

## ORIGINAL RESEARCH

**'It surprised me a lot that there is a link':  
a qualitative study of the acceptability  
of periodontal treatment for individuals  
at risk of rheumatoid arthritis**Lara S Chapman <sup>1</sup>, Karen Vinall-Collier <sup>2</sup>, Heidi J Siddle <sup>1</sup>, Zhain Mustufvi,<sup>2</sup>  
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**ABSTRACT**

**Objectives** Current evidence suggests that periodontal disease could be a causal risk factor for rheumatoid arthritis (RA) onset and progression. Earlier periodontal intervention in individuals at risk of RA could provide a unique opportunity to prevent or delay the onset of RA. This study aimed to explore the acceptability of periodontal treatment as a measure to potentially prevent RA among at-risk individuals and healthcare professionals.

**Methods** Semistructured interviews were conducted with anti-CCP positive at-risk individuals (CCP+ at risk) and a range of healthcare professionals. At-risk participant data were analysed using reflexive thematic analysis; subsequent coding of healthcare professional data was deductive, based on a preidentified set of constructs.

**Results** Nineteen CCP+ at-risk and 11 healthcare professionals participated. Three themes (six subthemes) were identified: (1) understanding risk (knowledge of shared at-risk factors; information and communication); (2) oral health perceptions and experiences (personal challenges and opportunities for dental intervention and oral health maintenance; external barriers) and (3) oral health treatment and maintenance (making oral health changes with the aim of preventing RA; acceptability of participation in periodontal research).

**Conclusions** Periodontal disease is common in individuals at risk of RA, but the impact of poor oral health may not be well understood. Oral health information should be tailored to the individual. CCP+ at-risk participants and healthcare professionals identified seeking dental treatment can be hindered by dental phobia, treatment costs or inability to access dentists. While CCP+ at-risk individuals may be reluctant to take preventive medications, a clinical trial involving preventive periodontal treatment is potentially acceptable.

**INTRODUCTION**

The initiation of rheumatoid arthritis (RA) is purported to occur at mucosal sites, including the oral cavity, lung and gastrointestinal tract.<sup>1</sup> Here, local inflammation may occur due to a combination of genetic and environmental risk factors. In addition, a bacterial

**WHAT IS ALREADY KNOWN ON THIS TOPIC**

- ⇒ There is an increased prevalence of periodontal disease in individuals at risk of rheumatoid arthritis (RA) and in people with established RA.
- ⇒ Early periodontal intervention in individuals at risk of RA could provide a unique opportunity to prevent or delay RA.

**WHAT THIS STUDY ADDS**

- ⇒ The impact of poor oral health may not be well understood by individuals at risk of RA and the health professionals involved in their care.
- ⇒ Seeking dental treatment can be hindered by dental anxiety, costs and inequalities around access to dentists.

**HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY**

- ⇒ A clinical trial involving preventive periodontal treatment is potentially acceptable for individuals at risk of RA.

dysbiosis may exist; it is postulated that the combination of inflammation and dysbiosis may trigger a break in immune tolerance, in particular towards citrullinated proteins.<sup>2</sup>

Periodontal disease (PD) is a chronic inflammatory disease that destroys the tooth supporting tissues including the alveolar bone, periodontal ligament and fibres, and the overlying gingiva. Globally, it affects 20%–50% of people, with approximately 10% suffering from its severe form.<sup>3</sup> There is mounting evidence associating PD with RA. Both share common genetic and environmental risk factors, including smoking,<sup>4</sup> obesity<sup>5 6</sup> and socioeconomic status.<sup>7 8</sup> The prevalence of PD is higher in patients with RA compared with the general population. PD is also increased in individuals at risk of RA, before the onset of clinical arthritis.<sup>9 10</sup>

suggesting that periodontal inflammation precedes joint inflammation. One bacterium of interest is *Porphyromonas gingivalis*, which is enriched in PD and produces a peptidyl arginine deiminase enzyme; this citrullinates c-terminus arginine residues in  $\alpha$ -elonase and fibrinogen—two peptide targets implicated in RA.<sup>11</sup>

PD can be effectively treated through surgical and non-surgical interventions. Interestingly, a recent trial reported an improvement in RA disease activity following the treatment of coexistent PD.<sup>12–13</sup> Early intervention to improve periodontal health in people with early RA or at-risk individuals may, therefore, provide a unique opportunity to delay the progression of RA or potentially prevent its onset.

Many individuals at risk of RA have expressed reluctance to take preventive medications, especially when asymptomatic, while making lifestyle changes is perceived to be more acceptable.<sup>14–15</sup> Periodontal treatment and advice could be considered a non-invasive, low-risk intervention that may provide similar systemic benefits to drug therapy, but without the risk of drug side effects, and has the additional benefit of treating a coexisting disease with its own complications such as pain and tooth loss. Lifestyle change interventions have been successfully demonstrated in patients with type II diabetes, reversing disease onset.<sup>16</sup>

A previous qualitative study explored the experiences and priorities concerning oral health, and barriers and facilitators for periodontal treatment participation, among patients with established RA.<sup>17</sup> However, to our knowledge, no previous studies have explored perceptions of oral health among individuals at risk of developing RA, nor of the healthcare professionals involved in their care. As successful periodontal treatment is dependent on both adequate service provision and patient adherence, it is necessary to explore the barriers and facilitators for accessing periodontal care and maintenance among these groups. This study aimed to explore the acceptability of periodontal treatment as a measure to potentially prevent RA among at-risk individuals and relevant healthcare professionals.

