

Department of Oral Public Health
Institute of Dentistry
Faculty of Medicine
University of Helsinki
Finland

**Preadolescents and Their Mothers as Oral Health-
Promoting Actors:**

Non-biologic Determinants of Oral Health among Turkish and
Finnish Preadolescents

Ayse Basak Cinar

ACADEMIC DISSERTATION

*To be presented with the permission of the Faculty of Medicine of the University of
Helsinki, for public discussion in the main auditorium of the Institute of Dentistry,
Mannerheimintie 172, Helsinki, on 27 November, 2008 at 12 noon.*

Helsinki 2008

Supervised by:

Professor Heikki Murtomaa, DDS, PhD, MPH
Department of Oral Public Health
Institute of Dentistry
Faculty of Medicine, University of Helsinki
Helsinki, Finland

Reviewed by:

Adjunct Professor Sisko Honkala, DDS, PhD
Department of Public Health Dentistry
Institute of Dentistry
Faculty of Medicine, University of Turku
Turku, Finland

and

Adjunct Professor Ossi Rahkonen, DDS, PhD
Department of Public Health
University of Helsinki
Helsinki, Finland

Opponent:

Professor Lone Schou, DDS, PhD, MPH
Head of Institute
The School of Dentistry, University of Copenhagen
Copenhagen, Denmark

ISBN 978-952-92-4580-2 (paperback)

ISBN 978-952-10-5026-8 (PDF)

Yliopistopaino 2008

Electronic version available at <http://ethesis.helsinki.fi>

“The truest guide in life is science.”

M. Kemal ATATÜRK

*“A man is valued not by his words,
but by his work.”*

Finnish Folk Saying

Abstract

Cinar Basak Ayse. Preadolescents and Their Mothers as Oral Health-Promoting Actors: Non-biologic Determinants of Oral Health among Turkish and Finnish Preadolescents. Department of Oral Public Health, University of Helsinki, Finland, 2008. 90 pp. ISBN 978-952-92-4580-2

The present study aimed to investigate how non-biologic determinants of oral health (behavior, cognition, and affect, maternal and societal influences) are interrelated with each other and with oral health among preadolescents in two different oral health care and cultural settings, Turkey and Finland. In addition, the association of their general well-being with their oral health was assessed.

The cross-sectional study of Turkish (n=611) and Finnish (n=223) school preadolescents in Istanbul and Helsinki, from the fourth, fifth, and sixth grades, aged 10 to 12, was based on self-administered and pre-tested health behavior questionnaires for them and their mothers as well as the youth's oral health records. Both questionnaires assessed self-reported dental health and oral health behaviors along with cognitive-affective factors (self-efficacy and dental anxiety). In addition, health behavior questionnaires for preadolescents (PHBQ) included questions of self-esteem and self-reported gingival health, whereas those for mothers (MHBQ) surveyed societal factors, dietary habits and body-weight of preadolescents. PHBQ were completed in classes, whereas MHBQ were carried to and from home.

Dental examinations in Turkey based on World Health Organisation (WHO) criteria (1997) were carried out in the classrooms 2 weeks after the questionnaire survey by two calibrated pediatric dentists. Finns' oral health data came with permission, from records at the Helsinki City Health Department.

Among the Turks, response rate for PHBQ was 97% (n=591) and 87% for the MHBQ (n=533). The corresponding Finnish rates were 65% (n=223) and 53% (n=182). Participation in oral health examinations was 95% for the Turkish (n=584) and 65% for the Finnish (n=223).

Clinically assessed dental status (DMFT) and self-reported oral health of Turkish preadolescents was significantly poorer than the Finns'. A similar association occurred for well-being measures (height and weight, self-esteem), but not for school performance. Turkish preadolescents were more dentally anxious and reported lower mean values of toothbrushing self-efficacy (TBSE) and dietary self-efficacy (DSE) than did Finns. The Turks less frequently reported recommended oral health behaviors (twice daily or more toothbrushing, sweet consumption on 2 days or less/week, decreased between-meal sweet consumption) than did the Finns. In both groups, those with high TBSE were more likely to practice the recommended toothbrushing. Similarly, all with high DSE were more likely to report recommended toothbrushing and sweet consumption. High levels of TBSE and DSE contributed to low dental anxiety in various patterns in both groups.

Turkish mothers less frequently reported dental health as being above average and recommended oral health behaviors as well as regular dental visits (once in every 6 or 12 months). Their mean values for dental anxiety was higher and self-efficacy on implementation of twice-daily toothbrushing were lower than for the Finnish mothers.

All preadolescents were likely to imitate all toothbrushing and sweet consumption behaviors of their mothers. In both groups, those who reported high TBSE were more likely to have mothers who practiced recommended toothbrushing. Among Finns, high maternal self-efficacy and low dental anxiety contributed positively to preadolescent's recommended toothbrushing and high TBSE. Among the Turks, high maternal dental anxiety contributed to that of their children.

Among Turks, the mothers of public school preadolescents reported a poorer societal profile and oral health behaviors than did mothers of private school preadolescents. Public school preadolescents were more likely to imitate non-recommended toothbrushing and sweet-consumption behaviors of their mothers, with their counterparts in private school following a similar trend for recommended maternal toothbrushing behavior.

Self-esteem and school performance were positively correlated with TBSE and DSE in both groups. Clustering between high self-esteem and low preadolescent- and maternal dental anxiety occurred in various patterns for Turks and Finns. Societal factors contributed to self-esteem among the Turks. Among all preadolescents, recommended toothbrushing was a common predictor for better school performance.

Oral health and well-being of preadolescents were interrelated. In both groups, DMFT was negatively correlated with better school performance. Body height and the societal factors were the common explanatory variables accounting for DMFT s.

TBSE and school performance contributed positively to self-reported dental health, in common, among all preadolescents. Self-esteem and maternal sweet consumption among Finns, number of children in the family, and preadolescent toothbrushing among Turks were the other contributors to self-reported dental health.

In the present study, non-biologic determinants of oral health were interrelated and related to well-being measures in various patterns, and these all contribute to the oral health of preadolescents. Based on these findings, a need exists for improvement in Turkish preadolescents' and their mothers' oral health behaviors, cognition, and affect. The paired associations separately studied in the literature; self-efficacy—behavior, child—mother health behavior, general well-being—oral health, self-esteem—school performance, were all found by a holistic theoretical framework, regardless of different cultural, socio-economic, and health-care systems in the two countries, Turkey and Finland. This may indicate that the respective associations are turning out to be part of the global health culture, and therefore a need exists for similar further research including the complex interaction pathways between these associations in countries with different developmental, cultural, and health-care characteristics. Clarifying these complex relations by psychosocial holistic approaches in different cultural settings and socio-economic contexts may provide a multidimensional understanding of preadolescents' oral health behavior that will provide enhancement of their well-being and oral health.

Author's address:

Ayse Basak Cinar, Department of Oral Public Health, Institute of Dentistry, University of Helsinki, P.O. Box 41, FI-00014 Helsinki, Finland
E-Mail: basak.cinar@helsinki.fi

Tiivistelmä

Cinar Basak Ayse. Esiteini-ikäiset ja heidän äitinsä suun terveyden edistäjinä: ei-biologiset suun terveyteen vaikuttavat tekijät turkkilaisilla ja suomalaisilla esiteini-ikäisillä. Suuterveystiede. Hammaslääketieteen laitos, Helsingin yliopisto, Finland, 2008. 90 pp. ISBN 978-952-92-4580-2

Tutkimus pyrki selvittämään, kuinka ei-biologiset suun terveyteen vaikuttavat tekijät liittyvät toisiinsa ja suun terveyteen esiteini-ikäisillä kahdessa eri terveydenhuolto- ja kulttuuriympäristössä, Turkissa ja Suomessa. Lisäksi tutkittiin esiteini-ikäisten yleisen hyvinvoinnin yhteyttä heidän suunsa terveyteen.

Tutkimusmateriaali kerättiin turkkilaisille (n=611) ja suomalaisille (n=223) 10–12-vuotiaille koululaisille ja heidän äideilleen toimitetuilla kyselylomakkeilla Istanbulissa ja Helsingissä. Molemmilla kyselylomakkeilla tutkittiin itse arvioitua suun terveyttä sekä suun terveyteen liittyvää käyttäytymistä kognitiivis-affektiivisten tekijöiden avulla tätä tutkimusta varten kehitetyssä holistisessa viitekehyksessä. Lisäksi esiteini-ikäisten terveyskäyttäytymisessä arvioitiin heidän käsityksiään itsetunnosta ja pystyvyydestä. Äideiltä kysyttiin myös ruokavaliosta ja lasten painoon liittyvistä tekijöistä.

Turkissa tehdyt kliiniset tutkimukset pohjautuvat WHO:n kriteereihin; kaksi lasten hammaslääkärinä suoritti ne kaksi viikkoa kyselyn jälkeen. Helsingissä hammasstatustiedot kerättiin lasten tutkimusluvan mukaisesti potilaskorteista. Kyselytutkimuksen vastausprosentti oli Turkin koululaisilla 97 % ja heidän äideillään 87 %. Suomalaisten vastaavat luvut olivat 65 % ja 53 %. Turkissa hammastutkimukseen osallistumisprosentti oli 95 % ja Suomessa 65 %.

Sekä kliinisesti arvioitu että itse raportoitu suun terveys oli turkkilaisilla huomattavasti huonompi kuin suomalaisilla. Samanlainen tendenssi ilmeni myös muissa yleisen hyvinvoinnin indikaattoreissa paitsi koulumenestyksessä.

Turkkilaiset koululaiset kertoivat vähemmän suositellusta hampaidenhoitokäyttäytymisestä ja kokivat enemmän hampaiden terveyteen liittyvää ahdistusta kuin suomalaiset. Turkkilaisten raportoimat hampaiden pesuun ja ruokavalioon liittyvät pystyvyyden tunteet olivat keskimäärin heikommät kuin suomalaisilla koululaisilla. Korkea hampaiden harjaamiseen liittyvä pystyvyyden tunne korreloi molemmilla ryhmillä positiivisesti myös suositellun hammasterveyskäyttäytymisen kanssa. Samoin kaikki ne koululaiset, joilla oli korkea ruokavalioon liittyvä pystyvyyden tunne, raportoivat myös suosituksen mukaisesta hampaiden pesusta ja makeisten kulutuksesta. Itsetunto ja koulumenestys korreloivat positiivisesti hampaiden pesuun ja ruokavalioon liittyvän pystyvyyden kanssa kaikilla koululaisilla.

