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A modified cognitive behavioural model as a method to improve adherence to oral hygiene instructions – a pilot study

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Abstract: *Objective:* The purpose of this project was to create a modified CBT model to determine the impact on increased adherence to oral hygiene instructions. In a pilot study test, this model was compared with traditional instructions. *Method:* Tools developed and tested in this pilot study were a self-reporting questionnaire, a visual information consisting of pictures and a diary to document according to a modified CBT method. Four participants were divided into two groups, control group and CBT group. At the first visit, all participants answered a self-reporting questionnaire. The clinical examination consisted of measuring the PI, GI and GBI. The same information and instructions were given. All received toothbrushes, dental floss and professional tooth cleaning. The CBT group was instructed to document their feelings and thoughts in a diary. After 3 weeks, the participants answered the same questionnaire, and the same clinical measurements were conducted at the re-examination. The CBT group brought their diaries for evaluation. *Result:* At the end of the study, there was a difference in PI, GI and GBI between the groups. The levels of PI, GI and GBI had decreased more in the CBT group than in the control group. The questionnaire also showed that the CBT group had increased their knowledge and awareness about oral health. *Conclusion:* This pilot study shows that using a modified model of CBT, by keeping a diary, resulted in increased adherence to oral hygiene and knowledge about gingivitis, compared with traditional instructions.

Key words: adherence; cognitive behaviour therapy; coping; oral hygiene; periodontal diseases; psychological approaches

Introduction

Adherence to oral hygiene is an important aspect of the treatment of periodontal disease, as the disease is caused by inflammatory response in gum tissue following the accumulation of dental bacterial plaque. Periodontal health is therefore an important aspect of oral health, as severe periodontal disease can ultimately lead to loss of otherwise healthy teeth (1–4). The degree of damage caused by the host response can be related to the levels of plaque on patients' teeth, which is in turn related to their standard of oral hygiene and other factors such as smoking, diabetes or pregnancy (4). Chronic periodontitis represents a significant and growing healthcare burden, despite continuing improvements in dental care and as the population is ageing (5). To achieve successful clinical periodontal

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outcomes, the standard of individual mechanical plaque removal needs to be extremely high, and in failure to achieve and maintain outcomes, which results in a long-term treatment failure (6). Optimal results require a willingness by individual patients to invest considerable time in achieving such high standards of oral hygiene, an awareness of what is required and the ability to perform quite complex technical procedures. Changing patient behaviours requires that the periodontitis patients implement the precise and consistent oral hygiene practices including brushing, flossing, tongue cleansing and use of specific interdental brushes for effective plaque removal (7).

Our task as dental hygienists is to get patients to cooperate to get better oral health, by teaching patients to recognize what dental plaque and gingival inflammation are and the importance of good oral health. Studies have shown that an individual adapted self-care-programme leads to the best result concerning oral health (3). Psychological approaches on the problem with poorly oral health can improve the hygiene behaviour. In a study that compared conventional information method about oral care with psychological intervention resulted in better rates of oral care in the group that got psychological intervention (8). The basic framework of cognitive therapy and specific psychiatric disorders was developed more than 40 years ago (9, 10). Cognitive behavioural therapies (CBT) are a psychotherapeutic approach that aims to solve problems concerning dysfunctional emotions, behaviours and cognitions through goal-oriented, systemic procedure.

CBT is all about reaching out to patients and making them aware of their feelings towards the knowledge that is given to them, and how these feelings lead to certain effective answers. The method teaches the patient to recognize discomfortable feeling and the thoughts concerning them, and then to find alternative thoughts that can help them to switch over from discomfortable to comfortable thoughts. Within common practitioner, CBT has been a method to help patients to have a better quality of life, by helping patient's recognize traps in their thoughts and coping with everyday tasks (11). One example is patients who suffer from long-term pain disorders (not headache). In a review article consisting of a meta-analysis where CBT was compared to a heterogeneous collection of alternative treatment, it was found that CBT was superior in reducing pain experience, increasing positive cognitive coping and appraisal and reducing behavioural expression of pain (12). One of the methods to achieve this is by keeping a diary for discomfortable/comfortable thought, and then together with a therapist evaluating the diary gives effect that is proven. (13). Coping, or the way we act or deal with demands or situations, depends on the psychological health. The feelings depends on the cognitive appreciation of the meaning of the environmental position the individual have, what self-esteem the individual possesses and what available coping-alternative lies before the individual (14). Traditional educational interventions have been shown to be of little value in achieving long-term behavioural change (4). There is a great need in dentistry for effective interventions to improve clinical outcome and especially to improve the long-term treatment success in periodontal patients (15).

