving and subject to change.

- Identifying the leaders and ambassadors who are going to fly the flag for oral health is important across the system. These need to be within the NHS and also independent of NHS structures, to enable greater sustainability.
- The organizations who should be involved in promoting a consistent oral health message include: the Care Quality Commission, Primary Care Diabetes Society, Royal College of General Practitioners and Diabetes UK.

Key recommendations for policy makers and nurse leaders

- Ensure oral health messages are embedded into key contacts with people throughout their lives through antenatal, early years school age and onwards.
- Create a coherent, clear and consistent message about oral health for people living with T2DM.
- Identify organizations, leaders and stakeholders to promote the oral health message.
- Scope the landscape for existing resources that may support nurses to integrate oral health assessment into their routine care.
- Advocate for making oral health an essential aspect of healthcare for patients with T2DM.
- Embed oral health care check into NHS Health Checks.
- Provide brief training opportunities for nurses across multiple platforms such as master classes or bite-size videos with opportunities for reflection and certificate of attendance to support nurses' revalidation.
- Embed oral healthcare into nursing curriculums, pre-registration and post such as specialist practice qualification within existing life course modules, not as a standalone module.
- Encourage nurses to keep questions simple with patients living with T2DM such as: 'Do you brush your teeth?'
- Ensure nurses know where they can signpost patients with T2DM.

Next steps

The outputs of this project, which include a series of educational resources for nurses on oral health and stakeholder recommendations, will shape and inform C3's future oral health work within this relatively new and highly relevant programme.

C3 is developing an article for publication about the project to continue to shine a light on the need for nurses to be bold and brave in widening their scope of knowledge and expertise and encompass oral health.

Ideally there is a need for further research to consider the wider impacts of oral health and supporting good oral hygiene to wider health and wellbeing outcomes. This would require separate funding and projects to consider.

The recommendations have been shared with the round table attendees for comment.
As a short-term project further funding would now be required to take the work forward.
Attendees at the roundtable expressed an interest to potentially take this forward and seek funding.
If there is any options to pursue this C3 would be happy to engage further.

Appendix one

Round table attendees 8 Nov 2023 Diabetes UK, London

Name	Title	Organization
Prof Cynthia Pine CBE	Emerita Professor of Dental Public Health Barts & The London School of Medicine and Dentistry, Queen Mary University	Barts & The London School of Medicine and Dentistry, Queen Mary University
John Grumitt	Trustee	C3 Collaborating for Health
Dr Nigel Carter OBE	Chief Executive	Oral Health Foundation
Natasha Marsland	Senior Clinical Advisor	Diabetes UK
Michelle Turner	Community Diabetes Specialist Nurse & member of the RCN Diabetes Forum	RCN Diabetes Forum
Victoria Jackson	Senior Program Manager	Institute of Health Visiting
Charlotte Gordon	Assistant Professor Adult Nursing	Northumbria University
Prof Stephen Lawrence	Associate Clinical Professor	Warwick University Medical School
Julie Webster	DWELL Programme Lead and Research Engagement Officer	Medway Community Healthcare
Amanda Epps	Lead Nurse for Diabetes and Endocrinology	East Kent Hospitals University NHS Foundation Trust
Elisabeth Morgans	Assistant Director	C3 Collaborating for Health
Michaela Nuttall	Nursing Associate	C3 Collaborating for Health
Helen Donovan	Nursing Associate	C3 Collaborating for Health

Appendix two

Literature review

It is no exaggeration to say that our mouths are the gateway to our health. Poor oral health is strongly associated with several non-communicable diseases (NCDs), sharing common risk factors including: tobacco use, harmful use of alcohol and poor diet, as well as the socioeconomic determinants of health.

Non-communicable disease

The impact of non-communicable diseases (NCDs) is significant and far reaching on a global scale, they are considered the biggest global killers in modern day society (1) and their impact includes the direct effects of living with NCD on an individual's health and quality of life, but wider consequences extend to healthcare delivery, the healthcare workforce and the global economy. The key NCD are: cardiovascular diseases (to include heart attacks and stroke); some cancers; chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma); and diabetes (2). NCD related deaths that occur below the age of 70 are considered premature and the majority of NCD premature deaths are considered preventable (3). Global deaths from NCD increased from 33.5 million in 2007 to 41.1 million in 2017 and WHO predicts that unless action is taken, the global number of deaths from NCD will increase to 55 million by 2030 (3,4).

The reason for the rise in NCD is complex and multifaceted. Globally, life expectancy is increasing, but this does not correlate with quality of life. The global epidemiological transition witnessed in recent decades is considered to be a decline in CMNN deaths and a rise in chronic NCD (4). The drivers of this increase in NCD are numerous and include population growth and aging populations but also other wider factors such as globalisation and its effect on market forces (3). Furthermore, rapid urbanisation particularly in low-income countries, changes to food systems, and changes in human behaviours have all contributed to the worsening NCD epidemic.