Turkkilaiset äidit kokivat oman hammasterveytensä harvemmin hyväksi ja kertoivat suositusten mukaisesta hammasterveyskäyttäytymisestä harvemmin kuin suomalaiset. Lisäksi heillä oli usein hampaiden hoitoon liittyvää ahdistusta. Molempien maiden koululaisille oli ominaista se, että he jäljittelivät äitiensä tapaa nauttia makeisia. Molemmissa maissa myös niillä koululaisilla, jotka raportoivat korkeasta hampaiden harjaamisen pystyvyydestä, oli todennäköisesti äiti, joka noudatti hampaiden pesuun liittyviä suosituksia. Suomalaisten koululaisten äitien suuri hampaiden harjauksen pystyvyys ja heidän alhainen hammashoitoon liittyvä ahdistuksensa korreloivat positiivisesti heidän lastensa suositusten mukaisten hampaiden pesun ja siihen liittyvän pystyvyyden tunteen kanssa.

Suun terveys ja hyvinvointi liittyvät toisiinsa esiteini-ikäisillä. DMTF korreloi sekä turkkilaisilla että suomalaisilla negatiivisesti paremman koulumenestyksen kanssa. Ruumiin pituus ja yhteiskunnalliset tekijät olivat yleisiä korkea DMFT:tä selittäviä tekijöitä.

Tässä tutkimuksessa ei-biologiset suun terveyteen vaikuttavat tekijät liittyivät toisiinsa ja yleiseen hyvinvointiin monin eri tavoin. Kaikki nämä tekijät vaikuttivat esiteini-ikäisen suun terveyteen. Turkkilaisten esiteini-ikäisten ja heidän äitiensä suun terveyteen liittyvässä käyttäytymisessä, ajattelutavoissa ja tunnekokemuksissa on runsaasti parantamisen varaa. Suun terveyteen liittyvät sosiaalipsykologiset tekijät – pystyvyyden tunne ja itsetunto sekä lapsien ja äitien terveystietäytyminen, yleinen hyvinvointi ja suun terveys, itsetunto ja koulumenestys –, joita kirjallisuudessa on aikaisemmin tutkittu vain pareittain, olivat kaikki tunnistettavissa holistisessa viitekehäksessä riippumatta näiden kahden maan kulttuurista ja niiden sosio-ekonomisesta tai terveydenhuollon järjestelmästä.

Tämä saattaa merkitä, että nämä assosiaatiot ovat osa globaalia terveyskulttuuria, ja siksi tarvitaan vastaavanlaisten tekijöiden vuorovaikutukseen kohdistuvia lisätutkimuksia. Holistinen psykososiaalinen tutkimusote voi auttaa näiden monimutkaisten vuorovaikutussuhteiden tunnistamista ja lisätä esiteini-ikäisten suun terveyteen vaikuttavien tekijöiden monipuolista ymmärrystä. Näin voidaan edistää esiteini-ikäisten hyvinvointia ja heidän suunsa terveyttä eri kulttuureissa ja terveydenhoitojärjestelmissä.

List of original publications

This thesis is based on the following publications referred to in the text by their Roman numerals:

- I Cinar AB, Tseveenjav B, Murtomaa H. The life-course approach in assessment of dental health among Finnish and Turkish preadolescents. *European Journal of Dentistry* (Accepted for publication, July 2008).
- II Cinar AB, Murtomaa H. A Comparison of Psychosocial Factors Related to Dental Anxiety among Turkish and Finnish Preadolescents. *Oral Health & Preventive Dentistry* 2007; 5:173-179.
- III Cinar AB, Tseveenjav B, Murtomaa H. Oral Health-related Self-efficacy Beliefs and Tooth-brushing: Social Cognitive Theory Based Comparison of Finnish and Turkish Preadolescents' and Mothers' Responses. *Oral Health & Preventive Dentistry* (Accepted for publication, March 2008).
- IV Cinar AB, Kosku N, Sandalli N, Murtomaa H. Individual and maternal determinants of self-reported dental health among Turkish school children aged 10-12 years. *Community Dental Health* 2008; 25:84-88.
- V Cinar AB, Kosku N, Murtomaa H. Self-Efficacy Perspective on Oral Health among Turkish Preadolescents. *Oral Health & Preventive Dentistry* 2005; 3: 209-215.

In addition, some previously unpublished results are presented.

Abbreviations

CDAS	Corah Dental Anxiety Scale
CI	Confidence Interval
DMFT	Number of decayed, missing, and filled permanent teeth
dmft	Number of decayed, missing, and filled primary teeth
DMFS	Number of decayed, missing, and filled surfaces of permanent teeth
dmfs	Number of decayed, missing, and filled surfaces of primary teeth
DSE	Dietary Self-Efficacy
e.g.	for example
et al.	and others
FDI	World Dental Federation
GRR	General Resistance Resources
HBSC	International Health Behavior in School-Aged Children (survey)
HFA	Health for All by the year 2000
MDAS	Modified Dental Anxiety Scale
MHBQ	Maternal Health Behavior Questionnaire
MSE	Maternal Self-Efficacy (related to implementation of twice daily toothbrushing in the daily life of the preadolescent)
NPHCA	National Primary Health Care Act
OECD	Organization for Economic Co-operation and Development
OR	Odds Ratio
PAHO	Pan American Health Organization
PHBQ	Preadolescent Health Behavior Questionnaire
PHC	Primary Health Care
SE	Standard Error
SOC	Sense of Coherence
SIGN	Scottish Intercollegiate Guidelines Network
TBSE	Toothbrushing Self-Efficacy
TDA	Turkish Dental Association
UNICEF	United Nations Children's Fund
U.S.	United States
vs.	versus
WHO	World Health Organization

Contents

1. INTRODUCTION	12
2. REVIEW OF THE LITERATURE.....	14
2.1. Significance of Oral Health.....	14
2.2. Oral Health Care Systems.....	17
2.2.1 Oral Health Care System in Turkey	18
2.2.2 Oral Health Care System in Finland.....	20
2.3. Concept of Health Promotion	21
2.3.1 Levels of Prevention and Oral Health	23
2.3.2 Preventive Approaches in Oral Health Promotion.....	26
2.4. Behavioral Aspects of Oral Health and Its Significance in Oral Health Promotion ...	29
2.4.1. Theories of Health Behavior.....	29
2.4.2. Oral Health Behaviors, Cognition, and Affect, and Maternal Influence in Preadolescence.....	32
3. AIM OF THE STUDY	36
3.1. General Aim.....	36
3.2. Specific objectives.....	36
3.3. Working hypothesis	36
4. MATERIAL AND METHODS.....	37
4.1. Material.....	37
4.2. Methods.....	37
4.2.1 Theoretical Model	37
4.2.2 Pilot Study	39
4.2.3 Questionnaires.....	39
4.2.4 Data Collection	42
4.2.5 Statistical Analysis	43
5. RESULTS	45
5.1. How oral health and its non-biologic determinants and general well-being measures differentiate between Turkish and Finnish preadolescents (I, II, III, V)	45
5.1.1 Clinically measured dental and self-assessed oral health.....	45
5.1.2 General well-being measures	45
5.1.3 Oral health behaviors, self-efficacy and dental anxiety.....	46
5.1.4 Maternal and Societal Factors	46
5.2. How maternal modeling contributes to oral health behavior, self-efficacy, and dental anxiety? (II, III)	49
5.2.1 The effect of maternal modeling on preadolescents' oral health behavior.....	49
5.2.2 The effect of maternal modeling on preadolescents' self-efficacy and dental anxiety.....	50
5.3. What is the role of societal factors in Turkish preadolescents' modeling the maternal oral health behaviors? (IV)	50
5.4. How non-biologic determinants, general well-being and oral health are interrelated (I, II, V)	51
5.4.1 The interrelation between general well-being and non-biologic determinants of oral health	51
5.4.2 The interlink between oral health, non-biologic determinants, and general well-being.....	52

6. DISCUSSION.....	54
6.1. Results of the study	54
6.1.1 Oral health status of Turkish and Finnish preadolescents	54
6.1.2 Oral health behavior of Turkish and Finnish preadolescents.....	54
6.1.3 The interrelation between oral health behaviors and non-biologic determinants among Turkish and Finnish preadolescents	55
6.1.4 The interrelation between non-biologic determinants, general well-being, and oral health among Turkish and Finnish preadolescents	58
6.2. Methodological aspects of the study	60
7. CONCLUSIONS.....	64
8. RECOMMENDATIONS.....	65
9. SUMMARY	66
10. ACKNOWLEDGEMENTS	69
11. REFERENCES	71
12. APPENDIX.....	83
Appendix 1	83
Appendix 2	87
Appendix 3	90
ORIGINAL PUBLICATIONS	

1. Introduction

Although overall improvements in oral health have been achieved in many developing countries over the last 30 years, disparities in oral health have emerged as a major public health problem because socially disadvantaged groups and nations experience high levels of oral diseases (Petersen, 2003). This may be interpreted as a threat for global health because oral health is an integral part of general health, and most oral diseases share the common environmental and behavioral risk factors with chronic diseases like cardiovascular diseases, obesity, and cancer (Petersen et al., 2005a, 2005b).

Today among the major oral diseases, caries is one of the most common preventable childhood chronic diseases (Selwitz et al., 2007), which affects 60% to 90% of school-aged children in most industrialized countries (Petersen et al., 2005b). Dental caries is a multifactorial disease that starts with microbiological shifts within the complex of biofilm and is affected by salivary flow and composition, exposure to fluoride, consumption of dietary sugars, and by individual behaviors and societal factors (Eriksen et al., 2006; Selwitz et al., 2007). Dental caries has been defined in terms of its biopsychosocial nature in the 1990s (Reisine & Litt, 1993), and the debate on the behavioral and social initiative factors has accelerated, especially during recent years. Today, there has been increased concern about social gradients of dental caries, since oral health inequalities are increasing even in countries with well-developed health care systems (Watt, 2007). Approaches to promote better oral health and to reduce the inequalities should take into account both behavioral and social factors by considering the non-linear hierarchical pathways existing between these factors (Newton & Bower, 2005).