## METHODS

This was a qualitative interview study employing a phenomenological approach to explore the meaning behind participants' lived experiences.<sup>18</sup> Our study is reported in line with the Consolidated Criteria for Reporting Qualitative Studies framework (online supplemental additional file 1).<sup>19</sup>

### At-risk participants

A purposeful sample of CCP+ at-risk individuals, with musculoskeletal (MSK) symptoms but no synovitis, were recruited from the Leeds CCP research cohort. Briefly, this is a national research cohort which recruits individuals presenting with new non-specific MSK symptoms but no clinical synovitis. Those who test positive for anti-CCP

antibodies are at risk of developing RA and are followed in the Leeds CCP research clinic. At-risk participants aged 18 and above who were able to give informed consent, and able to speak and understand English, were eligible to participate. Some at-risk individuals who were invited to participate in our qualitative study had already undergone periodontal assessment delivered by a dentist, and had commenced or declined periodontal treatment as part of a separate CCP dental study (IRAS ID 213744). Participants were approached by telephone.

### Healthcare professional participants

A wide range of healthcare professionals working in the planning and delivery of both medical and dental care services, including clinicians, commissioners and policy-makers were invited to take part in this study through purposive sampling using the authors' professional networks. Some clinicians were involved in providing direct care to CCP+ at-risk individuals, whereas others were National Health Service (NHS) rheumatologists/nurses independent of the cohort/research team and would not be expected to have any specific knowledge of this area. Other healthcare professional participants had an indirect role through their senior leadership position in providing commissioning advice, training of health workforce, etc. Other healthcare professional participants did not have a clinical background, but had a role in policy-making and commissioning. Participants were approached by email.

### Data collection

Individual semistructured interviews were conducted via video or telephone between February 2021 and August 2022, using topic guides (online supplemental additional files 2 and 3). Questions were open-ended and structured around the research aim. Each participant completed a single interview and provided written informed consent prior to their interview. Two female members of the research team (KV-C—a psychologist and senior qualitative researcher, and HS—a clinical academic podiatrist with experience in pre-RA research; both PhD) conducted the interviews with at-risk participants; both were previously unknown to the participants. The researchers conducted the first two interviews together to ensure consensus in the approach to questioning; the remaining interviews were undertaken by one of the two researchers. LSC observed two of the interviews. Healthcare professional participants were interviewed by one male member of the research team (SS—a specialist registrar in dental public health with experience in dental and RA research, PhD), who was known to nine of the 11 participants. All participants were briefed on the purpose of the study and the interviewing researcher's background and personal motivation, and were given the opportunity to ask questions prior to the interview. All interviews were digitally recorded, transcribed verbatim and supplemented with field notes. The interview duration ranged from 23 to 45 min. While we did not aim

**Table 1** At-risk participant characteristics

Participant no	Gender	Age at interview (years)	CCP dental study* status	Smoking (ever/never)	MSK symptoms (Y/N)	Oral health symptoms† (Y/N)	First degree relative with RA (Y/N)
1	Female	60	Had assessment and accepted treatment	Never	Y	Y	N
2	Male	41	Had assessment and accepted treatment	Never	Y	Y	N
3	Female	55	Had assessment and accepted treatment	Never	Y	Y	N
4	Female	56	Had assessment and accepted treatment	Never	Y	N	N
5	Female	50	Had assessment, declined treatment	Ever	Y	Y	Y (grandmother)
6	Male	42	Had assessment and would accept treatment	Never	Y	Y	Y
7	Male	53	Had assessment and accepted treatment	Never	Y	N	N
8	Male	70	Had assessment and accepted treatment	Ever	N	Y	N
9	Female	35	Had assessment and would accept treatment	Ever	Y	N	N
10	Female	62	Had assessment and would accept treatment	Never	Y	Y	N
11	Female	55	Not approached	Never	Y	Y	N
12	Male	61	Not approached	Never	Y	Y	Unconfirmed (grandmother)
13	Male	54	Declined assessment	Ever	Y	Y	Y (grandfather)
14	Male	38	Had assessment, declined treatment	Ever	Y	Y	Y (mother)
15	Female	40	Had assessment and would accept treatment	Never	Y	Y	N
16	Male	60	Not approached	Ever	Y	Y	N
17	Female	56	Had assessment, accepted treatment	Ever	Y	Y	N
18	Male	56	Not approached	Never	Y	Y	Y (father)
19	Female	52	Declined assessment and treatment	Ever	Y	N	N

\*CCP dental study in which CCP+ at-risk participants are offered periodontal treatment.

†MSK/oral health symptoms within 9 months preceding the interview.  
MSK, musculoskeletal; RA, rheumatoid arthritis.

for data saturation, which is arguably inappropriate for reflexive thematic analysis, we held ongoing discussions relating to recruitment to ensure our research aim was fully addressed and our final sample size was based on achieving adequate diversity of the sample and depth of data generated from participants.<sup>20</sup>

### Patient and public involvement

Patient and public involvement (PPI) contributors from local dental and rheumatology PPI groups were involved in shaping the research question, and developing the interview topic guide and participant information sheet (PIS) for at-risk participants. The wording in the topic guide and PIS changed as a result of involving PPI contributors,

who suggested providing further information to participants about why the study was being conducted and what the interview data would inform. PPI contributors also informed our approach to data collection; we originally intended to conduct the interviews exclusively by telephone, but it was suggested that holding a telephone for an extended period may be difficult for participants with joint symptoms. As a result of PPI, we offered all participants the choice between a video or telephone interview.

