Oral hygiene and periodontal treatment needs in children and adolescents with coeliac disease in Greece

ABSTRACT

Aim To evaluate the factors that influence the oral hygiene and the periodontal treatment needs of children and adolescents with coeliac disease (CD) in Greece.

Methods The sample consisted of 35 children and adolescents, aged 4-18 years. The evaluation included consideration of the detailed medical history, the duration of CD and of gluten-free diet, the history of oral mucosal findings and a dental questionnaire that included information about oral hygiene habits, symptoms of periodontal disease and dental attendance. The clinical examination consisted of the simplified gingival index, the oral hygiene index and the periodontal screening and recording index.

Statistics The chi square and logistic regression analysis were performed in order to determine the factors or parameters that had a statistically significant (p< or =0.05) impact on oral hygiene and periodontal treatment needs of children and adolescents with CD.

Results The periodontal treatment need index of children and adolescents with CD who were high and most of them needed treatment of gingivitis (60.01%) and only a few subjects had a healthy periodontium (34.29%). The periodontal treatment need index, the simplified gingival index and the hygiene index correlated statistically significantly with the presence of a coexisting disease, frequency of tooth brushing, bleeding upon brushing and oral malodor.

Conclusion The periodontal treatment need of children and adolescents with CD correlated with factors that related to the presence of a second medical condition and to the personal oral hygiene habits. Additionally, the oral hygiene level and periodontal status of children with CD do not have any specific characteristics but they have similarities to the oral hygiene level and periodontal status of the children of the general population.

Keywords: coeliac disease, periodontal treatment, oral hygiene, children, adolescents.

Introduction

Coeliac disease (CD) is an autoimmune chronic disorder characterised by permanent intolerance, mediated by T-lymphocytes, to the polypeptide fragments of gluten a protein found in wheat, rye and barley. This disease is characterised by a total or sub-total villous atrophy of the proximal intestine, resulting in poor absorption of the majority of nutrients and vitamins [Schuppan, 2000; Colin and Reunala, 2003; Seyhan et al., 2007].

The aetiology of CD is not fully understood, but there is a clinical and histological improvement on a strict gluten-free diet and relapse when dietary gluten is reintroduced [Schuppan, 2000; Poon and Nixon, 2001; Colin and Reunala, 2003; Seyhan et al., 2007]. The classical clinical symptoms of CD include chronic diarrhea, vomiting, irritability, anorexia, weight loss, growth deficit, abdominal pain and distension, variable degrees of compromised nutritional status, iron-deficiency anemia pallor and gluteal muscle atrophy [Pastone et al., 2008a]. The classical symptoms of CD generally can be manifested from the sixth month of life, coinciding with the introduction of cereals into the diet and usually occur in children under the age of two. However, nowadays the typical CD presentation is less frequent and many CD patients show atypical symptoms such as abdominal pain, vomiting or constipation as well as a number of extra-intestinal problems like iron deficiency, altered bone metabolism, short stature and unexplained elevation of transaminases or show minimal symptoms or are even asymptomatic [Roma et al., in press].

The prevalence of CD in Europe and USA in children between 2.5 and 15 years of age is approximately 1:300 to 1:85, varies from country to country and predominantly affects white individuals and children, who tend to have more severe symptoms often leading to growth retardation, malnutrition and significant weight loss and osteoporosis [Cataldo and Montalto, 2007; Torres et al., 2007].

Several authors have described a greater prevalence of some oral manifestations in CD patients, which are tooth enamel defects such as hypoplasia, recurrent oral aphthous stomatitis and pain or burning of the tongue [Aine, 1996; Poon and Nixon, 2001; Priovolou et al., 2004; Farmakis et al., 2005; Bucci et al., 2007; Bossù et al., 2007; de Lima et al., 2008; Pastone et al., 2008b]. These oral manifestations are of fundamental importance as diagnostic aids for the CD, especially in the coeliac forms difficult to be identified such as the atypical or the asymptomatic forms [Aine, 1996; Bucci et al., 2007; Pastone et al., 2008a].

