One for All™: How to Tackle with Diabetes, Obesity and Periodontal Diseases

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1. Introduction

Diabetes, obesity, and oral diseases (dental caries and periodontal diseases), largely preventable chronic diseases, are described as global pandemic due their distribution and severe consequences.[1-4] WHO calls for a global action for prevention and promotion regarding these diseases as a vital investment in urgent need.[1-4]

Current scientific evidence provides a strong and plausible basis to assert that diabetes, obesity and oral diseases have common risk factors (poor dietary habits, a sugar-rich diet, smoking)[5-9] and biologic mechanisms.[10-17] Current research supports that there is a bidirectional relationship between type 2 diabetes (DM2) and oral health: Poor oral health negatively contributes to glycemic control whereas poor DM2 management negatively affects oral health.[17] Thus, they lead to poor systemic health conditions.[18] Obesity is a triggering risk factor both for DM2 and oral diseases, namely periodontal diseases.[10-12]

Diabetes and obesity, showing an increasing trend, lead to disabilities and negatively affect the quality of life through life-course along with oral diseases.[19, 20] WHO projects that there are almost 200 million people with diabetes at present, and 3,2 million deaths/year are attributable to diabetes complications, and both will double worldwide by 2030.[19,21-23] Globally, more than 1 billion adults are overweight; almost 300 million of them are clinically obese. Being obese or overweight raises steeply the likelihood of developing DM2; approximately 85% of people with diabetes are DM2, and of these 90% are obese or overweight.[22] Promoting a good oral health is significantly essential for preventing and reducing the negative consequences of DM2 and obesity.[24]

Key to successful maintenance of a high glycemic control, DM2 management and obesity, and good oral health is adherence to the regime of daily treatment and self-care practices.[25-28] However, many patients find or feel themselves unable to follow recommended lifestyles (a healthy diet, physical exercise, no smoking, medications, twice daily toothbrushing), which makes them more prone to diabetes-related complications, poor oral health and obesity; therefore leading a poor quality of life.

WHO,[2] International Diabetes Federation (IDF),[29] The World Dental Federation (FDI),[30] and Council of European Dentists,[31] American Dental Association[32] underline a need to adopt a common-risk factor approach[33] for oral and general health promotion; a need for interventions integrating oral health into chronic disease management. WHO highly recommends behavioral interventions to meet this need.[34]

Health Coaching (HC), a health promotion tool, is a new and innovative `behavioral intervention that facilitates individuals in establishing and attaining health promoting goals in order to change lifestyle-related behaviors, with the intend of reducing health risks, improving self-management of chronic-conditions, and increasing health-related quality of life.[35] HC is demonstrated as an effective behavioral technique associated with positive behavioral outcomes (smoking cessation,[36] obesity,[37-40] and diabetes management[40-42]) but it has not been used as a holistic intervention for oral health and DM2 and obesity.

The theory of self-efficacy was developed within the Social Cognitive Theory by Bandura,[43] in which health is determined by the interactions between behavioral, environmental and individual factors. [43] Self-efficacy is the belief in one's capabilities to learn, to organize and to perform healthy behaviors across different challenging situations. The perception of self-efficacy plays a crucial role at adoption, maintenance, and improvement of health behaviors as people engage in activities that they believe they can manage but avoid the ones that they perceive as more than they can cope with.[44] In terms of diabetes management, diabetes-related self-efficacy has been found to predict compliance with diabetes treatment and patients´ understanding of glycemic control.[45,46] Little is known about how self-efficacy can play an intermediate role between oral health and diabetes management; thus better perception of dental self-efficacy was found to associate with better glycemic control and higher tooth-brushing frequency among patients with diabetes type 1.[47] As oral diseases and DM2 are defined as behavioral diseases, dental self-efficacy a may play a crucial role in management of both diseases. However, this has not been studied yet.

The aim of the current chapter is to introduce and to discuss an oral health focused HC model based on improving self-efficacy among patients with DM2, under the framework of a research project. The project refers to an intervention study which aims to assess the impact of oral health focused HC on oral and general health (DM2, obesity, quality of life) in two countries, Turkey and Denmark, by using subjective (self-reports) and objective (clinical) measurements. The new oral health focused HC aims to provide "One for All™"; a new translational health coaching model applicable in real life settings for the patients and an effective transformational leadership tool to improve the patient-health professional communication.

