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Moore, J, Csikar, J orcid.org/0000-0002-6943-9762, Kang, J orcid.org/0000-0002-2770-1099 et al. (3 more authors) (2020) Awareness, practices, training and confidence of Paediatric Diabetes Care Teams in relation to periodontitis. *Pediatric Diabetes*, 21 (2). pp. 384-389. ISSN 1399-543X

<https://doi.org/10.1111/pedi.12966>

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Title

Awareness, practices, training and confidence of Paediatric Diabetes Care Teams in relation to periodontitis

Running title

Awareness of periodontitis study

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Acknowledgements

We would like to thank The National Children & Young People's Diabetes Network and Jenny Foster, the Network Manager, for their help in distributing the questionnaire.

Conflicts of interest

Nil

Abstract

Diabetes and periodontal disease are non-communicable chronic diseases that have a bi-directional relationship. The European Federation of Periodontology and International Diabetes Federation recommend patients with diabetes should be screened for periodontal disease and referred to a dental professional where appropriate. This study investigated the awareness amongst Paediatric Diabetes Care Teams across England and Wales of diabetes as a risk factor for periodontal disease. The study enquired to the practices, training and confidence of health care professionals in relation to periodontal disease. A semi-structured online questionnaire was sent to all health care professionals working within Paediatric Diabetes Care Teams across England and Wales. Findings showed that 76.2% of participants were

aware that periodontitis is a possible complication of diabetes. Only 5.2% screened for periodontal issues, whilst 27% of respondents stated that oral advice is not typically given to patients at their clinics and 92.3% said that there is no access to a periodontal service within their clinics. There were 76.4% participants who stated that patients are rarely or never referred to an external dental service for their periodontal health. Only 4.8% of respondents said they have received training for recognising patients who require dental care for their periodontal health, whilst 23.2% feel confident identifying children who require referral and 85.4% of participants feel they would benefit from further training in periodontal health. In conclusion, patients are not routinely being informed of the risk of periodontitis or being screened or referred for it. Further training would be perceived as beneficial.

Key Words

Awareness, Confidence, Training, Diabetes, Periodontitis

Introduction

Periodontitis, also known as gum disease, is a non-communicable chronic disease. It is caused by a build up of pathogenic bacteria located around the gingivae and teeth in the mouth, which triggers a destructive inflammatory response¹. As the periodontal disease becomes more severe, the inflammation can lead to loss of the bone surrounding the teeth, ultimately leading to tooth loss¹. It is one of the most common diseases in the world. The prevalence of periodontitis is reported to affect between 20 and 50% of the global population², with approximately 10% globally having a severe form of periodontitis³.

It is well acknowledged that poorly controlled diabetes is a risk factor for periodontal disease⁴. In patients with poorly controlled diabetes, there was found to be elevated pro-inflammatory factors, such as IL1-p, TNF-a, IL-6, RANKL/OPG and oxygen metabolites, in the gingivae. Through this biological pathway, periodontitis may be aggravated⁵.

The relationship between diabetes and periodontal disease is in fact bidirectional. Further to diabetes affecting periodontal health, periodontal disease can also influence diabetic control⁶. For individuals who have type 2 diabetes or even those that are not diabetic, periodontitis is associated with higher levels of HbA1c when compared to periodontally healthy individuals⁶.

Moreover, studies have shown that there is a higher prevalence of diabetes-related complications among people who suffer from type 1 diabetes and periodontitis when compared to type 1 diabetics with good periodontal health⁶. Whereas, people with type 2 diabetes and periodontitis have significantly worse diabetes-related complications than those type 2 diabetics with good periodontal health⁶.

It has also been shown that periodontal treatment is effective in improving glycaemic control in people with type 2 diabetes in the short term with a statistically significant reduction of HbA1C levels of around 0.40%, which is equivalent to the effect of additional pharmacotherapy⁷. More research is required in this area to ascertain the longer-term effect of periodontal treatment in people with type 2 diabetes and the effect of periodontal treatment for people with type 1 diabetes in general⁴.

Considering all the above, it is vitally important to ensure that the presence of periodontitis is checked for all patients with diabetes. In summary, firstly, there is a greater risk of developing periodontitis. If present, periodontitis can be subsequently treated to reduce the unwanted dental consequences. Secondly, treating the periodontitis could have a positive outcome with regards to diabetic control and its management. Lastly, treatment of the periodontitis could in turn help reduce the prevalence and/or severity of diabetic-related complications, including microvascular complications and overall mortality⁷.