The burden of NCD on health, health systems and economies, has enabled NCD to occupy more space on international agendas, however their prevention is still not a high priority for many public health agendas (5). In 2015 the United Nation member states adopted the *Sustainable Development Goals (SDGs)* – a set of 17 global goals – designed to be a universal call to action to end poverty, protect the planet and ensure peace and prosperity for all individuals (6). The growing burden of NCD is included within SDG 3: 'Ensure healthy lives and promote wellbeing for all at all ages' where it is recognised that efforts must be made to achieve universal health coverage (UHC) and sustainable health financing to address the burden (7). These SDGs have embedded the need to address NCDs onto international agendas.

The need for effective prevention strategies is given further impetus by the move by many countries towards universal health care (UHC), to prevent burdening health systems with a high volume of costly chronic long-term conditions (8). There is therefore a global need to shift the focus from programmes that manage NCDs to those that address risk factor prevention and deliver health promotion initiatives. (5).

Oral disease

Oral disease is the most widespread condition affecting the global population. According to the WHO *Global Oral Health Status Report* (2022) there were an estimated 3.5 billion people globally affected by oral diseases in 2019; and the combined estimated number of cases of oral disease globally is about 1 billion higher than cases of all five main non-communicable diseases (NCDs) combined (mental disorders,

cardiovascular disease, diabetes mellitus, chronic respiratory disorder, and cancers) (9). Untreated caries of permanent teeth are the most prevalent form of oral disease followed by severe periodontal disease.(9)

Dental caries are the result of plaque formation on the surface of teeth, which converts free sugars contained in foods and drinks into acids that destroy teeth over time. Peridontal (gum) disease affects the tissues surrounding and supporting the teeth. The disease includes symptoms of bleeding or swollen gums, pain and bad breath. Oral diseases can cause substantial consequences, including pain, infection, reduced quality of life and decreased working productivity. Furthermore, the cost of dental treatment can be expensive for both individuals and the healthcare system as a whole (10). However, major oral diseases can be prevented using cost effective strategies.(9)

Many studies have evidenced the severe impact of tobacco smoking on oral health, which includes bad breath, discoloration of teeth, tooth loss, impaired wound healing and periodontal diseases. In the long term, smokers are more likely to suffer from oral mucosal lesions and even oral cancer (11). Harmful levels of alcohol consumption can also cause several oral diseases, because the acid in alcohol causes erosion of the enamel, leading to pain and sensitivity. Furthermore, some alcoholic drinks are very high in sugar, which can react with plaque and produce plaque acids, and potentially cause dental decay (11). Priyanka et al (2017) conducted a cross-sectional study in which alcohol drinkers were compared with matched abstainers. It concluded that the prevalence of periodontitis was higher among alcohol drinkers compared to non-alcohol drinkers and the prevalence of mucosal lesions among alcohol drinkers was also higher than the control group of abstainers (12). The impact of sugar consumption on the prevalence of caries, overweight and related diseases such as diabetes is of significant concern. Increased access to unhealthy consumer goods is shifting consumer behaviour and contributing to the higher incidence of NCD. High sugar intake is associated with an increased risk of dental caries, which is the most common oral disease affecting children in England – 90% of the tooth extraction for children under 5 years old is due to preventable dental caries (13). Furthermore, studies have also found that there is a strong relationship between childhood obesity and oral diseases; children with obesity have a higher incidence of dental caries than children of a healthy weight (24).

There is an abundance of research spanning many years that demonstrates a clear association between oral health and several chronic diseases sharing risk factors (all forms of tobacco use, harmful use of alcohol, and high sugar intake diet) (15), as well as the wider social and commercial determinants of health (16). The consequences of untreated oral diseases and conditions are significant – they include physical symptoms, functional limitations, stigmatisation, and detrimental impacts on emotional, economic, and social wellbeing and for those who undergo treatment for oral diseases, the costs can be high (15).

Poor oral health disproportionately affects poor, vulnerable and/or marginalised members of societies including: people who on low incomes; people living with disability; older people living alone or in care homes; people who are refugees, in prison or living in remote and rural communities; and people from minority and/or other socially marginalised groups (17)

The global agenda

In May 2021 the World Health Assembly approved a landmark resolution on oral health that acknowledged the global burden of oral diseases and their associations with other conditions. The Resolution urged Member States to address the shared risk factors (high sugar intake, tobacco use and harmful use of alcohol) with NCDs, to enhance the professional capacity of oral health professionals to deliver care, and to include oral health in universal health coverage (UHC) packages (18). This resolution was followed up by the