The development of health behaviors, the rapid cognitive and affective changes, transition from parental-dependency to individual independence and individual developmental patterns contribute to the unique body of knowledge of health promotion in adolescence (Srof & Velsor-Friedrich, 2006). Health promotion models for adolescents (Bruhn & Parcel Model of Health Promotion, Bruhn & Parcel, 1982; Model of the Health-Promoting Family, Christensen, 2004; The Health Promotion Model, Pender et al., 2005) explain, in common, the contribution of individual characteristics, and family-related factors to health behaviors. The synergistic interrelation between oral health behaviors such as mal-adopted toothbrushing practices, subjective well-being (low educational attainment) and family-related factors (poor parental support) in preadolescence tracks into adulthood with low socio-economic status (Koivusilta et al., 2001) and poor dental health (Astrøm & Jakobsen, 1998; Astrøm & Samdal, 2001; Thomson et al., 2004; Sanders & Spencer, 2005). As oral health behaviors are less likely to change after preadolescence (Kuusela et al., 1996), understanding the nature of these behaviors in terms of their complex interaction with their structural components (cognition and affect), family and societal influences in this developmental stage is essentially important in terms of the prolonged success and effectiveness of oral health-related promotion in adolescence and also in adulthood. However, studies assessing these interrelations and their impact on oral health among preadolescents are scarce.

Preadolescents and adolescents make up one of the largest demographic groups of Turkey's population: 20% of the whole. High numbers of this population are mostly uncovered by health insurance and, therefore, health outcomes are negatively affected (UNICEF, 2006). Furthermore, the low maternal education and labor rate are among the major contributors to the

problems experienced in health care by these young people. Even though compulsory primary education was secured by the 1982 constitution and Basic Education Law in 1997, illiteracy still exists and is higher in the rural than in the urban areas. This is significant especially among women; 17% of those living in urban areas cannot read or write as compared to 31% of their rural counterparts (UNICEF, 2006). The other significant problem is the low female labor rate in Turkey (25%), which is not compensated well enough by governmental or any official childcare subsidies (OECD, 2003). Furthermore, families have very little governmental support for their children's basic needs such as education and health care, and, in addition there are no unemployment payments.

Primary health care (PHC) services in Turkey have been poorly organized and the goals defined by the Alma-Ata Declaration, such as protection and promotion of health rather than curing illness (WHO, 1978), could not have been achieved. There is a need to assess factors contributing to oral health between biological and clinical factors and national-level factors, (Baelum & Lopez, 2004; Watt, 2007). These factors may also be called intermediate level factors (non-biologic determinants), and their analysis between two countries, one country with a well-established health care and social welfare system (Finland) and the other with a lack of these organized structures (Turkey), may facilitate to understand oral health care problems experienced by Turkish children and adolescents. This kind of comparative study may also provide benefits for the developed countries like Finland in terms of assessing their current strengths, and opportunities, as well as the threats in the near future for the oral health status of their young population.

2. Review of the literature

2.1. Significance of Oral Health

WHO has defined health as “the state of complete physical, mental and social well-being and the absence of disease or infirmity” (WHO, 1946). This has brought out two aspects of health: negative in terms of absence of disease and positive regarding the presence of well-being (Downie et al., 1996). In terms of oral health, much more emphasis has been put on the absence or presence of oral diseases rather than their contribution to the well-being of the individual. However, positive oral health is part of good health that keeps the individual in dynamic balance with the ecosystem he/she is living in. Ecosystems are composed of chains (e.g., society, individual, organism, organ, cells) that interact with each other in dynamic balance: Disturbance in one chain, such as in the oral health of the dental organs and tissues due to biological processes (endogenic input) and initiation by exogenous factors (individual behavior and societal factors), will affect the dynamics of others (Fig. 1) (Eriksen et al., 2006).

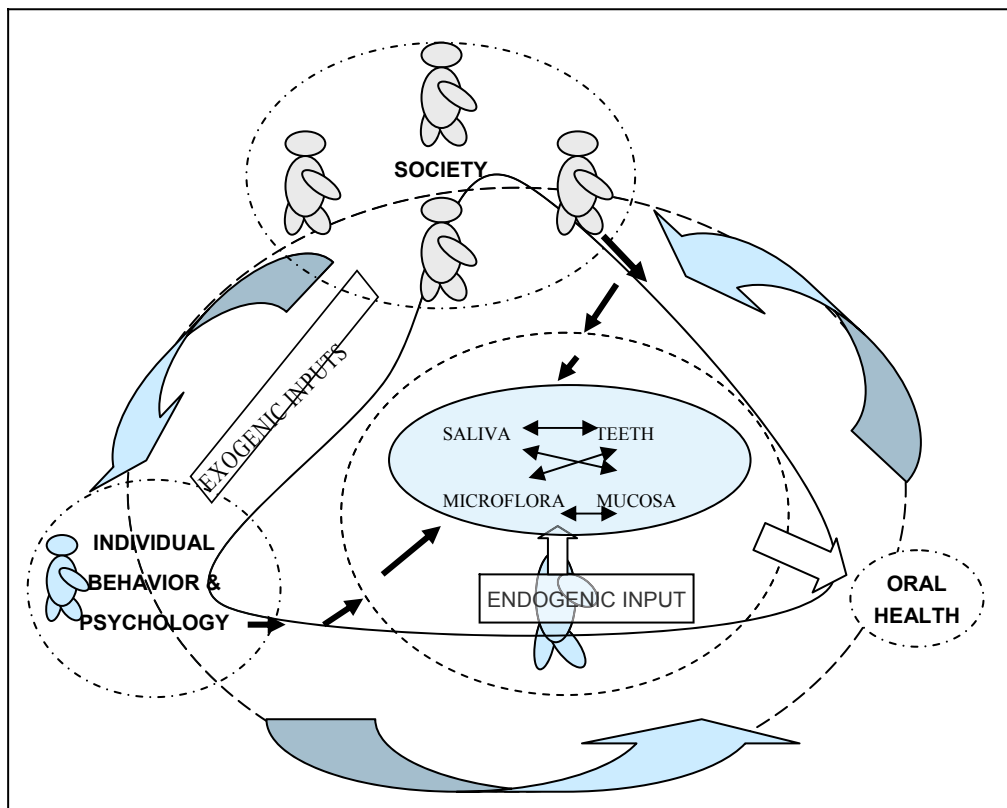


Figure 1 The interaction pathways of oral health in ecosystem (modified from "Oral Ecosystem" model by Eriksen et al., 2006 - with the permission).

Oral diseases, primarily dental caries, can lead to impairment of function, low self-esteem, reduced quality of life, and lost school time among children and adolescents (Fig. 2) (Kwan & Petersen, 2003; Department of Health, 2005). Dental caries can negatively affect quality of life among children due to increased pain, discomfort, acute and chronic infections, and might lead to nutrition and sleep disruption, psychological problems, functional limitations, and higher risk for hospitalization (Filstrup et al., 2003; Sheiham, 2005). Low school performance is a potential indicator of dental treatment needs among children (Crowley et al., 2003; Muirhead & Locker, 2006). In addition, Gift et al. (1992) has found increased lost school hours and restricted-activity days beyond school days due to dental visits or problems. Furthermore, dental caries can negatively contribute to the developmental patterns of school-aged children by such phenomena as obesity (Willershausen et al., 2004) and decreased body height (Nicolau et al., 2005). Among very young children, caries is a risk marker for iron deficiency anemia (Clarke et al., 2006). It can have negative impacts on nutrition, growth, and disability (Acs et al., 1992, 1999; Ayhan et al., 1996).

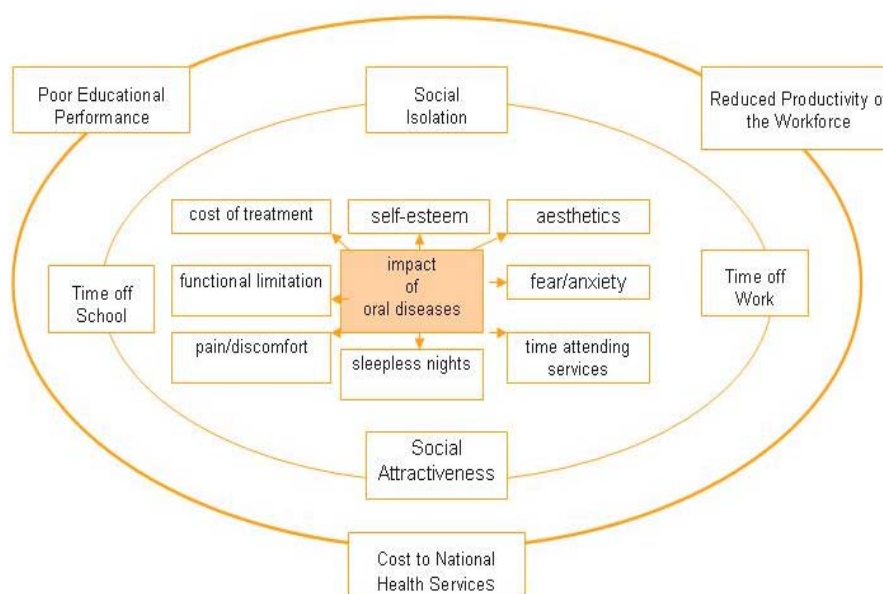


Figure 2 Impact of Oral Diseases (modified from the Department of Human Services, 1999 - with permission of Jenner T; Commissioning Directorate, Department of Health, London, England).

A large number of children, especially in developing countries with limited access to oral health services, suffer from dental caries, much of which is active and left untreated, or the teeth are extracted (Petersen, 2003). Europe has the second highest prevalence of caries, with an average mean DMFT of 2.6 for 12-year-olds among six regions of WHO (WHO, 2004) (Fig. 3).