2. Methods

The study is an international prospective intervention study including DM2 adult patients, Turkey (n=200) and Denmark (n=200). Patients will be selected by a random sampling from hospitals. In Turkey, it is planned to recruit patients through advertisement by a web site and from the hospitals` outpatient clinics (Turkish Diabetes Association, S.B. Kartal Research and Education Hospital). In Denmark, patients visiting the dental clinics of School of Dentistry, University of Copenhagen are to be included in the study. General practioners working at the participating medical settings are to be asked to refer their patients to the study. Key inclusion and exclusion criteria are shown in Figure 1.

Invitation for participation and a written informed consent along with an informative pamphlet will be distributed at the clinics and mailed (including postage paid envelopes) to eligible patients. All patients, including those who decline, will be asked to return the consents and response, allowing a comparison of participant and non-participant-groups. Participating patients will be randomly allocated to intervention (coaching) or control

(formal training) group, stratified by gender and age. Comparison of these two groups in terms of training format is shown in Table 1.
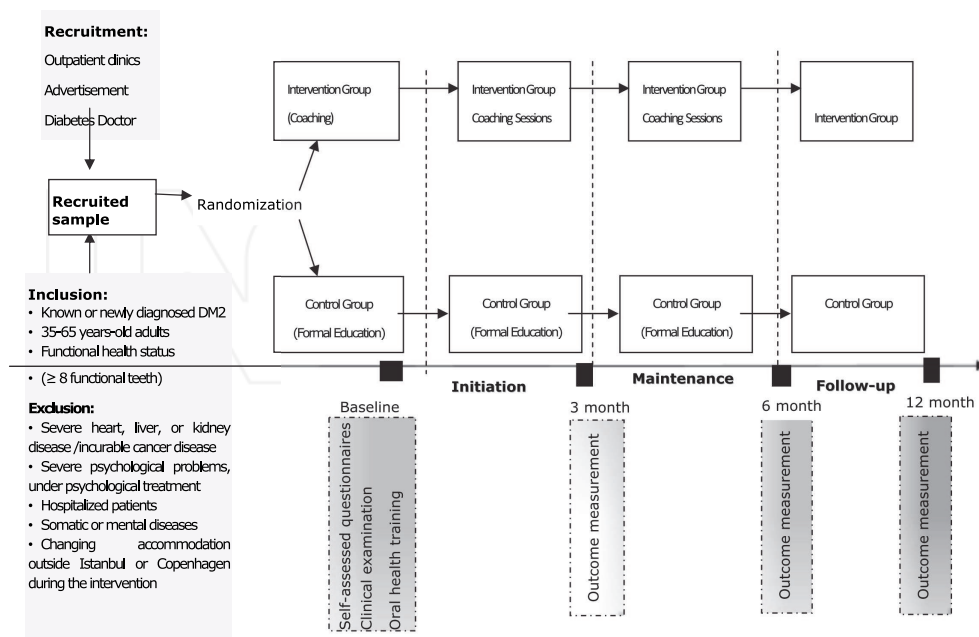

Fig. 1. Schematic representation of the study design.

All patients will be called for clinical examinations (oral and general health) and on the day of clinical examinations, questionnaires will be distributed and collected back. Then clinical oral health examinations (caries, CPI, Periodontal attachment loss) and measurements for BMI and body-fat will be performed. Then clinical measures (HbA1c, fasting blood glucose, postprandial glucose, cholesterol) from the last current patient records of the hospitals will be taken. Salivary samples to measure streptococcus mutans and lactobacillus counts will be taken by CRT® kit (IVOCLAR Vivadent, Plandent, Denmark). Within one week, all patients will be invited to a short seminar about oral diseases and their relation with diabetes and obesity. Then patients will be invited for periodontal cleaning; thus will be performed by two dentists in Turkey and two dental hygienists in Denmark.

3. The intervention

Two dentists in Turkey and two dental hygienists in Denmark, with professional ICC (International Coaching Council) training, will run the coaching sessions which will be modified from ICC manual. Sessions in format of individual,telephone and group coaching will start one week after the clinical examination. They will continue as two 3-months interventions and a 6-months follow-up. The sessions will be modified and adjusted by a multi-disciplinary team of professional health coaches, community dentistry professionals, and diabetes specialist nurse, physician and dietician.