WHO 2022 Global Oral Health Status Report, which has identified the immense scale of the problem and the need for urgent action, and suggests innovative solutions and recommendations around: integrating oral healthcare with primary care; including prevention and oral health promotion in settings outside specialist oral health facilities; optimising an individual's capability to perform effective self-care; access to and affordability of fluorides; oral health data surveillance; embedding oral health in the NCD agenda; and ensuring essential oral healthcare interventions are included in UHC benefit packages.(9)

The oral health status of children is a global challenge. Despite a reported general decline in prevalence of dental caries in school-aged children in most developed nations, (mainly attributed to the use of fluorides in different forms), poor oral health in children remains significant in many underdeveloped and developing countries of Africa and Asia including India due to lack of public awareness, motivation and inadequate resources for dental treatments and changing dietary habits according (19). Aside from the physical health consequences of poor oral health, children can also suffer bullying, stigmatisation, and exclusion from their peers, due to unsightly dental caries, smelly breath and constant toothache, which can impact school attendance and academic achievement, and subsequent future employability and opportunities.

Type 2 Diabetes Mellitus

Diabetes is the seventh leading cause of disability worldwide (20). In 2012, diabetes caused 1.5 million deaths and associated higher blood glucose levels caused an additional 2.2 million deaths, by increasing the risk of cardiovascular and other diseases (21); 43% of these 3.7 million deaths occurred under the age of 70 (21). Type 2 diabetes mellitus (T2DM) is the most common type of diabetes and accounts for approximately 90% of all diabetes diagnoses (22). It manifests due to the body's ineffective use of insulin; which is largely due to excess body weight and physical inactivity (23).

Rapid population growth and increased life expectancy observed since 1980, have been associated with an almost global quadrupling of the number of adults with T2DM (20). The increase in prevalence is associated with a rise in risk factors such as being overweight or obese (21), resulting in a higher body mass index (BMI) and higher blood pressure (BP). In addition to modifiable lifestyle factors that include diet and physical activity, risk factors for developing T2DM include: age, having a sibling or parent with T2DM; previous gestational diabetes; and ethnicity (24), which include South Asian, African Caribbean, Chinese, and Black African (25). More recently men have been classified as at higher risk of developing T2DM. The exact mechanism for this gender risk factor is not fully understood but evidence suggests that men appear at greater risk of T2DM than women with similar BMIs and it is hypothesised to be associated with rising obesity levels in men (26).

The increasing prevalence of T2DM has propagated an urgent need to implement population-based interventions to prevent diabetes, detect it early and use lifestyle and pharmacological interventions to prevent or slow down its progression (20). Diabetes management programmes should be combined with structured education and self -management programmes and be supported by a multidisciplinary team (27).

The bi-directional relationship

Oral diseases are associated with a range of NCD, including diabetes, respiratory disease, cardiovascular disease, and some cancers. Dorfer et al. (2017) conducted research on the relationship between periodontitis and NCD among older people and concluded that periodontitis is qualified as a risk factor in the complex pathogenesis of diabetes mellitus, cardiovascular disease, kidney disease and recurrent pneumonia in elderly patients (28). The evidence shows that the link between oral disease and type 2

diabetes is bi-directional – diabetes patients are more likely to develop periodontal diseases, while periodontal disease treatment improves blood glucose levels (18).This means that the presence of oral disease can also contribute to worsening diabetic symptoms. The inflammation that occurs from diseases like periodontitis is known to increase the body's immune response which can lead to insulin resistance.

An umbrella review of systematic reviews by Seitz et al (2019) that reported on correlations between dental conditions and chronic diseases found that of all the interrelationships between dental conditions and chronic systemic diseases periodontitis was the dental condition with the most reported correlations to chronic systemic diseases and T2DM was the condition for which most correlations to dental issues were found. The most frequently cited correlations were 1) periodontitis with T2DM and 2) periodontitis with cardiovascular disease (CVD). The systematic reviews frequently reported common risk factors for dental and chronic conditions, including smoking, age, sex, and BMI/overweight.

The nursing workforce

The significant change in the pattern of disease in society due to multimorbidities has profound implications for the future training of oral health professionals, the practice and delivery of dental care, and research (29). In the United States, 110 billion USD are spent on oral healthcare per annum, and in the EU, annual spending on oral health was estimated at €79 billion during 2008-2012 (18)In 2017/18, the NHS spent over two billion pounds on dentistry, and the patient charge revenue reached £807 million in 2017, which accounted for approximately 29% of the government expenditure on NHS dental services (30). In addition, the indirect costs relating to productivity loss due to absence from school and work are also substantial, which amount to 144 billion USD each year (31).