### Analysis

Data from interviews with at-risk participants were analysed using reflexive thematic analysis.<sup>21</sup> Interviews were uploaded into NVivo V.12 (QSR International;

**Table 2** Healthcare professional participant characteristics

Participant no	Gender	Field	Role
1	Male	Dental	General dental practitioner
2	Female	Dental	Consultant
3	Male	Dental	Academic; consultant
4	Female	Dental	Commissioner
5	Female	Medical	General practitioner; senior leadership role
6	Female	Medical	General practitioner; academic
7	Female	Medical	General practitioner
HC8	Female	Dental	General dental practitioner
HC9	Male	Dental	Consultant; senior leadership role
HC10	Female	Nursing	Rheumatology nurse specialist
HC11	Female	Medical	Consultant rheumatologist

2018) and initially coded by one researcher (LSC), who read and reread the transcripts, generated initial codes and collated similar codes. Coding was inductive, with 10% of the transcripts second coded (KV-C), and regular coding discussions held with all other team members. Discrepancies were settled by group consensus. Codes were grouped into provisional themes through a team discussion, then reviewed against the whole data set by one other researcher (ZM). Data from interviews with healthcare professionals were then independently analysed by two researchers (LSC and ZM); coding was deductive, based on the preidentified set of constructs identified from the at-risk participant data. The two researchers discussed any discrepancies in coding until consensus was reached. The entire research team then reviewed and refined the healthcare professional content of each prespecified theme through group discussion.

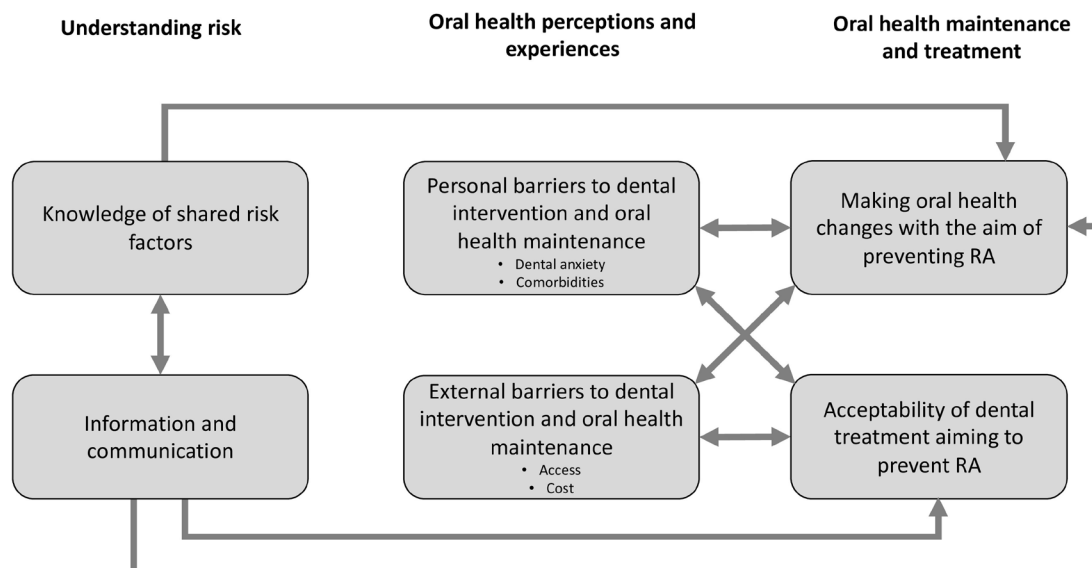
**RESULTS**

Twenty-two individuals at risk of developing RA were approached about the study, and 19 participated. One declined participation due to ill health, while two were withdrawn from the study as they developed inflammatory arthritis prior to being interviewed. Eleven healthcare professionals were also approached about the study, all of whom participated. At-risk participant characteristics and healthcare professional characteristics are presented in tables 1 and 2, respectively. At-risk participant data were obtained from interview transcripts where possible; medical records were accessed for missing data as required.

Three themes (six subthemes) were identified. A conceptual map identifying links between themes is displayed in figure 1 and an example of the coding tree is provided in online supplemental additional file 4. Quotations supporting each theme are presented in tables 3–5; quotes from at-risk participants are coded with the prefix PQ, while quotes from healthcare professionals are coded with the prefix HPQ.

**THEME 1: UNDERSTANDING RISK**  
**Knowledge of shared at-risk factors**  
 Individuals at risk of RA

Participants identified various perceived risk factors for RA, including genetics, diet, being overweight, lack of exercise and smoking. However, the majority of participants were unaware of any potential link between poor oral health and RA/the risk of developing RA prior to being invited to participate in a dental research study (PQ1). Some participants recognised the negative effects of smoking on oral health (PQ2, PQ3), and half of participants were aware that smoking would increase their risk of developing RA. Among at-risk participants who were unaware of the link between smoking and the risk of developing RA, the information was unsurprising (PQ4, PQ5). In contrast, one participant commented