Aspect	Control Group (Traditional Health Education)	Intervention group (Health Coaching Approach)
Orientation	Task-oriented (**The focus is on the tasks such** as tooth-brushing, regular physical exercise, adherence to dietary regimes)	Patient-oriented (**The focus is on the patient** such that if s/he can do regular tooth-brushing and physical exercise, and have the healthy diet. Focus is on the challenges and facilitators that patient faces up when s/he is to adopt positive health behaviors)
Most common techniques used	Advice-giving by the dental hygienist, information sharing between the dental hygienist and the patient: dentist / dental hygienist advises on regular tooth-brushing and healthy diet. She also asks and advises the patient about adherence to regular physical exercise and dietary regimes prescribed by the medical profession.	Expression of empathy, rolling with resistance of the patient to have healthy lifestyles, supporting self-efficacy: The patient sets up health goals, focusing on the oral health as the first, and then s/he works on how to achieve the goal together with the coach- professionally trained dental hygienist) There is an action plan within a set-up time frame, set up by patient and supported by the coach.
Technique used	None	Motivational Interviewing, self-efficacy, NLP
Decision-making process about to improve oral health and diabetes	Dentist / dental hygienist advises/tells what is best for the patient using evidence-based practice guidelines	Collaborative effort between dental hygienist and the patient Dental hygienist guides and supports the patient towards exploring how to improve oral health and diabetes. Dental hygienist facilitates movement of the patient through positive health behavior change.

Table 1. Comparison of the control and intervention.

The HC concept will be introduced at first session focusing on building the rapport between the coach and the patient. Knowledge and early experiences about health management, expectations and needs will be discussed to define health-targeted goals, specified by the patient. Coaching will focus on empowerment of patients for daily health-related practices, compliance to diabetes- and oral health care regimes and visits. The specific target will be improving skills for capacity building and self-monitoring, and taking responsibility for health and quality of life. A specific plan of action to be achieved until the next coaching session will be defined by the patient under the guidance and empowerment of a coach. Each HC session, the foundation for the next coaching session, is used for subsequent monitoring of patient's progress towards the achievement of the target goal. Pre-set time frame for HC sessions is 20-60 minutes, determined by needs, expectations, hindrances, and progress of each patient. Each session will be supported by telephone coaching sessions.

The HC intervention, focusing on improvement health behaviors for successful management of DM2 and oral health, targets to achieve 0.1% reduction on current HbA1c levels, reduced level of stress, increased self-efficacy and self-esteem, no gingival bleeding and no calculus as outcomes.