To this background, the hypothesis was that the use of CBT leads to better adherence to oral hygiene habits compared with traditional instructions. The purpose of this project was to create a modified CBT model to determine the impact on increased adherence to oral hygiene instructions. And in a pilot study test, this model was compared with traditional instructions.

Study population and methodology

Tools developed and tested in this pilot study were: (i) a self-reporting questionnaire about habits and knowledge in oral health, (ii) a visual information consisting of picture of the pathogenesis of periodontal disease and (iii) a diary to document thoughts and feelings according to a modified CBT method.

Participants in this pilot study were four female physiotherapeutic students in their fifth semester, between 20 and 30 years of age, and they were all healthy. They had all teeth, but the third molars were excluded. They were divided into two groups by drawing of lots, the control group and the CBT group. This study was an examiner blinded. The pilot study included two visits with 3 weeks of interval. At the first visit, all the participants answered the self-reporting questionnaire. Oral clinical examinations was performed, and the parameters included were: Plaque index (PI) by recording the presence of plaque on mesial, distal, buccal and lingual surfaces after painting Diaplac on all exposed tooth surfaces (16), and the red colour was also for a pedagogic purpose. Gingival-index (GI) (17) and gingival bleeding index (GBI) (18) was recorded. Toothbrush (19) and dental floss instructions on both model and in the patient's mouth were given, and the patient practiced the techniques during the visit. The information to the participants consisted of traditional education and by showing pictures of periodontal health and disease. The CBT group was further taught to process the given information by keeping a diary about thoughts and feelings that develop during or prior to tooth brushing and flossing during 2 weeks. They were asked to visualize the toothbrush and dental floss against the tooth while using the tool. And reward themselves after cleaning by letting the tongue feel the smooth surface of the clean teeth. All participants received a toothbrush, a roll of floss and professional tooth cleaning at the first visit for the same basic conditions. After 3 weeks, the participants returned for oral clinical re-examination. They all answered the same self-reported questionnaire, and PI, GI and GBI was registered again. The CBT group brought their diaries for evaluation. The four participating people cooperated on their own free will and were informed that they could interrupt the participation at any time.

Result

In the control group, mean value of GI was 1, and in CBT group the mean value for GI was 2 at the first visit. At

re-examination, the control group still had the level of GI at 1, but the CBT group had improved GI to 0. In the control group, the PI was lower than the CBT group at baseline, but the decrease in PI was higher in CBT group at re-examination (Fig 1.) The levels of GBI were approximately the same between the two groups at baseline, but also the decrease in GBI was higher in the CBT group (Fig 2).

The results of the self-reported questionnaire at the first visit showed varied knowledge about gingivitis and oral hygiene habits in both groups. The participants had different dental floss habits. Three of the participants answered that their gingiva bleeds when cleaning their teeth. One of the participants answered that she had good oral health, and three answered that their oral health could be better (Tables 1 and 2).

The self-reported questionnaire for the control groups showed no difference between the two visits, and oral care habits were unchanged (Table 3). However, in the CBT group, the questionnaire showed increased knowledge about gingivitis and the oral health care changed between the two visits. They reported that their oral health increased, and they had no more bleeding from the gingiva, and dental flossing had become a daily routine for them (Table 4). At the examination visit, the participants in the CBT group also answered a questionnaire about the CBT diary (Table 5). The answers in CBT group showed different strategies in how they used the diary for support. Keeping the diary had helped them in increasing their motivation and awareness about oral habits and gingivitis and recommends the method as a tool in changing behaviour for better oral health. Comments to the questions about the diary among others were: '*It was hard to do because I had to think about what I was feeling and why, when I brushed my teeth*'. '*I thought it was easy because I only used the diary as a support the days it was hard to motivate myself to brush and floss*'.