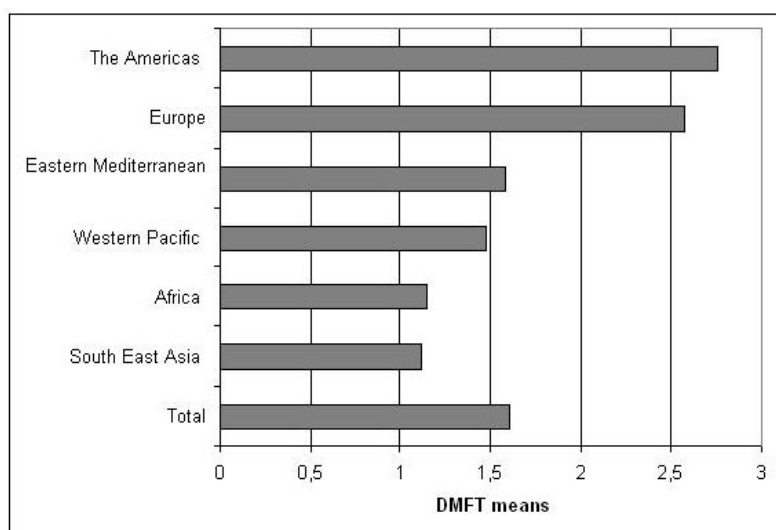


Figure 3 DMFT among 12-year-olds in six regions of WHO, 2004 (modified from the figures of the WHO Oral Health Country /Area Profile Programme - with the permission of WHO).

Caries prevalence with inconsistent patterns and a leveling off during the recent two decades in primary dentition demands attention (Speechley & Johnston, 1996; Poulsen & Scheutz, 1999; Gray & Davies-Slowik, 2001; Menghini et al., 2003) because of a positive association between the caries experience of the primary and the permanent dentition (Raadal & Espelid, 1992; Haugejorden & Birkeland, 2002; Skeie et al., 2006a).

The polarization of caries: accumulation of severe caries in a small proportion of the population, leading to a skewed distribution of caries prevalence, needs to be considered (Vehkalahti et al., 1997; Pitts et al., 2006). Regardless of variation in the distribution and prevalence of oral diseases between countries or regions, the greatest burden of all diseases is on the disadvantaged and socially marginalized populations (Bolin et al., 1997; Jones et al., 1997; Petersen, 2003). As an example, in Europe the prevalence of caries among 12-year-olds in Nordic countries is lowest, whereas it is highest in central and eastern Europe (Petersen, 2008). An explanation may be that inequality in utilization of oral services is considerable in eastern Europe due to the decentralization and privatization of oral health services after 1989. Nordic countries, with the highest dental-visit frequency for that age group across Europe (Fig. 4), provide free oral health care for children until age 18 years by the public health services except for Iceland (Widström & Eaton, 2004). Furthermore, the national Gross National Product per capita is over \$20,000 in these countries, whereas in central and eastern Europe it is generally below \$15,000 (WHO, 2008a), reflecting social and economic differences in use of oral health services.

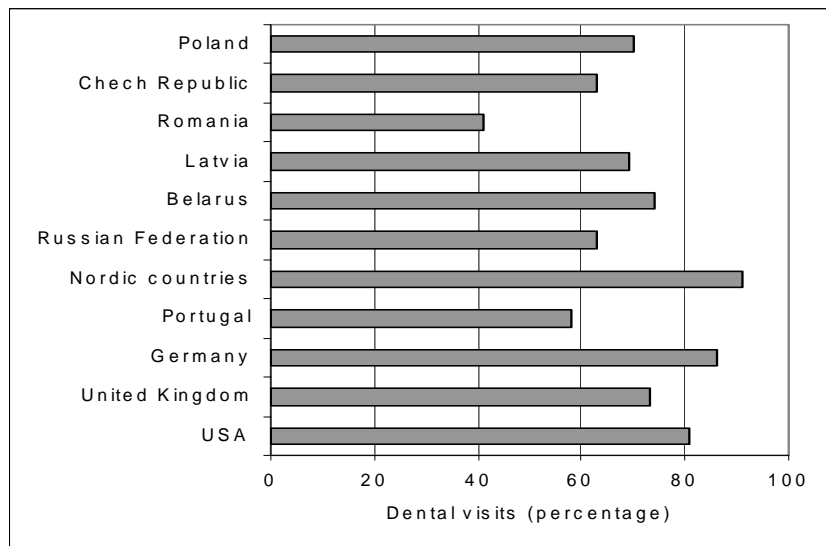


Figure 4 Dental visits within the past 12 months for 12-year-olds in selected countries (modified from Petersen, 2008 - with the permission of WHO).

2.2. Oral Health Care Systems

The 1970s and early 1980s may be considered the cornerstone years in attempts to reduce the inequalities between populations and nations by providing oral health care. Reforms in the health care systems of Nordic countries placed emphasis on preventive dental care subsidized or free of charge for all children and adolescents (Holst, 1997; Widström & Eaton, 2004). Consequently, a similar and significant decline in caries has been witnessed during the following 20 years (for a review, see WHO, 2008a).

Along with these improvements, have begun global attempts to get governments' attention focused on re-assessing the health concept with its determinants, going far beyond the biomedical approach. The Lalonde Report, published in 1974, was the first government document acknowledging the limitations of modern medicine and health care systems in improving the health status of the populations (Bhuyan, 2004). The Lalonde Report (1974) described four basic factors as determinants of health: biological factors, environment, lifestyle, and health-care services. This report was shortly followed by the document of the World Health Assembly in 1977, "Health for All by the year 2000 (HFA)". It stated that the main social goal of governments and WHO in the coming decades should be the "attainment by all people of the world by the year 2000 of a level of health that would permit them to lead a socially and economically productive life" (for a review, see PAHO, 1997). The Assembly called for the vigorous transformation of existing health-care strategies to facilitate the attainment of health for all as defined in the constitution of WHO (for a review, see PAHO, 1997). All these are primary steps in taking actions for improvement of health in all nations, regarding not only the biological but also the socio-economic, individual, and environmental aspects. The International Conference on PHC in Alma-Ata, in 1978, defined and granted international recognition to the concept of PHC as a strategy to reach the goal of HFA (WHO,

1978). It proposed mainly promotion of equity in health, intersectoral collaboration, and community participation (Downie et al., 1996).

The Global Oral Health Goals for the year 2000 were set to establish the goals and targets for HFA (Aggeryd, 1983). New Global Goals for the year 2020 were developed on the pros and cons of the 2000; stimulating awareness of the importance of oral health among national and governmental agencies. Prevention and control of oral diseases, not treatment, with accessible cost-effective oral health systems and reducing disparities in oral health between different socio-economic groups within a country are among the 2020 objectives (Hobdell et al., 2003).

2.2.1 Oral Health Care System in Turkey

Even though Turkey has signed Alma-Ata Declaration, the PHC approach with its main goals has not been integrated into the health care system. The main themes that were proposed for change in the Declaration continue to be among the main problems of the Turkish health-care system, including oral health: a biomedical approach, lack of well-established PHC services as part of a comprehensive national health system, inequality in access to health-care services, no community participation or intersectoral collaboration, and no referral system (Tatar, 1996).

In Turkey, the health care system is highly centralized and fragmented and has not developed very well (Savas et al., 2002). Almost similar governmental proposals and programs in health care are announced, especially since the 1990s (Table 1), despite the fact that parties in government have changed. Therefore the system continues to have many problems, especially in provision of equal, accessible, and cost-effective PHC for all (Savas et al., 2002; Agartan, 2005).

The current system is not prevention oriented, and community-based health services, health centers, and posts, are the main PHC settings providing preventive care and health promotion, and they are insufficient in number for the whole nation (Savas et al., 2002). Among the main responsibilities of PHC settings are mother-child care and communicable diseases, but neither oral care nor school health services (Giray, 2003). There is no functional referral system, thus leaving all patients' consulting outpatient clinics in either public or private hospitals without the advice of primary-care doctors. Hospitals of the Ministry of Health and Social Security Organizations, along with the increasing number of university and private hospitals, have been important points of initial contact with the health care system (Savas et al., 2002). All these first-level contact points are distributed unequally in the country, leading to the inequality in access to PHC services and to major health problems (Tatar & Tatar, 1997) such as differing mortality rates of infants (2% vs. 4%) and under-five-year-olds (3% vs. 5%) between urban and rural citizens (Hancioglu & Alyanak, 2004).

Table 1 Historical background of the health care system in Turkey (modified from the text by Savas et al., 2002).

Action	Outcome and Realization	Year
<p>Establishment of Ministry of Health Main aim: to establish preventive care and eradicate highly prevalent infectious diseases</p>	Provision of preventive and curative services respectively by Ministry of Health and municipalities was successfully achieved.	1920-1939
<p>Social Insurance Organization for manual laborers Integration of curative and preventive services Set up of health centers and those for mother and child to carry out integrated services Handing over the municipalities' responsibilities to Ministry of Health as responsible for all health care services</p>	Preventive care almost neglected and therefore the shortage of human resources for primary care increased after all health care services run by Ministry of Health.	1940-1960
<p>Law of Nationalization of Health Care Delivery*: Provision of health care, free or subsidized, equal and accessible to everyone Establishment of universal health insurance Priority to preventive care and needs of the population Integrated primary health care provided by health centers and health posts Extension of health care along with health education, preventive, and environmental health services to the whole country</p>	Equity in provision of health services, health insurance for all, and priority to preventive care was not achievable. The extent to which the other objectives have been met is still questionable.	1961-1985
<p>Launching Bag-Kur (Social Insurance Organization for merchants, artisans and the self-employed) New national policy developed by Ministry of Health for identification of current needs and setting of objectives for action with achievable targets.</p>	Failure in attempts to improve health care system due to political reasons; change in government in 1993 and six different ministers of health during the following 4 years.	1986-1997
<p>Government's proposal and program in health care*: To provide health insurance system for all To adopt family medicine in primary health services and to promote preventive as well as curative health services To encourage private-sector investment in health care</p>	Unsuccessful in achievement of social security coverage for all, of equality and in provision of health services, promotion of preventive medicine. Health insurance for all failed.	1996-2000
<p>Transformation in Health project* with the main aim to establish a high-quality and effective health service that is accessible to everyone, proposes to: Strengthen primary health care services and family medicine Provide health insurance compulsory for everyone Increase health care access by making use of the private sector Establish a public health school</p>	Family medicine is now being tested in a pilot project. Inequality in provision of health service is increased because the majority of health services including primary care are private. Public health school in the process of establishment.	2003- ...