**Figure 1** Conceptual map of themes and subthemes.

**Table 3** Quotations for theme 1: understanding risk

<b>Subtheme: knowledge of shared at-risk factors</b>	
PQ1	“Without this study and being informed about it, I wouldn’t have had a clue that, you know, there’s [a link] between oral health and rheumatoid arthritis.” – Participant 15
PQ2	“Yeah, well yeah, I knew about a long time ago that smoking can actually destroy your teeth and your gums, I knew quite a lot of information on that.” – Participant 6
PQ3	“So obviously, I’m aware that [smoking is] bad and my dentist always tells me off.” – Participant 14
PQ4	“I think everyone knows by now that tobacco is not good for people.” – Participant 6
PQ5	“Not about arthritis, but, you know, when you go to doctor’s and they do say, you know, you’ve got to stop smoking.” – Participant 8
PQ6	“If you ask most people whether or not they thought or were aware of any of this, then they wouldn’t have a scooby.” – Participant 7
PQ7	“I don’t think even my dentist might not know that I’ve got, I’ve got those factors anyway, but I didn’t know, and I don’t think, not sure even my dentist knew.” – Participant 3
PQ8	“Well, they never mentioned anything to do with arthritis ... you tick a form with certain things on it, but they don’t really ask you about any things on that ... they just want to get you in, have a look at your teeth, and get you out again, you know [laughs]. That’s what it seems like.” – Participant 5
PQ9	“I feel like it might be one of those things that a dentist, you know, they’ll have seven years of training and they’ll have an afternoon on it, and some of them will remember it, and some of them won’t.” – Participant 19
PQ10	“I think it’s more they want to know obviously your medications you take for it, rather than your condition itself.” – Participant 9
HPQ1	“I think most dentists’ experience is purely on a case by case basis, liaising with the consulting physician or cardiologist or GP because of some query relating to the dental treatment rather than treating a patient more holistically.” – Healthcare professional 2
HPQ2	“They, I don’t know, I think maybe it’s because we’re more thinking about the problem they’ve got that’s a rheumatology problem. And, and we’re, they’re more thinking about how their joints are, how they’re feeling, their tiredness, their pain and all that kinda thing. But you don’t generally, and I know for a fact I don’t, well certainly haven’t [thought about] their oral health and maybe we should.” – Healthcare professional 10
HPQ3	“Nobody’s said, ‘oh we don’t care about dentistry’. It’s just that we’ve never talked to them before. And as soon as you start talking to them they’re extremely interested.” – Healthcare professional 9
HPQ4	“They just don’t see, ‘you’re only a dentist’, is something we often hear. ‘Why do you need to know that, this is just my teeth?’” – Healthcare professional 8
HPQ5	“My impression of the dental contract is that dentists do not have to carry on taking NHS patients when they are full which we’re not allowed to shut our lists ... I think there’s probably some conflict between primary care and dental care over the contract that dentists do, are allowed to shut the list, they don’t have to continue taking on NHS patients. They can choose to take them privately ... I wonder sometimes if that might also be an additional barrier to actually starting to get relationships working.” – Healthcare professional 6
HPQ6	“Dentistry’s commissioned by NHSE ... and primary medical care services [are] commissioned by the CCG, so there’s no collaboration there ... I don’t think there’s always the movers for innovation. I think apart from goodwill and local networks there are no financial incentives to join up.” – Healthcare professional 2
HPQ7	“In terms of collaboration, it’s very interesting, I think it depends on where you are in the country and on which country you’re in. So ... where I work, the collaboration between me and my team and the physicians is fantastic. ... but those collaborations tend to be research based as opposed to clinical service based and I think there’s still a long way for us to go to get clinical pathways, joint clinical pathways going.” – Healthcare professional 3
HPQ8	“It does feel like medicine and dentistry are very separate, that they’re two completely different areas and that we don’t need to know anything about the mouth or the teeth and vice versa [laughs]. So I think that we could improve that in terms of perhaps within our ... regional teaching programmes we should have more sessions involving oral health which we have been starting to do. But I don’t know if that’s just Yorkshire because there are collaborations within the area or whether that’s something that’s happening nationwide. I suspect not.” – Healthcare professional 11
<b>Subtheme: information and communication</b>	
PQ11	“I think it varies, you know, as to different people will want it at different stages, and I think you’ve got to assess that as a clinician as, you know, as to how much information you give people or whether to get them back and take it a bit more slowly.” – Participant 1
PQ12	“I mean, initially, if you’re having a consultation, it’s good to hear somebody explain and tell you why. That’s, I’m most likely to retain it that way. But having something you can refer to, back to, either in written or online, is useful as well.” – Participant 19
PQ13	“I think, without someone, either a bit of encouragement, or knowing that you’re going back to someone, you’ve got to report back on how you’ve done, you know.” – Participant 2
HPQ9	“Yes I, I think it, I mean if they don’t go to the dentist they’re not gonna get any information from the dentist. So really I suppose it really ought to come from us ... maybe that’s something we ought to be thinking about and putting that into our sessions that we do with the patients and the education. Because I don’t think we really do think about that generally speaking.” – Healthcare professional 10
HPQ10	“When you are first told about a condition, that’s probably the time that you take on board the most things because that’s where you’re trying to learn about the condition and, and, and how to manage it. So I think if you were told at that point...that it was vitally important ... that your mouth was in as good a shape as possible in terms of stability of your disease.” – Healthcare professional 2