4. The coaching model: A continuous coaching cycle

Oral health focused HC follows a continuous empowerment cycle for adoption of positive health behaviors and a better lifestyle (Figure 2).
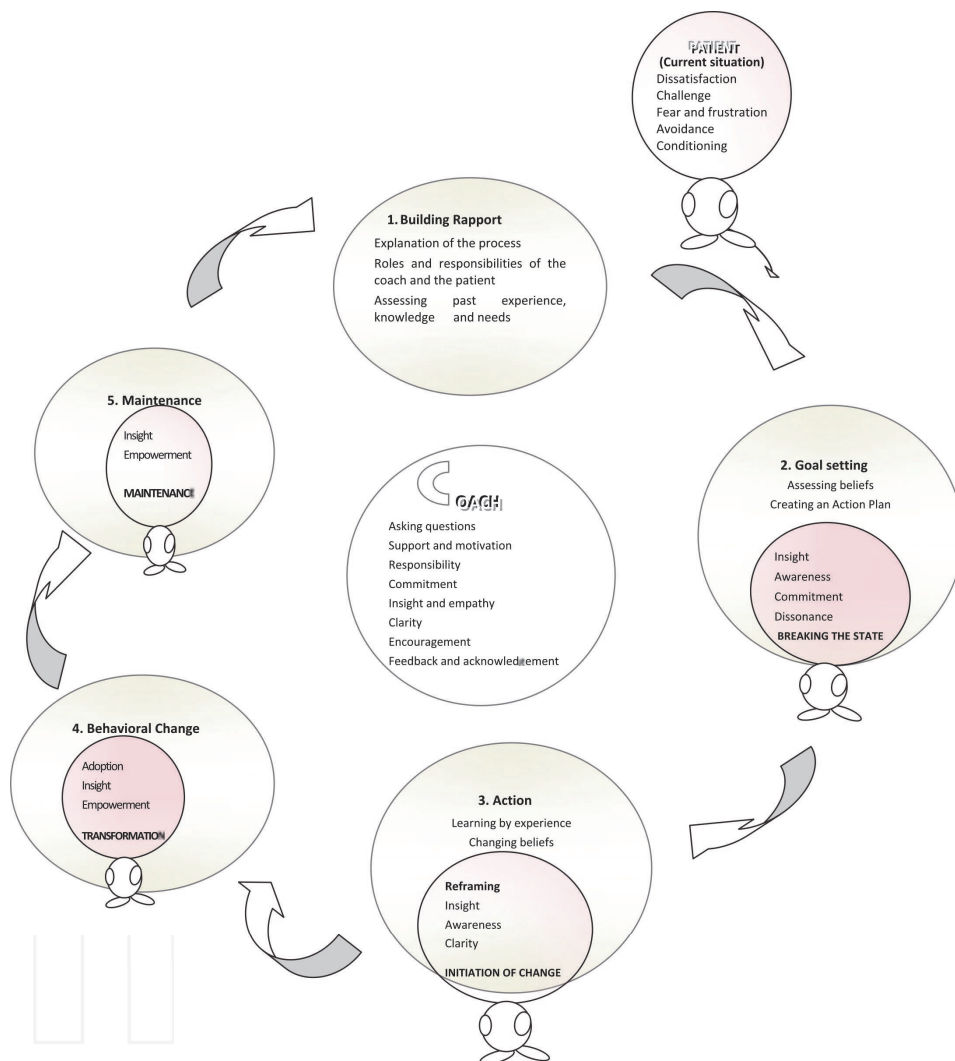

Fig. 2. Coaching cycle and its stages.

Stage 1. Building rapport and trust: The first session includes a letter of welcoming to the patient to the program and written information about coaching sessions. An informed consent between coach and patient is signed to set the framework for responsibilities and expectations of each. The first session is launched as an individual coaching, thus the patient shares his/her experiences about mainly oral health and diabetes. The coach asks questions about oral health,

diabetes, weight management, and quality of life. Visual analog scales are used to enable better assessment of current health situation by each patient. The log-book with the name and contact details of his/her coach is given to each patient to monitor own progress.

Stage 2. Goal setting, assessing of beliefs and creating action plan: During the first session, the patient is asked for questions to set up his/her goal, mainly for oral health. In case the patient's priority is other specific health issue concerning diabetes, then the session will be scheduled based on this need and expectation. Hindering and empowering beliefs to achieve the goal are questioned by a coach and the patient is led through a self-brainstorming process. Beliefs, knowledge, and attitudes about earlier experiences concerning health and relevant learning practices are to be discussed. Needs and expectations of the patient are to be assessed. An action plan is set by the patient under the framework of the coaching programme. Specific action plan and empowerment tools are attached in the log-book at the end. In addition, a monitoring schedule for blood glucose measurement and oral health behavior (toothbrushing) is included.

Following the first session, each patient is coached by telephone call (8-10 minutes) after 10-15 days for motivation, encouragement and support for specific behavioral change which was determined by the patient as a personal health goal. A bilateral agreement for the schedule and content is provided for the next session. Depending on his/her needs and health situation, patient may be coached and supported to consult a health professional concerning diabetes, nutrition, and/or dentist.

Stage 3. Changing beliefs, experiencing and learning. During the following coaching session patient adherence to the negotiated action plan and relevant obstacles are evaluated. Beliefs, attitudes, challenges and enablers experienced following the first coaching session are assessed by the questions. Reinforcement is provided to empower the patient for achieving the health-related goal. If the patient mostly fails at achievements, then struggles and challenges of the patient are clarified. The goal and action plan are re-evaluated by the patient under the supervision of the coach. Empowerment by telephone coaching is provided after the session. Depending on the patient's progress, a further individual coaching session may be launched. Summary of the coaching sessions is noted on the patient's log-book by himself. This stage may be so called as `transition` as the patient moves from his health-related past experiences and beliefs to new beliefs and knowledge by self-practice.