*Major outlines are interpreted

The oral health care system has also not been well established and is not integrated into PHC services (Cubukcu, 2003). Historically, governmental proposals and programs in health-care have not covered the issues related to oral health. Its organizational structure is not well-defined; therefore, a wide range of health-care facilities, mainly dental faculties, hospitals of the social insurance agency for manual laborers, government, and the private sector, along with some municipalities' health centers, offer oral health care services which are generally treatment-oriented (Cubukcu, 2003). There has been no screening or recording system for the oral health of children and adolescents except the national survey in 1988 (Saydam et al., 1990). The mean DMFT for the 12-year-olds was 2.7, with the D component as 2.2 at that time. Furthermore, at the age of 8, the rate of caries-free children was 9%, and with a trend toward an increase in mean DMFT with age, such that DMFT was 15 among 25-year-olds. The increase in the M component through older ages meant that 38% of 55- to 64-year-olds were edentulous. Similarly, periodontal disease prevalence was positively correlated with age so that it was observed at the age of 7 as 10%, rising to 70% among 15- to 19-year-olds (Saydam et al., 1990). The current oral health status of the children and adolescents may even be worse today, because there still have been no accessible, cost-effective, and equally utilized oral health care services with a preventive orientation.

The inequality in provision of oral health care services seems to continue since being first reported in 1990. At that time, the dentist: population ratio at national level (1:6 024) varied, with a range of 1:2 000 to 1:50 000 between the rural and urban areas (Saydam et al., 1990). The current situation was not improved in 2001; almost one third of the dentists in services of the Ministry of Health were working in the most industrialized three cities of Turkey (Ministry of Health, 2001). By the year 2004, the total number of dentists in both the private and public sector was 18 577 (WHO, 2004), which was less than the estimated number (27 431) in 1988 (Saydam et al., 1990). Furthermore there has still been a lack of trained and qualified dental auxiliary personnel, especially for provision of preventive services. There are only 2000 chair-side assistants, who are mostly medical nurses (WHO, 2004).

Today, privatization in the health-care sector, including oral health care, is common, and the choice to use the private or public services depends on education and income level of the individual/family; the educated and wealthier preferring the private sector (Savas et al., 2002; Mumcu et al., 2004). The majority of dental services are provided by the private sector (FDI, 2004), and almost 70% of all dentists in Turkey are working in the private sector (WHO, 2004). Privatization has brought wide variation in the charge policy for dental health treatment fees between private hospitals or clinics. In the Turkish national insurance system four insurance companies cover expenses of dental care at a certain rate, however, the system does not work effectively, and out-of-pocket payments are the major source of finance (Mumcu et al., 2004).

2.2.2 Oral Health Care System in Finland

Before the HFA program in Finland, equity in health by efficient and accessible health care for the whole population was emphasized by the National Primary Health Care Act (NPHCA), since early 1970 (Ministry of Social Affairs & Health, 2004). The act was PHC-oriented, and PHC facilities including oral health care were built throughout the country (Järvelin et al., 2002). Health centers provide primary curative, preventive, and public health services including

school health, maternal-child care, and oral health (Järvelin et al., 2002). In the public sector, patients need a referral from their health center doctor in order to get access to the outpatient or inpatient department of a specialized-care hospital (Järvelin et al., 2002).

Half of the amount of the 4587 Finnish dentists are practicing in private sector (Widström & Eaton, 2004). These dentists are working mainly in cities and large towns, and their services are partly reimbursed according to the National Sickness Insurance scheme. The other half is employed by the public sector. The dentist-population ratio is 1:1140, and it is supported by dental auxiliary personnel (WHO, 2004). The system is tax-financed and decentralized; municipalities are responsible for arranging health care and regulations on health care arrangements.

The first school dental health care clinic was established by privately practicing dentists in Helsinki as early as 1907 (Aspelund & Weber 1907, ref. Mattila, 2001). At that time, dental health care consisted of emergency care and provided pain relief. For some school children, caries status was first assessed in 1911 (Kerkkonen 1911, ref. Mattila, 2001) and caries prevalence in 1914 (Siven 1914, ref. Mattila 2001), but dental health treatment was available for only a minority of Finnish school children at that time (Aspelund 1907, ref. Mattila, 2001).

In Finland, the oral health care of elementary school children was initiated by a law in 1956 (School Health Law 1956). Such care was provided by both the public and private sectors. Since NPHCA until 1994, comprehensive regular oral health care was provided under the management of the municipalities free of charge for all children and adolescents under the age of 17, and after 1994 for all below 19 years of age (Järvelin et al., 2002), and their oral health records are regularly collected by dentists in the municipal public health centers (Helminen, 2002). Fees for health services provided by the private sector were subsidized for children and those born after 1955, until 2001. For this reason, in Finland dental treatment provided to children and adolescents by privately practicing dentists is minimal (Nordblad et al., 2004).

Regular dental check-ups by municipal public health centers has been oriented primarily toward preventive rather than curative measures, and social equality in utilization of dental services was achieved among children and adolescents after 1983 (Honkala et al., 1997). Creating supportive environments for oral health has led to remarkable improvement in dental health status among children and adolescents: DMFT among 12- and 15-year-olds in 2000 was almost a third of that in 1982 (4 vs. 1.2, 7.8 vs. 2.6) (Nordblad et al., 2004).

2.3. Concept of Health Promotion

Health promotion is defined as “the process of enabling individuals and communities control over the determinants of health and thereby improve their health” (WHO, 1986). The first international conference on health promotion was organized in Ottawa in 1986 to achieve HFA and beyond (WHO, 1986). The Ottawa Charter proposed that an individual or community should be able to identify and to realize aspirations, to satisfy needs and to cope with the environment. This has brought the empowerment concept through assessment of strategies and action areas of health promotion (Downie et al., 1996). Fig. 5 describes how the Health Promotion Emblem summarizes the content of the Ottawa Charter: The outside circle,

“Building Healthy Public Policies,” the first of the action areas of health promotion, encompasses three wings and therefore symbolizes the need for policies to “hold things together.” The three wings represent the other action areas, whereas the round spot within the circle stands for three basic strategies for health promotion. It may be interpreted as that the individual and his/her behavior as well as that of society is regarded as the primary target of health promotion to achieve and to improve the health of nations.

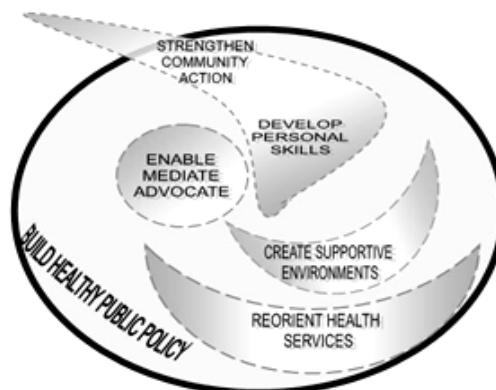


Figure 5 Health Promotion Emblem, Ottawa Charter, 1986 (with the permission of WHO).

Following the conference in Ottawa, a series of WHO international conferences was organized to assess and to develop health promotion policy and practice, based on the strategies and action areas described by the Ottawa Charter (Table 2) (Watt, 2005; WHO, 2008b).

Table 2 International Conferences on Health Promotion following the Ottawa conference (WHO, 2008b).

Conferences and outcome	Central Theme	Year
Adelaide Declaration (Adelaide Recommendations on Healthy Public Policy)	Building healthy public policy	1988
Sundsvall Conference (Sundsvall Statement on Supportive Environments for Health)	Creating supportive environments for health	1991
Jakarta Declaration (Leading Health Promotion into the 21st Century)	Health-promoting partnerships	1997
Mexico Declaration	Bridging the equity gap both within and between countries	2000
The Bangkok Charter (Health Promotion in a Globalized World)	Policy and partnership for action-addressing the determinants of health	2005

These international conferences highlighted mainly the decision-making process, and the following action (behavior) of the individual is the central core of health promotion (WHO, 2008b): 1) Individuals should be at the center of health promotion action and decision-making

processes. To achieve effective participation, equal access to education and information is essential. 2) Health promotion is not something that is done on or to people; it is done by, with, and for people either as individuals or groups.

Some of the other points underlined by these conferences are as follows (WHO, 2008b): 1) Health is a human right and a basic social investment. 2) There is a need to apply new government public health policies and commitment by all sectors to close the gap between socially and educationally disadvantaged people and the rest to raise the health status of the community as a whole. 3) Improvement of access to health-enhancing goods and services based on social equity should be the priority. 4) Supportive environments for health have social and economic dimensions. To develop more positive infrastructure of such environments requires assessment and use of the knowledge and skills of women in all sectors. 5) Health promotion should be central to the global developmental agenda, and therefore it is the main responsibility of all governments.

Comprehensive approaches for health development that use combinations of the action areas and strategies of the Ottawa Charter are proposed as the most effective. One of the settings where these strategies can be effectively implemented is in schools. Every child and adolescent has the right and should have the opportunity to be educated in a health-promoting school. Schools provide excellent opportunities to promote the physical, social, and emotional health of students, staff, families, and community members (Jakarta Declaration, for review, see WHO, 2008b). School years are influential stages in people's lives when life-long-sustainable oral health behaviors are being developed, and the right messages on lifestyles can be reinforced regularly during these years. Furthermore, schools serve as referral systems for transmission of the right messages and knowledge about oral health and behaviors to the parents (Kwan & Petersen, 2003).

2.3.1 Levels of Prevention and Oral Health

The overall goal of health promotion is the balanced enhancement of physical, mental, and social facets of positive health, together with the prevention of physical, mental, and social ill-health (Downie et al., 1996). Prevention in dentistry is described at three levels (primary, secondary, and tertiary) by Harris & Christen (1994) based on the definitions of Leavell & Clark (1965).

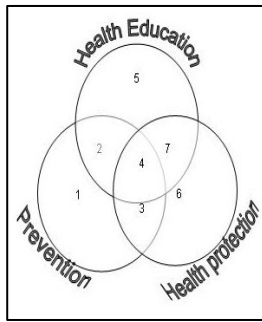
Primary prevention “employs techniques and agents to forestall the onset of disease, to reverse the progress of initial stages of disease or to arrest the disease process before treatment becomes necessary” (Harris & Christen, 1994). Downie et al. (1996) explained it through the risk concept: “Prevention of the onset or first manifestation of a disease process or some other first occurrence, through risk reduction.” Its aim is to keep a population healthy before disease or injury occurs by means of health education, disease-prevention, and health-protection strategies (Taylor, 1993). From a behavioral perspective, among adults, this is mostly in the form of intervening to alter health-detrimental behaviors (e.g., smoking, unhealthy dietary practices, irregular toothbrushing). However, among preadolescents and adolescents, the aim is to prevent these behaviors (Williams et al., 2002).