In studies of patients with CD there are findings of lesions in the gingival tissues, which are characterized as gingivitis, similar to the one found in patients with Crohn’s disease and which is due to the co-existence of diabetes [Tyllesley, 1983]. Additionally, there are patients with CD which demonstrate lichen planus [Scully et al., 1993] ulcerative gingival lesions [Eisen, 2002; Campisi et al., 2005] and ulcerative gingival lesions of vulvovaginal gingival syndrome (VVGs) [Eisen, 1994; de Lima et al., 2008]. These oral lesions may be poorly symptomatic or may co-exist with pain, burning, discomfort and bleeding on brushing teeth [de Lima et al., 2008]. Up-to-date, as far as we are aware, there are no references in the literature...
The questions addressed were regarding: the frequency of fissured tongue, recurrent aphthous stomatitis and cheilitis. Mucocutaneous manifestations, such as geographic or autoimmunity and autoimmune thyroid disease and the history of oral gluten-free diet, the presence of type 1 diabetes mellitus information regarding: the duration of CD and of the gluten-free diet, the presence of type 1 diabetes mellitus, and autoimmune thyroid disease were the only parameters that significantly correlated with the presence of gingival inflammation (r=0.542, p<0.01). The purpose of the present study was to evaluate the factors that influence oral hygiene and periodontal treatment needs in children and adolescents with CD for the first time in Greece.

Materials and methods

Study population

The study comprised 35 children and adolescents aged 4-18 years with CD, who were referred to the Department of Periodontics from the Gastroenterology Unit of 1st Department of Paediatrics of Athens University following approval of the local ethical committee. Children with CD aged less than 4 years were excluded. The diagnosis of CD was established according to the revised criteria proposed by the European Society of Paediatric Gastroenterology, Hepatology and Nutrition [ESPGHN, 1990]. The diagnosis of CD was based on the:

- presence of serum anti-tTG and/or anti-endomysium (EmA) antibodies;
- clinical symptoms and positive histological evidence of villous atrophy with crypt hyperplasia and increase in intraepithelial lymphocytes on the gluten-containing diet;
- disappearance of the symptoms and normalization of serum anti-tTG and/or EmA on a gluten-free diet (GFD) [ESPGHN, 1990].

All children and adolescents after CD diagnosis were introduced to a gluten-free diet resulting in clinical remission and return of serum serology to normal. During this phase they underwent an intra-oral examination of the periodontal tissues.

Medical records

Medical information was obtained from children, adolescents and their parents who positively responded to the clinical examination. Also, information was obtained from the hospital medical records. Especially, we selected information regarding: the duration of CD and of the gluten-free diet, the presence of type 1 diabetes mellitus and autoimmune thyroid disease and the history of oral mucocutaneous manifestations, such as geographic or fissured tongue, recurrent aphthous stomatitis and cheilitis.

Dental questionnaire

The questionnaire was completed by the investigators (AT, PP). The questions addressed were regarding: the frequency of tooth brushing, the method of tooth brushing and the source of information about the oral hygiene needs, the frequency of dental attendance and its reasoning and the symptoms of periodontal disease and especially gum bleeding on tooth brushing and oral malodor.

Clinical examination

The children and adolescents were examined at the Department of Periodontics of the Dental School of Athens, Greece. During the clinical examination the following parameters were evaluated:

- Hygiene index [Lindhe, 1981] in order to record the tooth surfaces which were free of dental plaque.
- Simplified gingival index [Lindhe, 1981] in order to record the gingival units that presented bleeding on probing.
- The number of examined deciduous or permanent teeth which were fully erupted.
- Periodontal Screening and Recording [PSR-American Academy of Periodontology, 1992] in order to define every individual’s periodontal treatment needs within the study population group. All clinical findings were evaluated with the periodontal probe WHO. According to this index, clinical findings were scored from 0, i.e. no bleeding, calculus or defective margins and the gingivae are healthy, to 4, i.e. probing depth greater than 5.5 mm in at least one site of each sextant.

The clinical examination of the hygiene index and the simplified gingival index was performed by one examiner (PP) and the examination of the periodontal screening and recording was performed by another examiner (AT), who also helped the patients to complete their questionnaire. For the intra-examiner reliability tests were performed prior to the study and showed Kappa-scores greater than 0.8 for each of two examiners.

Statistical analysis

The mean value of each index was calculated for each subject and the averages of the indices were analysed in Table 1. The findings from the medical records and the questionnaires were evaluated using \( \chi^2 \) and logistic regression analysis and definition of the correlation coefficient (r). The level of significance was evaluated at p 0.05.