**Table 4** Quotations for theme 2: oral health perceptions and experiences

<b>Subtheme: personal challenges and opportunities for dental intervention and oral health maintenance</b>	
PQ14	"I mean, a lot of mine stems from childhood, you know, I was like eight years old and the guy was kneeling on my chest to pull my teeth out." – Participant 14
PQ15	"I have told them about the, the heart but I'm not sure about the arthritis to be quite honest with you." – Participant 12
PQ16	"To be honest, I'd put that [my stomach] first, because ... I would like me mouth sorting out, but me stomach ... it's more or less every day." – Participant 5
PQ17	"Life takes over and it's, you know, if you did nothing else but the intensive list of all the things you're supposed to do all day, you'd get nothing else done ..." – Participant 7
HPQ11	"I think a lot [of] the people are nervous about going to the dentist and that makes them anxious perhaps about seeking care if they probably maybe go a bit late ... I think people in general are nervous about having any work done to their teeth or their mouth because they think it's gonna be painful." – Healthcare professional 11
HPQ12	"... the patients come with dental problems and they say they can't get a dentist appointment. And then the GP was saying she picked up the phone and the dentist say, 'yeah I've, I've got spaces' ... we know there's good research there that's shows that patients often don't want to see a dentist because they know that the dentist will say that they need an operative procedure and so they're avoiding because so many of the population are dental phobic and so is it 48% are dentally anxious and 12% are dental phobic." – Healthcare professional 8
<b>Subtheme: External barriers to dental intervention and oral health maintenance</b>	
PQ18	"I don't think anybody can get hold of an NHS dentist anymore, I think they're amiss, aren't they? ... I think they're unicorns." – Participant 7
PQ19	"I don't even think he put his hands in me mouth, he just kind of, you know, had a quick look and that was it, yeah, everything's great." – Participant 1
PQ20	"I think probably barriers, probably NHS cuts and time for dentist they've got to spend with each patient means that they can't go into, or I feel that's probably the reason, or hope it is the reason why they can't go into as much detail and explain, because I were never really told about me gum disease." – Participant 3
PQ21	"Maybe though, if it had been your teeth are gonna fall out, oh and all these, these other things, you're gonna have a heart attack or blah, de, blah, you know. Yeah, I think that would've, that would've been, that would've been an additional motivation." – Participant 2
HPQ13	"People struggle to get access to a dentist. They struggle to get access to an NHS dentist. I think that's throughout the country. They struggle to get routine dental care on the NHS and they struggle to get emergency dental care on the NHS ..." – Healthcare professional 5
HPQ14	"Certainly where I used to work in a very deprived centre ... a lot of patients didn't have a dentist. Where that is much less so now cause I work in ... a relatively affluent area and most people there do have access to their own dentist." – Healthcare professional 6
HPQ15	"I think probably one a' the biggest barriers that we find then is that when we advise patients to see a dentist, they just say they can't get one ... NHS dental services is stretched, and we get a lot that they just can't get on the lists or they can't get another appointment." – Healthcare professional 7
HPQ16	"But I think that, yeah probably makes us maybe think less about asking the patients about their teeth because we know they can't get in to see a dentist anyway." – Healthcare professional 11
HPQ17	"So I think it, if it was something we were to build into a review it, I suppose in a way we would have to feel that they could then access that service, as opposed to us signposting them to something that they'd struggle with." – Healthcare professional 7
HPQ18	"And you know there's a lot of people cannot afford private dentistry and there are very few NHS dentists these days that have got any spaces at all for patients. And I think it's really important that they can access something that's affordable because they are more at risk than most other people. And it's, it's, it's very sad that they can't get hold of a dentist and they don't go when they ought to because they can't afford it and that's the big problem. I mean it's a big problem for everybody I think." – Healthcare professional 10
HPQ19	"...obviously if someone is on benefits and things like that they are exempt but many people will not be and still would be, would see price as a barrier to access ... So it's the anxiety, it's the, the payment issues." – Healthcare professional 11

on the lack of public awareness of the link between poor oral health and RA, including the risk of developing RA (PQ6).

Some participants also perceived a potential lack of knowledge among dentists regarding their at-risk status and regarding knowledge of the association between

poor oral health and RA/risk of developing RA (PQ7, PQ8, PQ9), and highlighted that from a dental perspective, medical history was focused around any medications they were taking rather than specific conditions (PQ10).