Secondary prevention “employs routine treatment methods to terminate a disease process and to restore tissues to as normal as possible” (Harris & Christen, 1994). Leavell & Clark (1965) and Downie and coworkers (1996) underline the fact that secondary prevention constitutes early detection of diseases to prevent their process of progression, such as deep scaling (Harris & Christen, 1994) and limiting the impact of early caries (SIGN, 2000). In terms of preadolescent and adolescent behavior, secondary prevention efforts aim to alter the detrimental behaviors after their initiation. The success of this approach depends on the documentation of the health problems that are unique to these periods, “as well as a firm understanding of which problems will have negative trajectories into adulthood” (Williams et al., 2002).

Tertiary prevention is the “prevention of avoidable complications of an irreversible, manifest disease or some other unwanted state” (Downie et al., 1996) and it “employs measures necessary to replace lost tissues and to rehabilitate patients to the point that function is as near to normal as possible” (Harris & Christen, 1994). It requires extensive rehabilitation and surgical procedures, which are more expensive and will require more trained clinicians (Leavell & Clark, 1965). At this stage, the disease process has extended to the point at which the host’s health status will not return to a level comparable to the pre-diseased stage. An attempt to re-restore the teeth with secondary caries is an example of tertiary dental prevention (SIGN, 2000). Specifically, tertiary prevention is very critical in preadolescence and adolescence because a variety of developmental changes in these periods may be affected by the progressive disease and therefore may influence the long-term health outcomes (Williams et al., 2002). The preadolescents and adolescents with chronic diseases requiring tertiary prevention are more likely to exhibit psycho-social problems (Williams et al., 2002) that affect both oral health (Kwan & Petersen, 2003) and behavior (Macgregor & Balding, 1991; Källestål et al., 2000).

Effective prevention with long-term success may be achieved through inter-cooperation with other components of health promotion: health education and health protection (Downie et al., 1996). These three interlinked components altogether have been presented under a framework for defining, planning, and evaluating of health promotion to achieve the overall goal of health promotion through community participation (Tannahill, 1985). The interrelationship between those components produces seven domains which are presented in Fig. 6. The first four of these domains mainly emphasize the prevention of disease, whereas the final three domains are concerned with the enhancement of positive health (Ashley & Allen, 1996) (Fig. 6).

Watt & Sheiham (1999) have stated that having only one component of health promotion-education- to reduce oral health inequalities is inadequate. They suggest that an effective and progressive health promotion approach should recognize the social, political, and environmental determinants of oral health.



1. Preventive services and facilities	Screening programs that are used to detect early carious lesions or to identify children in school who may require dental help by referral to general practitioner or clinic. Preventive measures can be fissure sealants, professional cleaning of teeth, or topical fluoride application to reduce future caries in the identified high-risk groups.
2. Preventive health education	Aim: to influence lifestyle and oral health behaviors and encourage the use of preventive services and facilities to prevent oral diseases.
3. Preventive health protection	Use of legal and fiscal controls and policies, or voluntary codes of practice to prevent disease or ill health and to provide preventive measures that mostly grew out of the old regulatory public health measures. As an example: the effectiveness of fluoridated salt in Switzerland may offer a viable alternative to water fluoridation.
4. Health education for preventive health protection	Aim: to influence decision-makers in a position to develop policy. Health education aimed at health protection has much to do with the lobbying of disparate political groups and other influential bodies to understand the need for preventive health protection. It also involves fostering multi-agency awareness of the benefits of good oral health and securing support for fitting the message of oral health promotion into policies and programs of other professionals.
5. Positive health education	Falls into two categories: health education aimed at influencing behavior on positive health grounds (such as the encouragement of healthy diets with low sugar intake); and that which seeks to help individuals, groups or whole communities to develop positive health attributes (health-related life skills and a high level of self-esteem).
6. Positive health protection	Concerns increasing the chance for people to live in a healthy environment. An example is the implementation of a workplace smoking policy in the interest of providing clean air.
7. Health education aimed at positive health protection	Involves raising awareness of, and securing support for positive health protection measures among the public and policy makers.

Figure 6 A model of health promotion (adapted from the text by Ashley & Allen, 1996 and from the model by Tannahill, 1985 - with permission).

2.3.2 Preventive Approaches in Oral Health Promotion

Rose (1992) described two basic types of preventive approach in health promotion, the high-risk and the population approach. In the high-risk approach strategy, people at particularly high risk are identified through screening tests and offered appropriate treatment and advice (Department of Human Services, 1999; Watt, 2005). In the population approach, measures of public health interventions are implemented to reduce the level of risk in the whole population (Rose, 1992). In terms of action areas of health promotion (WHO, 1986), the high-risk approach may be defined as a tool to develop personal skills, whereas the population approach serves for creating supportive environments and strengthening community action.

2.3.2.1 High-Risk Approach

The High-Risk Approach seeks to protect susceptible individuals and tends to concentrate attention on the disease and risk, failing to recognize its integral links with the state of the population (Rose, 1992).

In dental prevention, this approach means that the individuals at high risk for dental caries must first be identified in order to design preventive measures for them (Helminen, 2002). Prevention and education are the approaches in high-risk strategy, and these alone can achieve short-term success, but may widen the health inequalities (Watt, 2005). The effectiveness of intensified prevention procedures of this approach, compared to basic prevention given to low-risk children is questionable (Seppa et al., 1991; Hausen et al., 2000). Furthermore, the compliance of patients with behavioral preventive regimes (healthy diet, regular toothbrushing) may fail, especially among children (Burt, 2005). In addition to the clinical factors, there is a need to assess the societal factors, oral health, and dietary behaviors in individuals either with high caries activity or those susceptible to caries. Not only professional measures but also alterations improving personal oral hygiene measures such as preventive strategies should be considered (Forss, 1994).

This approach is criticized in terms of its underlying concept and long-term success (Rose, 1992; Batchelor & Sheiham, 2002): 1) Prevention becomes medicalized so that people are 'labeled' as unhealthy; that only ill health is taken into account, not positive health. 2) Success is palliative and temporary because this strategy is directed either to protection against the effect of exposure or to reduction in the individual's level of exposure. It does not seek to alter the situations which determine exposure. 3) It is behaviorally inadequate because most health behaviors are shaped by the norms of the particular society. 4) As it considers that the rest of the population is healthy and safe, it fails to deal with the majority of new lesions involved with the changes in caries decline observed to occur throughout populations, not confined to subgroups.

Despite its disadvantages, there are some advantages from a high-risk approach (Rose, 1992): 1) avoidance of interference with those who are not at special risk, 2) offering a cost-effective use of resources, 3) an improved benefit-to-risk ratio. However, all these are available if the target is correct.

2.3.2.2 Population Approach

In population approach, public health administrators set program goals and objectives for the whole population, so that the target is everyone in the population whether healthy or diseased (Burt, 1998). That strategy attempts to control the causes of incidence in order to lower the mean level of risk factors in that population (Rose, 1985). Examples of the population approach include fluoridation of water supplies, dental education through the mass media, and restriction of sugar intake by regulation or financial incentives.

This kind of approach is necessary wherever risk is widely diffused through the whole population (Rose, 1985). There is a need to consider the implications of a situation in which a small risk involves a large number of people, who according to the high risk-approach would be categorized as normal (Rose, 1992). Rose notes that population approach is appropriate when personal lifestyle is socially conditioned, and there is a need for social acceptance to change an established habit. When the healthy habit is socially accepted as a norm of the time (such as use of fluoridated toothpaste), the whole population will benefit, with no need for reinforcement (Sheiham & Joffe, 1991). As disadvantages of the population approach, Sheiham & Joffe identify the lengthy periods of time needed to change social norms (such as use of products rich in sugar) and the possible adverse impact of its implementation (such as unemployment in the sugar industry).

2.3.2.3 Direct Population Approach

Rose (1992) stated that the high-risk and population approaches are not in competition, and the prior concern should always be to discover and control the causes of incidence. There is a growing international consensus that there is a need for a combination of these approaches (Hausen et al., 2000; Baelum & Lopez, 2004; Burt, 2005; Watt, 2005). Initiatives designed to reduce inequalities in health can be structured by identifying the communities at greater risk for disease and using population strategies within these target groups. This approach is defined as geographic targeting or a direct population approach, focusing on higher-risk groups, communities, or subpopulations (Department of Human Services, 1999; Watt, 2007), and it may be interpreted as aiming to reduce the disadvantages and increase the advantages of a population and a high-risk approach.

2.3.2.4 Common Risk Factor Approach

A holistic approach and intersectoral collaboration are among the set of guiding principles on developing oral health strategies based on WHO recommendations (Watt, 2007). The Common Risk Factor Approach has the underlying concept that promoting general health by controlling a small number of risk factors that have a major impact on large number of diseases will provide lower cost, and greater efficiency and effectiveness than disease-specific approaches do. The Common Risk Factor Approach focuses on improving health conditions for the whole population as well as high-risk groups, by reducing social inequities (Sheiham & Watt, 2000).

Sheiham & Watt next underline the fact that the causes of major oral diseases, caries and periodontal diseases, are diet, plaque, and smoking; these are also common to a number of other chronic diseases such as heart disease, cancer, and strokes (Fig. 7).