Results

Among the 35 individuals included in the study, 12 were boys and 23 girls with a mean age of 10.46 (SD ± 4.33) years and an age range 4 to 18 years. The duration of gluten-free diet and the accompanied diseases of the participants, according to the medical records, are shown on Table 1. The mean hygiene index was 48.21% (SD±15.51) and the simplified gingival index 48.82% (SD±23.16). On the periodontal screening only 34.29% of participants, according to the medical records, are shown. The mean value of each index was calculated for each subject and the averages of the indices were analysed in Table 1. The findings from the medical records and the questionnaires were evaluated using \( \chi^2 \) and logistic regression analysis and definition of the correlation coefficient (r). The level of significance was evaluated at p 0.05.

Results

Among the 35 individuals included in the study, 12 were boys and 23 girls with a mean age of 10.46 (SD ± 4.33) years and an age range 4 to 18 years. The duration of gluten-free diet and the accompanied diseases of the patients, according to the medical records, are shown on Table 1. The mean hygiene index was 48.21% (SD±15.51) and the simplified gingival index 48.82% (SD±23.16). On the periodontal screening only 34.29% of the children and adolescents had clinically healthy periodontium, while in the rest different degrees of periodontal treatment needs were identified (Table 2). The presence of co-existing diseases such as type 1 diabetes mellitus and autoimmune thyroid disease were the only parameters that significantly correlated with the presence of gingival inflammation (r=0.542, p<0.01), the
effectiveness of removing dental plaque \( r=0.461 \ p<0.01 \), and the need for periodontal therapy, as indicated by the periodontal screening and the record index \( r=0.332 \ p<0.05 \) (Table 3).

Among the factors concerning the personal oral hygiene habits of the 35 children and adolescents with CD it was found that the frequency of tooth brushing was significantly correlated with the simplified gingival index \( r=0.422 \ p<0.01 \), the hygiene index \( r=0.468 \ p<0.01 \) and the periodontal screening and record index \( r=0.357 \ p<0.05 \). In addition, the source of information about the oral hygiene needs was statistically significantly related with the periodontal screening and record index \( r=0.329 \ p<0.05 \) (Table 4). Regarding the clinical findings from the periodontal examination the parameters showed that the mean value of simplified gingival index was significantly correlated with the mean value of the hygiene index \( r=0.766 \ p<0.01 \), the periodontal screening and record index \( r=0.888 \ p<0.01 \) as well as the mean value of the hygiene index with the periodontal screening and record index \( r=0.726 \ p<0.01 \) (Table 4). Referring to symptoms of the periodontal disease it was found that the bleeding on tooth brushing was statistically significantly related with the simplified gingival index \( r=0.674 \ p<0.01 \), the mean value of the hygiene index \( r=0.692 \ p<0.01 \) and the periodontal screening and record index \( r=0.688 \ p<0.01 \), as was the case of the oral malodor - halitosis with the above indexes \( r=0.684 \ p<0.01 \), \( r=0.736 \ p<0.01 \) and \( r=0.682 \ p<0.01 \) respectively (Table 4).

Table 5 shows the personal oral hygiene conditions of 35 children and adolescents. The distribution of periodontal treatment needs, using the X2 method and contingency tables, revealed that the 15 subjects whose personal oral hygiene was daily tooth brushing had less and different kind of periodontal treatment needs from the group of 20 subjects who rarely performed tooth brushing habits. Most of the subjects with daily tooth brushing had recording codes of 0 and 1 of the PSR index (16 of the 20 subjects), while the subjects with rare tooth brushing had scores of 1 and 2 of the PSR index (12 of the 15 subjects).

The difference in the distribution of periodontal treatment needs relating to tooth brushing frequency was statistically significant \( (X^2=29.51 \ p<0.05) \). The 12 subjects who referred bleeding upon tooth brushing had less and different kind of periodontal treatment needs from the group of 23 subjects who did not bleed upon tooth brushing. Most of the subjects with bleeding upon brushing had recording codes of 1 and 2 of the PSR index (10 of 12 subjects) while the subjects without bleeding on tooth brushing had recording codes of 0 and 1 of the PSR index (17 of the 23 subjects). The difference in the distribution of periodontal treatment needs related to bleeding upon tooth brushing was not statistically significant \( (X^2=7.55 \ p>0.05) \). In addition, 9 subjects with oral malodor had less and different kind of periodontal treatment needs than the group of 26 subjects who did not have oral malodor. Most of subjects with oral malodor had recording codes of 1 and 2 of the PSR index (7 of the 9 subjects) while the subjects without oral malodor had as recording codes of 0 and 1 of the PSR index (18 of the 26 subjects). The difference in the distribution of periodontal treatment needs related to oral malodor was not statistically significant \( (X^2=4.60 \ p>0.05) \).
Discussion

According to epidemiological data from other studies, in the general population the prevalence of CD approaches 1% and almost 50% of the patients with newly diagnosed CD do not present with gastrointestinal symptoms making the diagnosis difficult [Fasamo et al., 2007; Pastone et al., 2008b]. Thus, identification of «atypical» or «silent» CD patients is crucial. Research has shown that although the proximal part of the intestinal mucosa represents the main site of the intestine involved in CD, the gluten driven T-cell activation is not restricted to the small intestine but it is also present in the whole gastrointestinal tract [Schuppan, 2000].