**Table 5** Quotations for theme 3: oral health perceptions and experiences

Subtheme: making oral health changes with the aim of preventing RA	
PQ22	“So I have [extracted] about three myself ... I didn’t have the money, you know. I possibly didn’t have the dentist at the time.” - Participant 13
PQ23	“I think I probably am better with my teeth. I never forget to do them now. You know, I always do them at night and in the morning.” – Participant 10.
PQ24	“I definitely drink less fizzy drinks and I have cut down on smoking and I have started eating less badly.” – Participant 14
PQ25	“If a dentist recommended it, I definitely would. But if they didn’t, I probably wouldn’t, because at the moment, I’ve not, as far as I know, I’ve not got rheumatoid arthritis.” – Participant 11
PQ26	“I’ve always been doing these practices before that, but now my mouth’s gonna be like priority again.” – Participant 15
HPQ20	“I think that people generally don’t see cleaning their teeth as being oral health. I think it’s just something that they do. It’s just their daily hygiene routine, and I think there’s a mismatch in people’s minds.” – Healthcare professional 8
HPQ21	“I think quite a lot of our patients don’t even think about it. And it’s only if they have a problem that they then think about it. But I don’t think they think about brushing their teeth two or three times a day or whatever or using mouthwashes etcetera. I don’t think they think of all that. Well not a lot of the ones I see [laughs] ... And it only really comes to the forefront of their mind when they’ve actually got a problem and by then it’s too late for them to, you know, maintain their health, their mouth and their gums.” – Healthcare professional 10
HPQ22	“There are some patients I think who have never bothered about their teeth. They’ve never cared for them, have had a lot of fillings when they were younger. Perhaps haven’t been educated enough about managing dental hygiene.(It’s probably harder to change their habits.” – Healthcare professional 11
Subtheme: acceptability of participation in periodontal research aiming to prevent RA	
PQ27	“Yeah, definitely, I’ll do whatever is required to reduce the risk.” - Participant 6
PQ28	“Yeah, it won’t get mine [CCP level] down to six, but I mean, would it get it down to 200 or 250, I don’t know. Any positive step in the right direction is a motivation, innit?” – Participant 7
PQ29	“Have somebody look at my teeth ... Just actually see a dentist.” – Participant 16
PQ30	My grandchildren down the line might be in the same position and because I haven’t stepped up, they could be in the exact same position if people don’t do this research.” – Participant 18
PQ31	“He talks me along, whatever he’s doing and, you know, he’s quite, he’s obviously quite used to people who don’t like going to the dentist ... My dentist knows now, you know, he literally, every little movement that he’s gonna make, he’s like, ‘I’m just gonna do this,’ so it’s not a surprise.” – Participant 14
PQ32	“Yeah, I sort of shuffle [appointments] about, I have to adjust work and have a day off or whatever.” - Participant 13
HPQ23	“It wouldn’t be cost effective ... for a dentist to [attend a MDT] because there are so many people ... with these systemic diseases.” – Healthcare professional 3
HPQ24	“There’s also factors about making the best use of a highly skilled trained force. So the dentists may not be the best person to spend time doing things like making every contact count or doing blood pressure. That could be another member of the team, ‘cause the dentists will be the most expensive part of that system ... it could be delegated the way it is in primary medical care to other members of the team.” – Healthcare professional 2
HPQ25	“I think it’s important to understand we don’t have to use fairly expensive dentist time to do all of this. Clearly they’ll need to do some of the assessments but they don’t need to do, won’t need to do any of the introduction and the prevention pathway. That can all be done by the extended duty dental nurses.” – Healthcare professional 1
HPQ26	“So the ones that make an effort to go to the dentist and are flossing their teeth and are aware of it, I think they would be very keen on that rather than taking different medication. Some people will just say, ‘oh no’.” – Healthcare professional 11
RA, rheumatoid arthritis.	

### Healthcare professionals

Healthcare professionals highlighted a disjoin between dentistry and medicine, with some from a medical background acknowledging that it did not occur to them to send their patients to a dentist or ask about oral health, and that communication between medical and dental professionals was rare unless there was a specific problem. Inadequate holistic management of patients was identified from both a dental and rheumatology perspective (HPQ1, HPQ2), but the potential to overcome this was also recognised (HPQ3).

Healthcare professionals from a dental background emphasised the difficulties of not having access to complete medical histories for patients, from a safety perspective. They felt that some patients incorrectly assumed that their healthcare records were automatically shared between healthcare professionals, whereas other patients did not recognise the importance of sharing this information and were surprised by the link between oral health and general health (HPQ4).

Some healthcare professionals perceived that the disjoin between medicine and dentistry was a result of

commissioning and financial barriers and inadequate training (HPQ5, HPQ6). Variations in the extent of collaboration between medicine and dentistry, due to geographical location and research activity, were also acknowledged (HPQ7, HPQ8).

### Information and communication

#### Individuals at risk of RA

Preference for provision of information relating to the association between oral health and RA, and to dental trial participation, varied among participants. One participant perceived that time point preferences would depend on the individual (PQ11). Some participants expressed a preference for verbal information, others preferred written information, and others felt they needed a combination of both (PQ12).

Likewise, some participants felt information of this nature was best delivered by a dentist, while others felt it should come from a rheumatologist. One participant suggested a multidisciplinary approach whereby dentists and rheumatologists provide the same information, while others recognised the issues that lack of communication between dental and medical teams posed. A participant with dental phobia expressed a preference for visual aids prior to treatment. Other participants highlighted the importance of feedback and encouragement regarding the impact of dental treatment on their risk of developing RA as a motivator to continue with preventive measures (PQ13).

#### Healthcare professionals

One healthcare professional perceived that information relating to the link between oral health and the risk of developing RA should come from the rheumatology team (HPQ9). With regard to the timing of information provision, another felt the link between poor oral health and systemic conditions should be discussed at diagnosis (HPQ10). The use of guidelines and posters was suggested to aid rheumatology teams to ask patients about their oral health.

## THEME 2: ORAL HEALTH PERCEPTIONS AND EXPERIENCES

### Personal challenges and opportunities for dental intervention and oral health maintenance

#### Individuals at risk of RA

The majority of participants made routine visits to a dentist; however, negative perceptions of these visits were common. Participants described ‘hate’ towards the experience of visiting the dentist, ‘a little bit of fear at the general thought of it’ and ‘tensing up’. Some participants explicitly expressed a phobia of dentists and attributed their anxiety to traumatic dental experiences during childhood (PQ14). A minority of participants were comfortable visiting the dentist, with no anxiety whatsoever, but still perceived that ‘people don’t like dentists’.

Comorbidities also impacted on the perceptions and priorities around oral health for some participants. One participant noted that her reflux had caused multiple

fillings. Another acknowledged that his leaking heart valve meant he was supposed to look after his teeth; this participant had explicitly made his dentist aware of his heart condition, but was unsure if the dentist knew he was CCP+ at risk (PQ15).