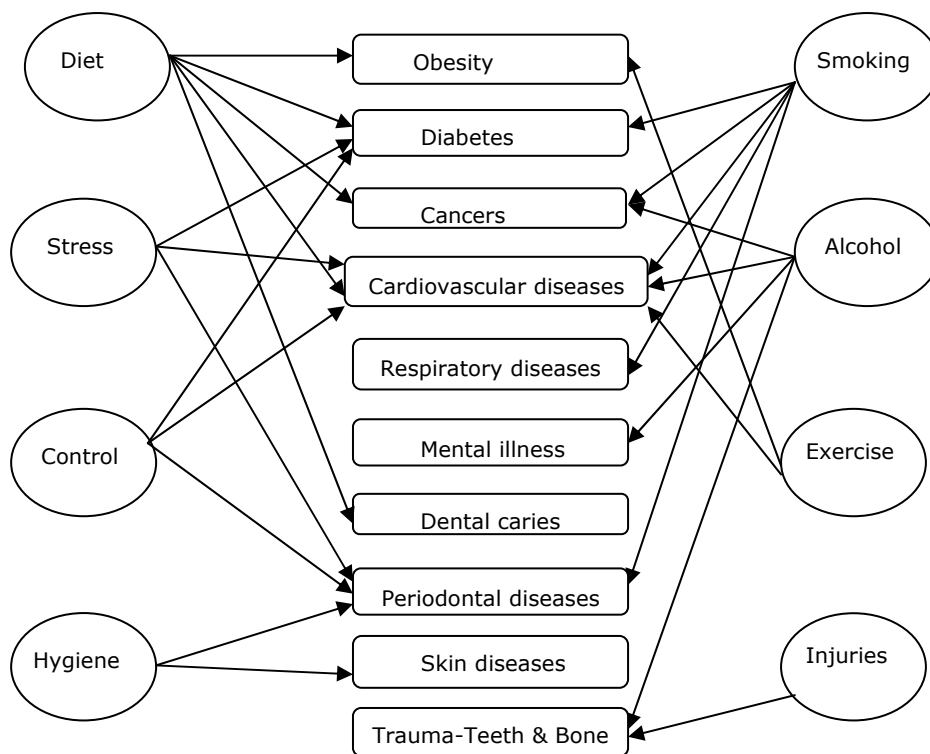


Figure 7 The Common Risk Factor Approach (Sheiham & Watt, 2000 - with permission).

Sanders et al. (2005) has found that body mass index, oral health behaviors, and smoking share a cluster among adults. Among adolescents, those who are more likely to perform health-enhancing behaviors (healthy eating, regular physical exercise) are more likely to experience better dental care (Donovan et al., 1993; Aarø et al., 1995; Neumark-Sztainer et al., 1997). The studies that have found a positive contribution of increased caries prevalence to obesity (Willershausen et al., 2004; Cinar & Murtomaa, 2008) and to cardio-vascular diseases (Larsson et al., 1997) among adolescents may provide further evidence for the common factors underlying oral and general health.

The Common Risk Factor Approach includes efforts to improve health by reducing risks and promoting the health and empowerment of individuals by creating supportive environments and facilitating behavior change (Sheiham & Watt, 2000). As can be seen in Fig. 7, multi-behavioral consequences of negative health outcomes should also be taken into consideration in preventive policies and health-promotion programs; either a population or high-risk strategy of prevention starts with the recognition that the occurrence of diseases reflects behavior and circumstances of society as a whole or individual lifestyles (Rose, 1992; Forss, 1994). Among children and adolescents, the Common Risk Factor Approach implemented through a population or a direct population approach is preferable for prevention of dental caries and periodontal diseases, because the majority of preventable causative factors for these diseases are environmental (such as tobacco and food policy) and interpersonal (such as family influence on self-care behavior) (Sheiham & Watt, 2000; Kallio, 2001).

2.4. Behavioral Aspects of Oral Health and Its Significance in Oral Health Promotion

Dental caries and periodontal diseases can be seen as behavioral and social diseases (Fejerskov, 1995; Kuusela et al., 1997; Sheiham & Netuveli, 2002). Dental caries is the outcome of the disease process, which includes pathological factors (acidogenic bacteria, sugar), and which starts under the influence of initiative factors such as social factors including attitudes and behaviors (Eriksen & Dimitrov, 2003). Periodontal disease, like other chronic diseases, is socially patterned, composed of the psychosocial factors that lead to change in the oral environment and in behavioral responses of the host, such as poor oral hygiene and smoking (Sheiham & Netuveli, 2002). The quantitative and qualitative composition of the resident oral microflora is dictated by the oral environment, whose response to the bacteria is affected by psychosocial factors and the behaviors of the individual (Sheiham & Netuveli, 2002).

2.4.1. Theories of Health Behavior

Theories attempting to explain the formation of health behaviors at an individual level have been developed under a variety of frameworks (for review, see Glanz et al., 1997; Ogden, 1997; Conner & Norman, 2003). These theories are valuable in explaining many aspects of preventive behavior (Pine, 1997) and in providing information on what needs to be changed to promote health behavior, but they do not explain how changes are to be induced (Brug et al., 2005). It is noted that these theories neglect the effects of socio-economic and environmental conditions on health, and that they associate the effectiveness of preventive and curative regimens with each individual's intention to follow required health behaviors (Sheiham, 1986; Brug et al., 2005). A meta-analysis using the Theory of Reasoned Action and Theory of Planned Action showed that only 20% of variation of intention and 40% of variation of behavior could be explained (Sutton, 1998). Inglehart & Tedesco (1995) noted that existing models fail to account for oral health behaviors comprehensively, because all assume that behavioral change is a function of an individual's thinking and learning history, neglecting the socio-economic factors and time concept, essential components for behavioral change.

Health-behavior theories at the individual level explain the relationship between health behaviors and related factors, assuming a linear causal pattern (Cinar, 2001), while the common criticism of these theories is that no such a linear causal relationship exists (Freeman et al., 1993; Flay & Petraitis, 1994; Bedell & Lennox, 1997; Conner & Norman, 2003). Gochman (1982) described a possible non-linear association of cognitive (self-efficacy, knowledge, beliefs) and affective (feelings, expectations) factors with overt behavioral patterns, actions, and habits relating to health maintenance, restoration, and improvement. Cinar (2001) proposed that bi-causal relationships were not sufficiently predictive to assess alterations in health behaviors regarding the non-linear structure of changes. Cognitive and affective factors underlying the behavioral changes relevant to smoking and alcohol use among adolescents were studied with the Cusp Catastrophe Model (for review, see Carver & Scheier, 1998), which focuses on non-linear patterns of health behavior. It was suggested that this nonlinear model provides a better explanation than does any simple or interactive linear model (Clair, 1998; Byrne et al., 2001).

Further, these theories are criticized because they cause the success of health interventions to be less clear at a population level (Glass & McAtee, 2006), and they may result in largely ineffective health policies (Bunton et al., 1991), therefore not tackling health inequalities. Recently emerging theoretical approaches and concepts focus on exploring the basis for health inequalities and underline the importance of social and environmental determinants of health: the Life Course Approach (Kuh & Ben-Shlomo, 1997), the Salutogenic Model (Antonovsky, 1979, 1987), and the Social Capital Approach (Watt, 2002). These theories have provoked considerable debate as to their potential value in contributing to both general and oral health promotion (Watt, 2002). One interpretation is that antecedents of these three approaches lie in the Social Cognitive Theory of Bandura (1986). This theory explains the nature of behavioral change within the context of a triadic reciprocal relationship between behavior, interpersonal (cognitive-affective components of behavior, and biology) and external (e.g. socio-economic, environmental) factors. Therefore, social support, and the individual's behavior, and cognition and affect influence each other (Bandura, 1986, 1997). The Social Cognitive Theory proposes that an individual's belief in his/her capacity to perform a certain type of behavior, self-efficacy, develops by individual experience, observation, modeling, and social persuasion. Increased levels of self-efficacy have been successful in adoption and maintenance of positive oral health behaviors (Stewart et al., 1996; Syrjala et al., 1999).

There has recently been increasing interest in conceptualizing chronic disease etiology within a life-course framework (Hertzman & Power, 2003). The Life Course Approach aims to assess the effects of physical, psychological, and socio-economic exposures on chronic-disease risk throughout the individual's life-span. The long-term effects of these risk factors on chronic diseases are investigated at five main life stages; gestation, childhood, adolescence, young adulthood, and adult life (Bartley et al., 1997; Kuh & Ben-Shlomo, 1997; Ben-Shlomo & Kuh, 2002).

Genetic inheritance and pre-natal and post-natal development within the social and physical environment influence the health of the individuals throughout all of their lives (Kuh et al., 2003). Moreover, dental caries and periodontal diseases develop over time (Fejerskov & Kidd, 2003). Exposures to risk factors early in life are involved in initiating diseases' processes prior to clinical manifestations (Lynch & Smith, 2005), and therefore studies have found that gingival bleeding and dental caries among adolescents have early-life implications (Nicolau et al., 2003a, 2003b). Findings by Peres et al. (2005) reveal that social and biological risk factors accumulated in early life contribute to the high level of dental caries in childhood. As an example, low birth weight and a poor socio-economic and psychological family profile experienced by preadolescents during their developmental periods continue to negatively affect height and dental health throughout the life course (Poulton et al., 2002; Nicolau et al., 2003b, 2005). Furthermore, socially patterned exposures during childhood and adolescence may account for socio-economic inequalities in adult health (Kuh et al., 2003).

The Salutogenic Model was proposed by Antonovsky (1979, 1987) who developed the model based on the idea that health was a movement in a continuum on an axis between total ill health and total positive health (Eriksson et al., 2007). It is a psychosocial model that considers the factors for moving towards good health; with the central construct on General Resistance Resources (GRRs) and Sense of Coherence (SOC) (Antonovsky, 1996; Watt, 2002; Lindström & Eriksson, 2006). GRRs are biological, material, and psychological factors that make it easier

for people to perceive their lives as consistent, structured, and understandable. Typical GRRs are income, experience, self-esteem, healthy behavior, social support, social and cultural capital, and intelligence (Lindström & Eriksson, 2006). An individual with a strong SOC has the ability to define life events as less stressful, to mobilize resources to deal with encountered stressors, and to possess motivation (Savolainen et al., 2005). The SOC is defined as: “a global orientation that expresses the extent to which one has a pervasive, enduring, though dynamic feeling of confidence that is comprehensible, manageable, and meaningful” (Antonovsky, 1979, 1987).

The Salutogenic Model proposes that the stronger the SOC that the individuals and groups have, the more adequately they can cope with stressors and maintain their health status (Antonovsky, 1979, 1987). This theoretical model as a health promotion tool focuses on solving problems by identifying the problems and the GRRs for helping people to move in the direction of positive health. The key is not what is available; it is the ability to use and re-use available GRRs to construct coherent life experiences for promotion of a strong SOC (Lindström & Eriksson, 2006). In terms of oral health care, Savolainen & coworkers (2004, 2005) have found associations between regular dental attendance and higher SOC, and the increased probability of having good oral hygiene and the frequency of recommended toothbrushing with a strong SOC, among adults. It has been proposed that an SOC begins to develop at an early age, and a tentatively strong SOC can be achieved (Lindström & Eriksson, 2006). Studies among children and adolescents are scarce. Maternal SOC has been shown to be associated with children’s dental caries and levels of periodontal diseases, as well as dental attendance (Freire et al., 2002). An SOC is also identified as a psychosocial determinant of adolescents’ oral health behaviors, particularly affecting their pattern of dental attendance (Freire et al., 2001).