Nurses and midwives are the most trusted health professionals and the most numerous, they can play a critical role in detecting oral disease and in educating individuals, families and communities about oral health. Midwives can provide information and education to pregnant women about caring for their own teeth and the developing teeth of their baby. Maternal and child health nurses can reinforce positive messages about the importance of a healthy daily oral hygiene routine. School nurses can influence teachers, students and their parents with education, information and campaigns. Practice nurses can implement community wide oral health promotion programs. Nurses in all inpatient settings can reinforce oral health messages and all nurses and midwives can look inside the mouths of individuals for the early detection of disease and take the opportunity to emphasise the importance or oral health. Engaging the wider healthcare team provides an effective intervention to improve oral health at opportune moments across the life course (32). A systematic review of the incorporation of oral healthcare education in undergraduate nursing curricula was conducted by Bhagat et al (2020) and found limited education on oral health was provided to student nurses who had varying interest and understanding of the importance of providing oral health education to clients and patients (33).

Adams (1996) highlighted the importance that nurses place in oral health but also the apparent gaps in nurses' knowledge and confidence in oral health matters (34). Daly and Smith (2015) argue that nursing staff and health care professionals (HCPs) play an important role in preventing dental disease and inadequate nutrition, facilitating the early detection of dental disease and appropriate referral to dental care services. Ibrahim and Blair (2016) suggested that arming nurses with basic oral health competencies can have a significant impact on reducing oral health inequalities by contributing to a downward trend in caries experienced among older people (35).

Results of a 2021 survey of 1,576 nursing staff in the NHS in England found that 42% of nursing staff have not had training in oral health and although nurses in general feel confident in carrying out mouth care, they feel less confident in assessing the mouth (36). A study on preventing early childhood caries in Peru, South America showed that nurses consider oral health important and are willing to participate actively in programmes, provided they receive adequate training (37). Evidence shows that competency training in oral health to the wider health team significantly increases confidence in delivering oral health prevention and should be incorporated into initial training curricula as well as provided as continuing professional development to established practitioners (32). Common barriers to implementation of oral health into primary care are cited as the absence of healthcare policies and strategies, inadequate interdisciplinary training and workload increase in addition to perception of oral healthcare needs (38); oral care is frequently considered to be a lower priority compared to other aspects of care (36). The evidence suggests that improving the standards of supportive oral care can be achieved by increasing access to training for nurses (36). Facilitators for implementation of integrated care include online education, electronic health records and web-patient portals (38).

Conclusion

Oral health is undervalued and financially inaccessible for many. The evidence suggests nurses currently have limited training on oral health, however they are in a unique position, because of their access to and acceptance by the general population, to promote positive oral health behaviours. While nurses and midwives are taught the basics of oral hygiene, in practice this is often limited. Education about the importance of oral health is currently lacking in nursing education programmes and in continuing professional development education for nurses. Nurses and midwives are in a unique position to contribute to improved oral health for infants, children and adults, and subsequently lowering the incidence of NCD, especially T2DM because of the bi-directional relationship between T2DM and oral health.

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Appendix three

Resources

Below is a list of several resources referenced throughout this project by key stakeholders and experts to support both nurses, and individuals living with T2DM.

For HCPs

Commissioning Standard: Dental Care for People with Diabetes (2019) by NHS England and NHS Improvement and NHS improvement

National Institute for Health and Care Excellence (NICE) Guideline Type 2 diabetes in adults: management March 2022

Periodontal disease and diabetes mellitus – a risky relationship (2022) Diabetes UK Fact Sheet

Diabetes and gum disease: information for health care professionals British Society of Peridontology and Implant Dentistry

Recommendations for medical professionals and pharmacists. European Federation of Periodontology

For patients living with T2DM

Diabetes and gum disease Diabetes UK

Diabetes and gum disease: information for patients British Society of Peridontology and Implant Dentistry.

Recommendations for patients and the public European Federation of Periodontology

Appendix four

Below is the addiotion feedback provided by attendees of the Learn with Nurses webinars providing as part of the training resources:

- Interesting topic. Within the OH setting, oral health is a key check within the food industry (for food hygiene purposes, mostly.) Thinking of the demographics and associates health challenges of many of these employees,I can see the correlation quite clearly. Worth introducing to other sectors too.
- Thank you for the extra learning and support
- This session was very informative and interesting. there was a lot I wasn't aware of that I will put into practice and also encourage my colleague to do the same.
- A good selection of webinars offered through this platform.
- Very informative session and have ideas I will definitely take forward in my practice
- Have been enjoying these topics
- I throughly enjoyed the presentation, it was informative, and I learned a lot.
- Insightful interactive session, thank you!
- Insightful session. Points I will use in practice.
- Thank you for the session it is amazing
- Presentation was most helpful. Oral care within care home sector is badly neglected. The associated links to complications such as pneumonia are a real eye opener.
- Very good point that nurses cant refer to dentist- have seen the mouth care details in patient booklet, but no one refers to dentist re broken teeth, lost dentures. So much poor dentition out there.
- Very informative, thanks for further reading links
- Was very interesting and informative specialy about oral care and it effect on type 2 diabetes.
- Well presentated and informative.