Oral health was identified as less of a priority when compared with conditions such as irritable bowel syndrome, which had a greater impact on daily life (PQ16). Another participant expressed how stress and anxiety made oral health less of a priority (PQ17).

#### Healthcare professionals

Healthcare professionals also identified dental anxiety as an issue for patients, perceiving that some patients avoided going to the dentist despite needing treatment (HPQ11, HPQ12).

### External barriers to dental intervention and oral health maintenance

#### Individuals at risk of RA

Many participants expressed difficulty in accessing an NHS dentist, particularly since the COVID-19 pandemic. Some participants had gone to a private dentist as a result (PQ18). One participant who did have an NHS dentist felt ‘lucky’, but emphasised the short duration of NHS dental appointments, while another expressed how her NHS dentist had not explained she had gum disease or given any advice on how to address it. This was attributed to lack of time during NHS dental appointments (PQ19, PQ20).

While a minority of participants confirmed that the cost of dental treatment was not a problem for them, many participants identified that the cost of dental treatment had previously been or was still an issue. Some noted that although cost was an issue, it had not stopped them going to the dentist, whereas others explicitly stated that the cost had an impact on how frequently they were able to go. Cost also impacted on oral health maintenance; for example, one participant could not afford the upkeep of his dentures after volunteering for a limited course of free treatment at a dental school. Another participant perceived that dentistry was about making money rather than about health, while another felt that dentists had not given enough advice regarding the link between oral health and general health as a motivator to maintain good oral health habits (PQ21).

#### Healthcare professionals

Healthcare professionals identified similar barriers to dental intervention, highlighting that patients, both their own and in the wider sense, had difficulties accessing NHS dentists (HPQ13). Some attributed these access difficulties to social deprivation (HPQ14, HPQ15). This perceived lack of access to a dentist had a potential impact on healthcare professionals’ management of patients (HPQ16, HPQ17).

Some healthcare professionals also identified cost as a barrier to seeking dental treatment. This included cost of



both NHS treatment, and private treatment when NHS access was not possible (HPQ18, HPQ19).

### THEME 3: ORAL HEALTH MAINTENANCE AND TREATMENT Making oral health changes with the aim of preventing RA Individuals at risk of RA

Participants discussed oral health issues such as bleeding and sore gums, chipped and weak teeth, infections, missing teeth and self-extraction. In some cases, oral health issues were closely linked to the external barriers identified in Theme 2 (PQ22). A minority of participants stated they had no problems with their oral health.

Participants described varying levels of oral health maintenance, including regular brushing, flossing, use of interdental brushes, mouthwash, and electric toothbrushes, avoidance or reduction of carbonated drinks and sugary snacks, and drinking through a straw.

Although half of participants described experiencing symptoms in their hands, and discussed how joint pain had led to limitation or modification of activities, being unable to work, and relying on family members for personal care, only two reported that these symptoms had caused difficulties with oral health maintenance.

Among participants who were previously aware of the link between oral health and developing RA, some had actively made changes; for example, visiting the dental hygienist more often, having a better brushing routine and quitting or reducing smoking (PQ23, PQ24). One participant stated that being at risk of developing RA resulted in being willing to pay for dental treatment. Another reported that she would only seek dental treatment due to being at risk of RA if a dentist recommended it (PQ25), whereas being told about the link between developing RA and oral health during the interview was enough for another participant to state that she would prioritise her oral health (PQ26).

#### Healthcare professionals

Some healthcare professionals identified that the importance of good oral health behaviours might be underestimated, by people in general and by rheumatology patients specifically (HPQ20, HPQ21). They concluded that patients who had previously neglected their oral health would have difficulties changing their behaviour (HPQ22).

#### Acceptability of participation in periodontal research aiming to prevent RA

##### Individuals at risk of RA

Seventeen of the 19 participants reported that a clinical trial aiming to reduce the risk of RA through dental treatment would be acceptable to them (PQ27). In contrast, a clinical trial aiming to reduce the risk of RA through taking a medicine was less acceptable; participants identified the need to consider their risk level and side effects of the drug. Facilitators to participating in a dental trial included the personal benefits of being able to reduce their risk of developing RA (PQ28) and access free dental

treatment (PQ29), and the wider societal benefit of being able to potentially help others in the future (PQ30). A participant with dental phobia felt that the acceptability of this type of trial was dependent on the clinician carrying out the treatment, and that pain or discomfort during treatment would influence his decision to participate. Other participants recognised the importance of seeing the same dentist at every visit was important and felt they would be more comfortable receiving treatment from their routine dentist rather than a new dentist (PQ31). In contrast, another participant felt that treatment as part of a research study should be done by a specialist rather than at a routine dentist appointment.

Other potential barriers to dental trial participation included the location of treatment and appointment times. Some participants suggesting that a smaller, less clinical environment would be better for people with dental phobia, while others focused on ease of parking nearby and public transport routes. Participants highlighted other commitments that could affect their ability to participate, such as childcare and work (PQ32). One participant perceived that she had no oral health problems, so participation in the trial would not be a priority for her.

#### Healthcare professionals

While healthcare professionals understood the advantages of a multidisciplinary approach to managing patients with systemic diseases, some identified the cost of dentists' time as a potential barrier. Others perceived that this could be overcome by using other members of the dental workforce (HPQ23, HPQ24). In relation to provision of preventive dental treatment for individuals at risk of RA, cost-effectiveness was also highlighted (HPQ25). The extent to which individuals at risk of developing RA would be open to receiving preventive dental treatment was perceived to depend on their current oral health behaviours (HPQ26).