The European Federation of Periodontology (EFP) and the International Diabetes Federation (IDF) have jointly developed the following recommendations⁴:

- Oral health education should be provided to all patients with diabetes.
- Diabetes care visits should include investigation for the presence of periodontal disease.
- Referrals for oral health screenings and periodontal examinations should be made for children and adolescents diagnosed with diabetes and for all people with newly diagnosed diabetes mellitus⁴. More specifically, annual screening for early signs of periodontal involvement and dental caries is recommended for children and adolescents with diabetes starting as early as possible⁴.

This study looked at Paediatric Diabetes Care Teams Across England and Wales. Its aims were to determine:

- 1) The level of awareness of diabetes as a risk factor for periodontal disease.
- 2) Whether annual reviews of patients who attend Paediatric Diabetic Care Clinics include periodontal checks.
- 3) Whether oral care advice is provided and if so how.
- 4) Whether patients are referred for dental care.
- 5) Whether training has been undertaken to recognise patients requiring dental care.
- 6) Whether it is perceived that benefit would be gained from training to identify patients who may require dental care.

Currently there are no other studies that have investigated all of the above, certainly not in England and Wales. However, it has been acknowledged that there is a lack of oral health awareness among patients with diabetes and the health professionals who care for them^{8, 9}.

Method

An online semi-structured questionnaire was sent to all health care professionals

(including doctors, dieticians, psychiatrists and nurses) involved in Paediatric Diabetes Care Teams in England and Wales. The National Children & Young People's Diabetes Network, who had access to all health care professionals at all Paediatric Diabetes Care Teams, sent an invitation email with a link to the questionnaire. Reminder emails were sent to increase response rate. To reduce bias, the study was entitled 'Awareness of Complications of Diabetes in Paediatric Diabetes Care Teams Across England and Wales'. This ensured that participants were not aware that there was a focus on periodontal disease.

The questionnaire consisted of 16 questions. The first set of questions ascertained the participant's age, gender, job category, years since primary qualification and geographical location of work. The next question established whether the participant was aware of the link between diabetes and periodontal disease. The question asked was 'What in your view are the possible complications of diabetes in children/teenagers (whether now or later in life)?'. To reduce bias, several options were given including other actual complications, such as 'Nephropathy', and incorrect options, such as 'Tonsil problems'. The options were also presented in alphabetical order so as not to place any importance on any particular condition. Options of both 'Gum problems' and 'Tooth decay' were given so as to ensure no ambiguity in the participant's knowledge.

The next question determined which checks were typically provided in an annual review. Again, a range of options, presented alphabetically, was given. The following question covered whether the diabetes clinic typically provided advice for children/teenagers with diabetes for certain topics including oral care and how this advice was delivered. The subsequent question asked which areas/services the diabetes centre had access to within the centres and how often they referred externally to other services. Participants were then asked whether they had received any training in recognising certain conditions in children/teenagers with diabetes, whether they felt confident in identifying children/teenagers with diabetes who may require certain services and whether they felt that they would benefit from further training in identifying children/teenagers with diabetes who may require certain services. One final open-text question was included for any other comments that participants wanted to add.

Ethical approval was obtained from University of Leeds Dental Research Ethics Committee (Ref: 180518/JM/252).

Descriptive statistics are presented for demographic features as frequency and percentages. Chi-square tests were performed to compare the response among gender, job roles, number of years of qualification and regions, when appropriate (number of observations >5).

Results

There were 168 health care professionals who responded and completed the questionnaire. Participants' demographic features are presented in Table 1. Approximately 850 health care professionals were emailed the invitation to partake in

the study. This produced a response rate of 19.8%.

With regards to awareness of periodontitis as a possible complication of diabetes in children/teenagers (whether now or later in life), 157 of the 168 participants answered the question, with 128 respondents (76.2%, 95% CI: 69.2%-82.0%) recognising that periodontitis was a possible complication.

In comparison to other well-established complications, there was a noticeable difference in the level of awareness as seen in Figure 1.

There was no statistical significance with regards to level of awareness of periodontitis found between gender, number of years of qualification, and job roles as seen in Table 2.

For those who were involved in annual reviews of patients (N=155, 92.3% of total respondents), only 8 (5.2%) and 10 (6.5%) perform gum and teeth screening, respectively.

Of the 166 respondents who stated they were involved in providing advice at their Diabetes Clinic, 82 (49.4%) stated that the oral care advice for children/teenagers is typically given verbally at their diabetic centres, whilst 11 (6.6%) stated that leaflets regarding oral care are provided. Additionally, there were 45 (27%) respondents who stated that no oral advice is typically given to patients at the clinics. A comparison of the levels for which no advice is typically given for different complications/conditions can be seen in Figure 2.