Discussion

There are differences in the clinical data between the two visits when comparing the control group with CBT group. The participants in the CBT group showed a clear improvement in PI, GBI and GI.

The result also showed an increased insight in their knowledge about gingivitis and the importance of good oral hygiene. In this study, all of the test persons cooperated to examination, and they were all interested to participate, even though improvement was margin in the control group. In another study made with psychological interventions with CBT, a greater reduction in plaque control compared with other methods was shown (20). Also in this study, reductions in plaque

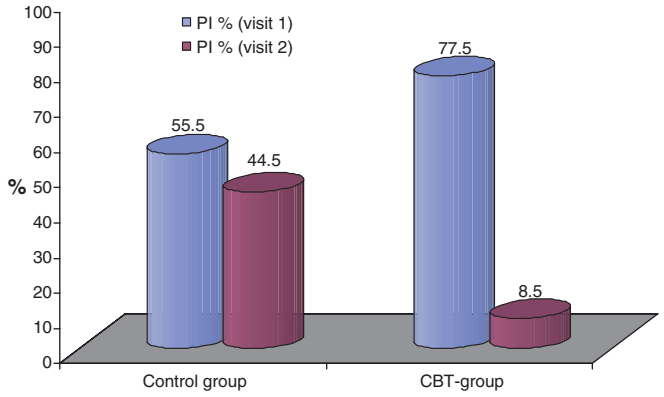

Fig. 1. Mean values of plack index (PI) in % at the first and second visit for subjects in both control and CBT group.

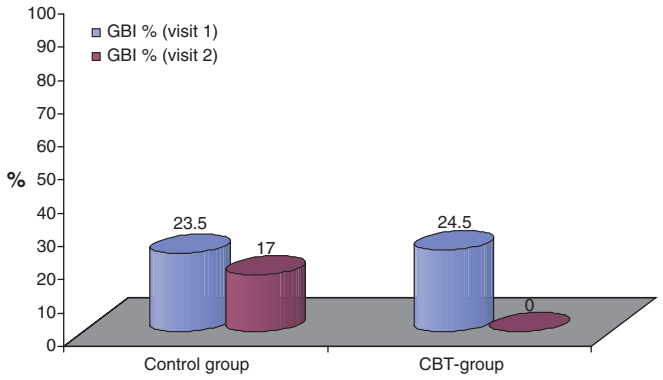

Fig. 2. Mean values of gingival bleeding index (GBI) in % at the first and second visit for subjects in both control and CBT group.

Table 1. **Self-reported questionnaire from control group at first visit**

Knowledge questions about gingivitis (control group) visit 1	Person 1	Person 2
How often do you brush your teeth?	2 times a day	2 times a day
Do you use toothpaste?	Yes, every day	Yes, every day
Do you floss?	Sometimes	Yes
How often do you floss?	Sometimes	Every other day
Does your gum bleed?	Yes, sometimes	No, never
When does your gum bleed?	When brushing	
How would you say your oral health status is?	Good, but can be better	Good, but can be better
Do you think that your have enough knowledge about gingivitis?	Yes	Yes
If you answered yes, what is causing gingivitis?	Bacteria and hard brushing	Bacteria

Table 2. **Self-reported questionnaire from CBT group at first visit**

Knowledge questions about gingivitis (CBT group) visit 1	Person 1	Person 2
How often do you brush your teeth?	2 times a day	2 times a day
Do you use toothpaste?	Yes, every day	Yes, every day
Do you floss?	Yes	Yes
How often do you floss?	Every other day	2 times a day
Does your gum bleed?	Yes, sometimes	Yes, sometimes
When does your gum bleed?	When cleaning	When cleaning
How would you say your oral status is?	Good but can be better	Healthy
Do you think you have enough knowledge about gingivitis?	Yes	No
If you answered yes, what is causing gingivitis?	Bacteria	