In the literature, there is also information that patients, especially children with CD frequently complained of dry mouth symptoms [Seyhan et al., 2007; Pastone et al., 2008a]. This subjective sensation of dry mouth is found together with low salivary flow and xerostomia, a significant correlation with the pathological oral findings. However, a variety of changes have been described: a tendency toward enlarged gingiva, sessile or pedunculated gingival polyps, polymorphous gingival proliferations, abscess formation, completely evolved and especially the keratinised zone of the gingival tissue is fully developed, thus giving us the ability to thoroughly examine the oral tissues.

In the present study, two out of the 35 subjects reported oral manifestation before the diagnosis of CD; however, after the diagnosis of CD all subjects were placed on a gluten-free diet and this could be the reason for the disappearance of previous symptoms or that new oral symptoms did not appear. The findings of the present study are in accordance to previous studies. Bussi et al. [2007] reported that more than one third of patients with CD, suffering from recurrent aphthous stomatitis before the diagnosis of CD, benefited from a gluten-free diet, while Majorana et al. [1992] reported that recurrent aphthous stomatitis and intestinal histological alterations relapsed after gluten challenge, while Campisi et al. [2008] observed that the recurrent aphthous-like ulcers should be considered as a risk indicator for coeliac disease but the gluten-free diet leads to ulcer amelioration.

Additionally, the present study investigated the impact of the co-existence of a second medical condition like autoimmune thyroid disease and diabetes mellitus, since these two conditions are most commonly found along with CD. Nine subjects out of the thirty five had a second medical condition could play an important factor in the periodontal condition and periodontal treatment needs of children and teenagers with CD in Greece. In our study none of the participants complained of dry mouth and our clinical findings did not indicate any evidence of dry mouth; therefore, we did not address the question of measuring salivary flow and the possible role of dry mouth since our patients did not complain of dry mouth or had any clinical signs of dry mouth. In the present study, we have included children over 4 years old, since at that age the deciduous dentition is complete and the gingival tissues have completely evolved and especially the keratinised zone of the gingival tissue is fully developed, thus giving us the ability to thoroughly examine the oral tissues.

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periodontal pocketing, severe gingival inflammation, rapid bone loss, loosened teeth. Children with type I diabetes tend to have more destruction around the first molars and incisors than elsewhere but this destruction becomes more generalised at older ages

The subjects of the present study have described bleeding when brushing, a clinical finding that describes the presence of inflammation of the gingiva which means presence of gingivitis. The treatment needs of the subjects in the present study depended on the status of the oral hygiene. In a recent study of Oulis et al. (2009) within the population under investigation there were groups of 12 and 15 years old school children. When we compare their findings to our findings we have noticed the following. In the 12 years old children group the healthy periodontium was 15.4%, in the 15 years old children group the healthy periodontium was 16.7% whereas in our study it was 34.29%. The percentage of children with bleeding upon probing but without need for scaling was in our study 28.57% whereas in the 12 years old children group was 41.5% and in the 15 years old children group was 30.1%. The percentage of children with gingivitis and the need for scaling in our study was 31.44% whereas in the 12 years old children group was 42.7% and in the 15 years old children group was 53.1%. Our study group seems to be healthier than the other two groups. However, we have to point out that these differences could be due to the different indices that were used; in our study we used the PSR whereas in the other study the CPTITN was used, and to the differences in determining scores 1 and 2 of these two indices. The present study obviously has some limitations such as the small number of patients available for examination and the fact that all participants were under diet. Even though, the comparable findings of the present study with those of a previous study in a general population. A path finder survey—proposals for improvements Hel Stom Rev 2009; 53:97-120.


Conclusion

The periodontal treatment needs of children and adolescents with CD is correlated with factors that relate to the presence of a second medical condition and to the personal oral hygiene habits. Additionally, the oral hygiene level and periodontal status of children with CD do not have any specific characteristics but they have similarities to the oral hygiene level and periodontal status of the children of the general population.