Stage 4. Behavioral Change. Based on the self-regulation and self-learning practices, the patient performs a new positive health behavior including structuring and anchoring, so a transformation takes place. New experiences are shared by a group coaching session, and interactive learning from personal experiences is used for anchoring and empowering the new positive health behaviors and beliefs. Patients are encouraged to discuss about the patterns - action plan - to maintain and to improve the new behavioral patterns with each other. Visual analog scales for self-assessment are used for better evaluation of the current stage. Evaluation of the coaching sessions are summarized and shared. Bilateral agreement on further sessions is to be decided by the patient and the coach.

Stage 5. Behavioral Maintenance: The patient is on the stage of self-monitoring for newly adopted health behavior. As positive health behaviors, so called health enhancing behaviors, cluster together, patient will be on the process of practicing new positive health behaviors while he/she is practicing the newly adopted one. Insight and awareness of positive outcomes of the new behavior will be a gateway to experience the other health enhancing behaviors. Empowerment and support by the coach will enable to better assess changes in self-regulation. At this stage the coach follows up the patient and provides coaching sessions

less frequently as the patient is on the process of learning to be a `coach` of himself/herself; thus he/she adopts and maintains positive health behaviors.

5. The control (education) group

The control group receives the formal education focused on oral health and its relation with diabetes, obesity and quality of life. Two dentists, participated in post-graduate oral public health training by Turkish Dentists Chamber, will give oral health education in the format of seminars to patients. In Denmark, two dental hygienists will be consulted about the curriculum of the formal education and then they will perform the oral health training with the patients. A diabetes specialist a nurse, a physician and a dietician will participate in the education programme in both countries, and their sessions will include diabetes, education self blood glucose monitoring, the importance of physical activity, healthy diet, weight loss, medication and smoking cessation, and late complications of DM2. Educative pamphlets about oral health and diabetes will be posted to the patients following the training sessions to support the learning environment. Training will be performed face to face twice in a month supported by phone sessions once in a month. Patients will be asked and advised on telephone by the trainers about any possible change regarding their beliefs, knowledge and behavior concerning mainly oral health, diabetes and weight management.

6. Outcome measures and data collection

The outcome measures are clinical, psycho-social and behavioral. The clinical measures are as follows: HbA1c, postprandial glucose, fasting glucose, body-fat composition, BMI, dental (DMFT) and periodontal health (CPI, periodontal attachment loss) status along with streptococcus mutans and lactobacillus counts. Measurement of these species for caries risk assessment may enable assessing the diabetes risk groups as poor oral health is a risk factor diabetes and glycemic control. All outcome measures are collected at baseline and at the end of the two 3-month interventions and at the end of follow-up after 6-months.

The self-administered questionnaires to measure psycho-social and behavioral and socioeconomic were modified from several scales (PAID,[48] Summary of Diabetes Self-Care Activities,[49] Appraisal of Diabetes Scale,[50] WHO Quality of Life,[51] and WHO HPQ[52]), and Health Behavior Questionnaire.[53]

A pilot study was conducted among 60 DM2 patients in Istanbul, Turkey, December 2009-January 2010 to test the reliability and validity of the questionnaires, in collaboration with the Oral Public Health Department (Yeditepe Dental Faculty) and The Diabetes Association. The response rate was 56%. The results are under analysis; preliminary results were submitted for presentation to IADR Congress.[53]

7. Sample size considerations and statistical measures

The size of the study is estimated by G*Power statistical power analysis software program[54, 55] (Power =0.95 α, significance level 0.05) based on the mean group difference (0.7, moderate level Cohen's d), thus may be detected as 150 for each group. Considering the possible drop-outs and non-attendance, the initial sample will target 200 patients in each group. Neither patients nor study personnel are blinded to treatment assignment. The study statisticians carrying out the data analysis on the outcomes will be blinded and will not have any contact with the patients.

Descriptive statistics (means ± SD, or median and percentile ranges, as appropriate) will be used to describe the study sample with regards to baseline characteristics. The analysis will be performed according to the intention-to-treat principles using the statistical software SPSS 17. Comparisons of outcomes between the two groups will be analyzed by values measured after the two 3-month interventions and the follow-up, using appropriate parametric tests for variables fulfilling the normal distribution criteria or appropriate non-parametric tests for variables not fulfilling the normal distribution criteria. When relevant, changes in outcomes from 3-month interventions to 6-months follow-up will be assessed. The patients will be allocated according to their oral health risk groups (streptococcus mutans and lactobacillus counts and CPI), and those groups will be analyzed and compared for the recommended goal for HbA1c and better health outcomes such as reduced body-fat ratio and stress, healthy BMI and increased quality of life. Statistical significance is set at $P < 0.05$.