Table 3. **Self-reported questionnaire from control group at second visit**

Knowledge questions about gingivitis (control group) visit 2	Person 1	Person 2
How often do you brush your teeth?	2 times a day	2 times a day
Do you use toothpaste?	Yes, every day	Yes, every day
Do you floss?	Yes	Yes
How often do you floss?	Sometimes	Every other day
Does your gum bleed?	Yes, sometimes	No, never
When does your gum bleed?	When cleaning	
How would you say your oral status is?	Good, but can be better	Good, but can be better
Do you think you have enough knowledge about gingivitis?	Yes	Yes
If you answered yes, what is causing gingivitis?	Bacteria	Bacteria

Table 4. **Self-reported questionnaire from the CBT group at second visit**

Knowledge questions about gingivitis (CBT group) visit 2	Person 1	Person 2
How often do you brush your teeth?	2 times a day	2 times a day
Do you use toothpaste?	Yes, every day	Yes, every day
Do you floss?	Yes	Yes
How often do you floss?	Once a day	Once a day
Does your gum bleed?	No, never	No, never
When does your gum bleed?		
How would you say your oral status is?	Healthy	Healthy
Do you think you have enough knowledge about gingivitis?	Yes	Yes

Table 5. **Follow-up questions and answers about the CBT model at the second visit**

Follow-up questions and the answers to the CBT diary	Person 1	Person 2
Did you write in the diary every day when cleaning your teeth?	Yes	No
How did you feel about keeping a diary when cleaning your teeth?	Hard work	Easy
If you answered hard, why?	It took a long time	
Do you think you have been more aware about your feelings and thoughts about dental hygiene?	Yes	Yes
Do you think that the diary helped to motivate you using the toothbrush and floss?	No, the result of oral hygiene was motivating	Yes
Would you recommend the method to other individuals?	Yes	Yes

levels are shown, as well as an increase in awareness for oral health in the CBT group. The results are in agreement with a recently published study where a six-step method of systematic cognitive behavioural approach was used compared with traditional oral hygiene instructions. The test group had higher self-efficacy, lower plaque index, longer brushing duration and higher frequency of interdental cleaning than the control group. The cognitive behavioural approach could be effective for enhancing self-efficacy and behavioural change of oral hygiene than traditional oral hygiene instructions alone (21).

Time is however a factor to consider, it takes more time using CBT compared with giving information in a traditional

way. Therefore, the time limit has been a problem, because longer time with the patient is necessary when using CBT (20). Coping beliefs scale (CBS) is another method that shows how patients own self-esteem reflects in how they are coping with their oral health habits, subjects with low self-esteem showed higher levels of plaque (22). Wolfe *et al.* 1996 (23) showed that patients, who used CBT to improve oral hygiene, resulted in better answers to the questions in the CBS survey compared with other interventions. The result was statistically more significant compared with the other groups. This study shows that by keeping a CBT diary the awareness increases about thoughts and feelings when cleaning the teeth. A CBT diary also strengthens the individuals own motivation to comply with given instructions. Patients who get to learn CBT increase their self-awareness as a part of the therapy. This is a positive side effect that they not only increase their oral heath awareness and are coping better, but they also increase their self-esteem. A compile of studies made so far in the subject of psychological interventions for change in behaviour in view of odontological prophylaxis resulted in the increase of oral hygiene in the test people. But the studies did not show any greater effect on pocket-depth. The quality on the studies was low, and there is a need to increase the demands on the methods used in studies in the future (4). Psychological treatments are complex as it is difficult to blind patients and therapist to treatment condition, and in this study the examiner was not blinded. But this pilot study can present material for discussion where future studies in this rarely unknown field are needed. Furthermore, as a suggestion, randomized clinical trials are needed for evidence in the effectiveness of CBT on oral health improvements.

This pilot study shows that using a modified model of CBT, by keeping a diary, resulted in increased adherence to oral hygiene and knowledge about gingivitis, compared with traditional instructions.

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