With regards to whether patients at the diabetes clinics are being referred for periodontal care if required, 155 (92.3%) respondents said that they did not have access to a gum care service within their diabetic clinics. Whereas, 84 respondents (50.1% of all participants) stated that patients are rarely or never referred to an external dental service for their gum health. Overall 110 participants answered this question, thus equating to 76.4% of responses to this question. This is also shown on Figure 3.

With regards to training for recognising patients who require dental care for their periodontal health, only 8 (4.8%) health care professionals said they had received any such training (2 from East Midlands, 2 from North East and North Cumbria, 1 from North West, 1 from South East coast and London, and 2 from Yorkshire and Humber). With regards to feeling confident in identifying children/teenagers with diabetes who may require referral to oral health care professionals, only 39 (23.2%) participants said that they are confident in identifying children who require such a referral. After examining the responses and breaking down in region, job role and gender, no statistical difference was found (all p-values not significant). Regarding whether it was perceived that benefit would be gained from training to identify patients who may require dental care, 140 (85.4%) health care professionals responded that they feel that they would benefit from further training in gum care. Again, the analysis revealed no difference was found between region, job role and gender.

Discussion

This study has brought several key issues to light. Almost 1 in 5 respondents were not aware or were uncertain that periodontal disease was a possible complication of diabetes. If health care professionals are unaware, they may be less likely and less focused on investigating for periodontitis and taking appropriate action such as referrals.

However, even though approximately 80% of respondents were aware, the participants and their Diabetes Clinics are only screening for periodontal issues in 5% of cases. This coincides with 92.3% of respondents not having access to periodontal dental care within their Diabetes Clinic. This may not be such an issue if the patients are subsequently being referred to dental services, as it may be impractical and not feasible to have a dentist on site who can offer dental care. However, 76% of respondents and their Diabetes Clinics rarely or never refer patients to dental health care professionals. This, coupled with approximately 27% of respondents indicating that oral care advice is never given at their centres, shows that there may be a significant number of patients who are not being informed of the potential risk of periodontal disease and not being screened for it.

A possible explanation of this may be a lack of training in this topic. Fewer than 5% of respondents stated that they had received training in identifying children or teenagers who may need periodontal care. This can subsequently lead to a lack of confidence, where fewer than 25% of respondents felt confident enough to identify patients requiring further periodontal care.

The findings of this study clearly indicate a lack of training for those health care professionals who play important roles for these patients. This should be taken seriously and be addressed. Considering the age of most health care professionals in this study, it would be most beneficial to introduce professional courses for those already qualified. However, considering the future, it would be wise to introduce relevant teaching at the undergraduate and training levels, so that all future health care professionals will possess the appropriate knowledge from the very beginning of their careers.

Nevertheless, even though knowledge may be improved through training, it is important to ensure that there is a dedicated time or place to investigate periodontal health in the annual diabetic reviews/check-ups. Measures should be taken to ensure periodontal health education can be provided and referrals can be made as appropriate. It is important that policies and the guidance for health care professionals take the bi-directional link between diabetes and periodontal disease into consideration, as annual reviews may be tailored to these recommendations. Currently, NICE guidelines for the diagnosis and management of diabetes type 1 in adults¹⁰, type 2 in adults¹¹ and type 1 and 2 in children¹² do not consider periodontal disease. The awareness of the link between these two chronic diseases needs to be improved so that policy makers take note. Very recently, NHS England and NHS Improvement have produced the Commissioning Standard: Dental Care for People with Diabetes¹³. This Commissioning Standard will 'support the local implementation of pathways for patients to enable the benefits of timely and effective periodontal management on oral

health and importantly general health to be realised' ¹³, p.5.

It is important to continue research in this area. This study only looked at paediatric diabetes centres and it would be prudent to study health care professionals and their practices in taking care of adult diabetic patients for whom the prevalence of periodontal diseases is higher. It would also be important to follow up on this current study population to measure the impact of any interventions that may be implemented as a result of the findings of this study.

This study did have limitations. There were no responses from Wales. Upon further investigation, it became apparent that invitation emails were not actually emailed to the health care professionals. The link to the questionnaire was only included in a regional newsletter. Therefore, these health care professionals were not recruited as per the study protocol, and thus excluded from the study and not included in the overall response rate.

Taking this into account, excluding Wales, the response rate was 19.8%. This response rate, although low, is a usual outcome for survey response rates. In fact, when compared to other studies that used web-based surveys, invited participants via email and had similar populations^{14, 15}, it is a higher rate.