## DISCUSSION

This study informs our understanding of the perceptions and experiences of oral health among individuals at risk of RA. Our findings indicate that dental intervention and oral health maintenance to reduce the risk of developing RA are generally perceived to be acceptable among at-risk individuals, congruent with previous studies whereby at-risk individuals were more willing to make lifestyle changes and adopt healthy behaviours than to take preventive medication.<sup>14</sup>

Despite growing evidence suggesting an association between PD and RA, our findings indicate that awareness of this association is limited both among patients as well as healthcare professionals. This may reflect a wider disconnect between medicine and dentistry, which was highlighted by both at-risk participants and healthcare professionals. Models to address the siloed delivery of medicine and dentistry are being explored in the UK

with the view of developing pathways that facilitate access to care for high needs patients, including those with multimorbidities.<sup>22</sup>

Our findings emphasise that dental anxiety can impact on patients' dental care seeking behaviours. This is congruent with a previous study focusing on attitudes towards oral health in patients with established RA, whereby previous negative experiences of dental care discouraged participation in a periodontal trial.<sup>17</sup> Our study also highlighted that pursuing dental treatment can be hindered by treatment costs and further inequalities around access to an NHS dentist. This reflects inequalities throughout Europe; in 2021, 5% of the European Union (EU) had an unmet need for dental examination or treatment, due to cost, distance and waiting lists.<sup>23</sup> In England, primary dental care under the NHS is not free at the point of delivery and most patients are expected to pay for their treatment, with a few exceptions such as children, pregnant women and people receiving certain state benefits.<sup>24</sup> Access to NHS dental care has been highlighted as an increasingly pressing problem, especially for people living in the most socially deprived areas. Several patient organisations, trade unions and even cross-party parliamentary groups have been calling for dental system reform. The newly established Integrated Care Systems are expected to take over the commissioning responsibilities for both medical and dental care services in England, creating new opportunities for reducing the siloed delivery of these services.

There have been various initiatives aimed at reducing the barriers between healthcare services, such as Making Every Contact Count (MECC). MECC aims to maximise the benefits of the interactions between various healthcare settings and patients by promoting evidence-based preventive messages and signposting between healthcare services.<sup>25</sup> Dental care professionals could have an important role in providing preventive interventions and early detection of chronic conditions by capturing non-regular attendees of general healthcare services.<sup>26</sup> With an expected increase in the number of people with multimorbidities, there are unique opportunities to design more person-centred, integrated medical and dental care services delivered by multidisciplinary teams.<sup>27</sup>

Our study has implications for clinical practice and future clinical trials. Rheumatology teams should consider oral health as part of the holistic management of RA including those at risk of developing RA, while dental care professionals should consider the implications of being CCP+ at risk when managing these patients. Whereas patients with established RA have reported difficulties in maintaining their oral hygiene due to their joint problems and a burden of numerous different hospital appointments linked to having RA, leading them to deprioritise oral health,<sup>17</sup> targeting CCP+ at-risk individuals bestows an earlier opportunity to provide information and advice that may be easier to act on.

When designing and conducting pre-RA clinical studies, researchers must consider the barriers and

facilitators to participation reported by patients. A personalised approach that considers each participant's level of dental anxiety, their preferred methods of information delivery, location accessibility and appointment time flexibility is recommended. Future studies in this area should focus on how at-risk individuals assess risk versus benefit in deciding on participation in preventive periodontal studies, addressing the research agenda within recent guidance for conducting clinical trials and observational studies in individuals at risk of RA.<sup>28</sup> This agenda also highlights the need to understand which risk factors at-risk individuals consider to be high risk for developing RA. Our study has started to address this point, but emphasises the importance of at-risk individuals to understand all potential risk factors before considering which are high risk. Future research should also explore potential differences between CCP+ at-risk individuals who accept certain preventive measures and those who decline, to determine what factors influence different approaches to health behaviours.

Our findings must be viewed in light of some limitations. First, health professionals were recruited through the authors' professional networks and most of those interviewed were known to the interviewer, which may have introduced bias during data collection. However, in an attempt to minimise bias, the authors took care to recruit fellow health professionals who they felt did not have additional specific experience or knowledge around the impact of PD on RA, and all interviews were independently analysed by a member of the research team who is not from a dental background and had no preconceptions. Second, the rationale for this study was to explore the acceptability of periodontal treatment from the patient perspective, with input from health professionals to triangulate and explore factors that might influence patient participation. Our analysis, therefore, commenced with the patient interviews and was widened out from there, but not all data from the health professional interviews related to the patient perspective. In addition, we acknowledge that our sample of at-risk participants were already part of a CCP cohort study, and may not reflect the views of at-risk individuals who are less willing to participate in research. Nevertheless, to our knowledge, this is the first qualitative study to explore the perceptions and experiences of periodontal health in this population and provides a grounding for future research supporting the design of preventive interventional periodontal studies in individuals at risk of developing RA.

## CONCLUSIONS

The association between poor oral health and RA may not be well understood by individuals at risk of RA and the healthcare professionals involved in their care. Information relating to this association should be tailored to the individual. While PD is common in individuals at risk of RA, seeking dental treatment can be hindered by dental phobia, treatment cost and inequalities around

access to an NHS dentist. A clinical trial involving preventive periodontal treatment is potentially acceptable for individuals at risk of RA.

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