8. Ethics

The study will be conducted according to the principles of the Helsinki declaration. The approval from the Danish National Committee on Biomedical Research Ethics and the Danish Data Protection Agency is in process. The permission from The Turkish Biomedical Research Ethics Committee was taken in May 2010.

9. Discussion

In Turkey, the prevalence and severity of oral diseases is high;[56-59, 26] thus 88-92% of adults experience dental caries and they have almost no healthy gums compared to the whole population (Oktay I. National Oral Health Survey 2009. Personal Communication, April 2010).[56,59] In Denmark, mean caries experience among Danish adult population is 46.6 DMF-S with an increasing prevalence among the elderly (104.1 DMF-S, 65-74-year-olds) and those with low education[60]. A study among Danish adults aged 35-44-year olds has found out that bleeding is about one fourth of the teeth and one third of the study population has at least one shallow pocket (4-5mm), most severe sign of periodontal disease, while deep pockets (at least 6mm) are about 6%.[61,62]

Inflammation in the periodontium in early old age tends to be associated with mortality in older age.[63] As people with diabetes are more likely to have periodontal disease than those without diabetes, most probably due to the increased susceptibility to contracting infections,[64-66] these people may have high risk for having a healthy life-course. However, the current periodontal health status of DM2 patients in Turkey and Denmark does not seem to be known –to our knowledge-.

DM2 is increasing in both Turkey [current prevalence: 14.7%; Oğuz A. PURE (Prospective Urban and Rural Epidemiological Study) 2010. Personal communication, April 2010] and Denmark (4.6%).[67,68] It is expected that the number of patients with diabetes almost to triple up to year of 2030.[68-70] Many individuals in Turkey and Denmark die each year because of diabetes and its complications, thus the number increases considering the interrelation of diabetes with CVD, and obesity.[69, 70] DM2 represents 90-95% of the total number of people with diabetes.[22] However, the deaths and the complications are preventable by at least 40% by improving the lifestyles.[70] Poor lifestyles (increased consumption of fat and carbohydrates, physical inactivity) contribute to DM2, accompanied mostly by obesity,[1, 3] and oral diseases.[2, 26] Thus, DM2 and oral diseases may be called lifestyle diseases so the

assessment of patient's health behavior by its psychosocial and environmental determinants is crucial. Relevant studies in Turkey and Denmark are scarce.

Psychological support is needed for successful life-long management of diabetes and better quality of life.[71,72] Good psychological well-being is a prerequisite for a healthy diet, improved glycemic control, regular diabetic self-care[72, 73] and oral health care. Respective studies for oral health speak that dental caries is interrelated with self-esteem, school performance and obesity among adolescents. In addition, self-efficacy is a significant contributor for healthy eating patterns and twice daily toothbrushing.[2, 8, 9, 74] However, interventions considering patient's psychology (e.g. structuring the patient goals and motivation) on oral health and diabetes management are scarce. The present research, -to our knowledge for the first time-, is structured on capacity building skills of patients focusing on a common risk factor approach for management of both oral health and DM2 among adults.

This prospective, controlled and randomized study tests whether an oral health focused HC compared to the formal oral health training provides better health outcomes considering diabetes, oral health, obesity and quality of life among DM2 patients. Both groups receive formal oral health and diabetes training at the initial stage, further process speaks for HC for the intervention group and formal advice giving for the control group about mainly oral health, and partially diabetes, weight, and quality of life management. The major difference between two groups is that in oral HC, the patient first explores his/her `self` and then sets a health goal based on his/her expectations, needs, and beliefs. The task of the coach is to ask specific questions to guide the patient in finding out his/her own solutions and action plan. The coach empowers and supports the positive actions and change for adopting the new positive health behavior.

There are many researches in the field of health promotion and prevention of DM2 and oral health; however, there is not any research in that field speaking for both chronic diseases by HC based intervention, as well by assessing both oral health and diabetes-related subjective and clinical outcomes. The study, first in the field of oral health coaching, is unique -to our knowledge-.