However, overall, it has to be acknowledged that there is a potential source of non-responder bias.

Not all questions had to be answered in the study. Therefore, even though there were 168 participants overall, only 157 responded to the 'Gum disease' option for whether a certain condition was 'a possible complications of diabetes in children/teenagers (whether now or later in life)?', whilst all 168 responded to the nephropathy option for this question. This could be due to participants not being confident in answering the former question, as they were not sure, thus producing less accurate and reliable results.

Finally, due to ensuring participant anonymity, only the region of work was asked and not more specific details of the actual diabetes centre. This eliminated the chance to use more in depth analysis and multilevel modeling to control the clustering effects of care teams. Collecting postcode level information for purely a data analysis purpose would have allowed us to know whether there was any clustering effect within participants working in the same institutes. In any follow up research, it would be important to address these limitations.

In conclusion, the authors' recommendations would be that diabetes care teams should:

1. Mention the relationship between diabetes and periodontal disease.
2. Stress the importance of good oral hygiene and oral health.
3. Ask the patient if they are registered with a dentist and recommend that they seek regular check ups.
4. Ask the patient to provide the dentist with information about their diabetic control.

Furthermore, a specific question or questions could be added to the National Paediatric Diabetes Audit to record whether this is being carried out. These questions could be

the following: 'Was the patient recommended that they seek regular dental check ups?' and possibly: 'Was the patient informed of the relationship between diabetes and periodontal disease?' The questions could be included as part of the 'Additional Care Processes' in the audit.

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Table 1.

		N	%
Age (Years)	20-29	12	7.2
	30-39	32	19.2
	40-49	58	34.7
	50-59	57	34.1
	>60	8	4.8
Gender	Male	32	19.3
	Female	134	80.7
Number of years of qualification	0-1	2	1.2
	2-5	23	13.7
	6-10	18	10.7
	11-20	42	25
	>=21	83	49.4
Job Role	Consultant	55	33.1
	Dietician: Paediatric	39	23.5
	Dietician: Adult covering paediatrics	3	1.8
	Diabetes specialist nurse	55	33.1
	Outpatient nurse	1	0.6
	Ward Link nurse	2	1.2
	Clinical psychologist/Psychiatrist	3	1.8
	Other	8	4.8
Regions	East Midlands	11	6.5
	East of England	41	24.4
	North East and North Cumbria	20	11.9
	North West	24	14.3
	South East Coast and London	14	8.3
	South West	11	6.5
	Thames Valley	6	3.6
	Wessex	4	2.4

West Midlands		4.2
Wales	0	0
Yorkshire and Humber	30	17.9

Table 1. Participants' demographic features, including age, group, gender, number of years of qualification, job role and regions.

Table 2.

		N (%)	p-value
Gender	Male	26(81.3)	0.43
	Female	100(74.6)	
Number of years qualified	<=5	17(68.0)	0.48
	6-10	15(83.3)	
	11-20	30(71.4)	
	>=21	66(79.5)	
Region	East Midland	7(63.6)	0.18
	East of England	25(61.0)	
	North East and North Cumbria	18(90.0)	
	North West	20(83.3)	
	South East Coast and London	10(71.4)	
	South West	9(81.8)	
	Thames Valley	4(66.7)	
	Wessex	3(75)	
	West Midland	7(100)	
	Yorkshire and Humber	25(83.3)	
Job Role	Consultant	40(72.7)	0.19
	Dietician: Paediatric	28(71.8)	
	Dietician: Adult covering paediatrics	1(33.3)	
	Diabetes specialist nurse	46(83.6)	
	Outpatient nurse	1(100)	
	Ward Link nurse	2(100)	
	Clinical psychologist/Psychiatrist	1(33.3)	
	Other	7(87.5)	

2. Table 2. Awareness of periodontal disease as a possible complication of diabetes with regards to demographics. Note: 1. Years of qualification is grouped as <5, because the number of cases of 0-1 and 2-5 are too little. 2. Wales was excluded because there were no responses from this region. 3. Job role registrar, responses from these categories.

Figure Legends:

Figure 1. Percentage of respondents that thought a certain condition was a possible complication of diabetes in children/teenagers (whether now or later in life).

Figure 2. Chart showing the percentage of respondents who state that advice for a specific subject is not typically given at their Diabetes Clinic.

Figure 3. Chart showing how often patients are referred to an external dental service for their gum health (taken as a percentage of the total number of responses to this question (110)).