10. Relevance of the project to clinical dentistry

Even 1% reduction at HbA1c has significant effects at decreasing the risk of developing complications (18%, myocardial infarction; 25%, deaths).[75] Clinical treatment of periodontal disease supported by HC intervention by dental chair-side may speak for at least 1% reduction at DM2 complications. That may enlighten the significant and frontier role of dentistry at provision of quality of life and general health among DM2 patients.

In addition, possible association/interrelation between

1. HbA1c and periodontal disease, and between caries and BMI, may provide evidence that clinical oral health examination should take a frontier role at holistic medical diagnosis: Diagnosis of DM2 at early stages and also monitoring the progress of DM2 by periodontal health status may prevent further DM2 complications. That will increase the long-term success and effectiveness of the dental and medical treatments which will reduce more complex treatments and their relevant costs.

2. HbA1c, BMI, body-fat ratio and cariogenic bacteria can provide evidence and enlighten the need of specific dental preventive regimes and oral health promotion among DM2 patients.

HC may increase the patient compliance which is a major challenge in dentistry. That will reduce the further complex treatments and therefore their costs. Evidence for the success of HC may bring a dental therapy concept that can be integrated to clinical dentistry; thus will

provide new resources for clinical dentistry in terms of treatment success, finance and cost-effectiveness.

11. Relevance of the project for interdisciplinary research

HC speaks for integration of medical sciences, business administration, psychology and sociology. It is based on NLP, motivational interviewing and cognitive psychology which are currently accepted as the most effective resources for adoption, change and maintenance of positive health behaviors, leading to a healthy lifestyle. Positive health behaviors and healthy lifestyles are the main concerns of many international and national organizations; thus HC goes far beyond building a bridge between certain disciplines by connecting different stakeholders whose concern is health. Present study, based on both clinical and community dentistry, speaks for an interdisciplinary research and common concern of different organizations; that is one of the first, to our knowledge.

12. Conclusion

The study, to our knowledge, is the first that settles up a common health promotion and intervention for DM2 and oral health, in line with the declaration of IDF and FDI (2007).[29,30] Besides, it uses also for the first time an oral health focused HC as an intervention tool for chronic disease management under an umbrella. The findings of the research may provide a new approach for the holistic management of oral diseases and DM2. As there is a growing evidence that the dentistry can play a pioneer role in DM2 diagnosis and as well in prevention of further complications of DM2, the findings of the study may answer some of the questions regarding "why" and "how" dentistry can take a significant role in DM2 management. The study further underlines the need for a strong collaboration between various stake holders (universities, hospitals, government) and professionals (diabeticians, physicians, dentists, coaches) to improve the quality of life among DM2 patients and as well their families.

13. Acknowledgements

14. References

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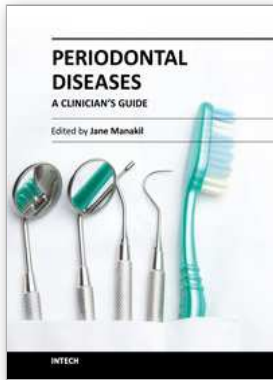
Periodontal Diseases - A Clinician's Guide

Edited by Dr. Jane Manakil

"Periodontal diseases" is a web-based resource intended to reach the contemporary practitioners as well as educators and students in the field of periodontology. It is fully searchable and designed to enhance the learning experience. Within the book a description is presented of the current concepts presenting the complex interactions of microbial fingerprint, multiple genotypes, and host modulations. In addition, an overview is given of the clinical outcome of the disease's progression, as influenced by the epigenetic factors. Emerging concepts on periodontitis as a risk factor for various systemic diseases and as a bilateral modulating factor have been elucidated in detail as well.

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Ayse Basak Cinar (2012). One for All™: How to Tackle with Diabetes, Obesity and Periodontal Diseases, Periodontal Diseases - A Clinician's Guide, Dr. Jane Manakil (Ed.), ISBN: 978-953-307-818-2, InTech, Available from: http://www.intechopen.com/books/periodontal-diseases-a-clinician-s-guide/1-for-all-how-to-tackle-with-diabetes-obesity-and-periodontal-diseases

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