The Social Capital Approach assesses how the features of social organization such as social trust, support, and degree of involvement in social and community issues in a community influence health measures like life-expectancy rates, and mortality rates from chronic diseases (Watt, 2002). The integrative focus of this approach is that micro (groups, family, social networks), macro (work-sites, communities, schools), and mezzo (national/state organizations) institutions co-exist in a society, and these can complement each other. Social capital can facilitate meeting social, ecological, and political goals, and it can also be a mediating agent between them (Cullen & Whiteford, 2001). Therefore, these societies with high levels of social capital have better general health and lower levels of morbidity and mortality (Woodcock & Narayan, 2000). In terms of adolescents’ oral health, neighborhood empowerment -an indicator of social capital- seems to play an important role in explaining inequalities in the levels of dental caries (Pattussi et al., 2006). Furthermore, poor socio-economic conditions and low levels of social cohesion were found to positively correlate with increased levels of dental caries among 12-year-olds (Pattussi et al., 2001).

Recently, a fourth framework, the modified System Theory model, integrating the Salutogenic Theory and Social Capital Approach, was proposed by the European Health Promotion Development for Maintenance and Improvement of Health (Bauer et al., 2003). Original System Theory (von Bertalanffy, 1950) suggests that the whole cannot be predicted accurately by examining the parts of the system because it is by their continuous interaction that the whole and homeostasis at a population is formed (Anderson & Ross, 1998). Systems Theory is

somehow a critique of reductionism which has the core assumption that a phenomenon is best understood by breaking it into parts and then studying the parts in terms of cause and effect. It is suggested that this theory should be integrated into health promotion strategies such as tobacco control, to improve the synthesis and translation of research findings (Best et al., 2003). The modified System Theory model (Bauer et al., 2003) is a socio-ecological model identifying the systems-based primary action areas of the Ottawa Charter as individual, community, organizations, policies, and environment. This model can be integrated to maintain and to improve any of these systems so that the system in focus (e.g. individual) continuously interacts with its socio-ecological environment that includes the other systems affecting each other and the system in focus. The health of the focal system, a continuum between positive health (salutogenesis) and disease (pathogenesis), is reproduced and improved over time by the quality of the structure and process of the system and its environment. Structure and process have three dimensions: a socio-economic dimension (social-capital and socio-economic status), a cultural (mind, psyche, values, norms), and a physical/ecological dimension (the body) (Bauer et al., 2003).

2.4.2. Oral Health Behaviors, Cognition, and Affect, and Maternal Influence in Preadolescence

2.4.2.1 Significance of Preadolescence in Health-related Behavior, Cognition, and Affect

Each individual is part of the social ecosystem in a dynamic balance with the environment (Eriksen et al., 2006). To keep this equilibrium, he/she accepts or avoids certain types of behavior in daily life such as going to school or resting at home, brushing the teeth or not, eating candies or eating fruit. Accepting a certain type of practice and avoiding its substitute has many reasons behind it such as achieving personal goals, adjusting to social norms, or being part of certain social groups (Cinar, 2001). Therefore, health behaviors including oral health co-occur as separate clusters as either health-enhancing or health-detrimental behaviors in the same individual, either adult (Aström & Rise, 2001) or adolescent (Donovan et al., 1993; Aaro et al., 1995). Engagement either in health-enhancing or in health-detrimental behaviors is proposed to represent the adolescent's health-related lifestyle (Donovan et al., 1993).

Preadolescence (10-12-year-olds, see, for instance, the U.S. National Cancer Institute, 2008) is a critical period for the adoption, maintenance, and improvement of health-enhancing lifestyles. Health behaviors formed during childhood and preadolescence are difficult to change beyond adolescence (Sheiham, 1986; Kelder et al., 1994). Health-enhancing behaviors for maintaining good oral health like twice daily toothbrushing and positive dietary habits are also effectively initiated when school-age children learn and voluntarily adopt these behaviors (Addy et al., 1994; Kwan & Petersen, 2003). These behaviors should be adopted before adolescence, considering that preadolescents brushing their teeth at least twice daily follow a more stable pattern in oral health behavior during their adolescent years than do those with irregular patterns (Kuusela et al., 1996).

Maintenance of recommended toothbrushing (twice daily or more; for review, see e.g., Löe, 2000) and positive dietary behaviors are critical during preadolescence also because preadolescence is the risk period for erupting second permanent molars (Nordblad, 1986;

Vehkalahti et al., 1991; Larmas et al., 1995), and preadolescent metabolism requires additional high-energy foods (DeBlase, 1991). The preadolescent diet is more often characterized by snacking behavior and irregular eating patterns than is that of children (Prättälä et al., 1988; Inchley et al., 2001). Less than twice daily toothbrushing and negative dietary behaviors, correlating significantly with each other among children and adolescents (Rugg-Gunn et al., 1984; Donovan et al., 1993; Stecksén-Blicks & Holm, 1995), tend to increase from adolescence through adulthood (Aström, 2004), and they are risk factors for oral health in later stages of life (Kelder et al., 1994; Aström & Jakobsen, 1998; Kotler et al., 2001; Kvaavik et al., 2003; Patton et al., 2003).

The critical period for establishing attitudes and beliefs that shape each individual's health behaviors extends also through preadolescence into adolescence (Nutbeam et al., 1989) because constructs of *self* (personal identity) are definite and well-circumscribed compared to the unpredictability and instability of those in adolescence (Freud, 1998). *Self-concept*, a system of affective-cognitive structures (Markus & Nurius, 1986), consists of beliefs, expectations, descriptions, and assumptions about oneself (Coopersmith & Feldman, 1974; Hattie, 1992). One's *self-concept* develops in childhood through adolescence through interactions with the environment and with the significant individuals—mostly the parents—in that environment (Randall, 1996). Positive construction of one's *self-concept* is important in development of health-enhancing behaviors (Randall, 1996). Self-esteem and self-efficacy are among the major constructs related to *self* (Randall, 1996; Bandura, 1997; Santrock, 2007), referring respectively to affective and cognitive facets of *self-concept* (Bong & Clark, 1999).

Self-esteem is the global evaluative dimension of the self (Santrock, 2007) and is concerned with judgments of self-worth (Bandura, 1997). Self-esteem, an indicator of psychological health (Mechanic & Hansell, 1989; Piko & Fitzpatrick, 2001; Hall-Lande et al., 2007), stems from self-evaluations based on personal competencies or on possession of attributes that are culturally invested with positive and negative values (Bandura, 1997). It follows a linear increase pattern during preadolescence compared to the unstable patterns it follows in adolescence (Baldwin & Hoffmann, 2002). Low levels of self-esteem during adolescence are directly associated with increased risk for engagement in health-detrimental behaviors such as tobacco and alcohol use and bullying (Wild et al., 2004) and lead to poor physical and mental health along with worse economic prospects in adulthood (Trzesniewski et al., 2006).

However, in the dental literature little is known about self-esteem and its association with preadolescents' oral health behaviors. Among 11- and 12-year-olds, there appeared a direct association between low self-esteem and poor oral health-behavior (Källestål et al., 2000; Honkala et al., 2006, 2007), both of which were influenced by poor socio-economic factors (Källestål et al., 2000). In the follow-up study among 12-year-olds (Källestål et al., 2006), the association between self-esteem and oral health behaviors was not significant at adolescence, whereas other studies have shown it to be significant (Macgregor & Balding, 1991; Regis et al., 1994; Honkala et al., 2006, 2007). These contradictory results may reveal the dynamic and unstable nature of self-esteem during adolescence (Baldwin & Hoffmann, 2002).

Self-efficacy is concerned with cognitive judgments of personal capacity for a specific behavior. It refers to beliefs in one's capability to organize, to control, or to perform a specific action (Bandura, 1997), therefore reflecting the cognitive dimension of behavior. Self-efficacy

also helps to determine how much effort the individual will devote to a specific activity, how long one will persevere when confronting obstacles, and how resilient one will be in the face of adverse situations (Schunk et al., 1987). Accumulation of social and cognitive skills such as self-esteem, self-efficacy, and coping strategies are among the important risk and protective factors in chronic-disease etiology, especially for chronic diseases relevant to adolescents' eating disorders and poor dietary habits (O'Dea & Wilson, 2006; Zabinski et al., 2006). Development of high self-esteem and self-efficacy are among the priorities of health-promoting schools (Tones, 1996; Konu & Rimpela, 2002; Lee et al., 2005) to promote good nutrition and health-enhancing behaviors including better oral health behaviors (Kwan & Petersen, 2003). Studies assessing the relation between self-efficacy and self-esteem and oral health among children or adolescents are few.

Anxiety may be defined as a negative affective state (Bandura, 1997) which is a consequence of fearful or aversive experiences in specific situations (Skaret et al., 2003) that mostly lead to avoidance behavior in that particular situation. It is therefore considered an affective dimension of the behavior (Cinar, 2001), which is closely interlinked with cognition, so that low self-efficacy plays a pivotal role in development of high dental anxiety (Bandura, 1997). Bergman & Scott (2001) have found that self-efficacy, self-esteem, and past worries are interrelated. In oral health-related research, among preadolescents needing orthodontic treatment, those who obtained the treatment were more likely to have higher levels of self-esteem in adulthood, predicted by higher life satisfaction, self-efficacy, and low social anxiety (Kenealy et al., 2007). However, research considering the association between self-efficacy, self-esteem, and dental anxiety among children is sparse. Dental anxiety leads to behavioral management problems in dental settings and to delay in dental appointments (Klingberg, 1995; Klingberg et al., 1995; Skaret et al., 1999), as well as to increased occurrence of dental caries among children and adolescents (Kinirons & Stewart, 1998; Kruger et al., 1998).

2.4.2.2 Significance of Preadolescence in Family Influence

Health behaviors either health-enhancing or health-detrimental are exposed to the impact of the social environment in which the individual lives (McQueen, 1996; Cinar, 2001). They are mostly derived through the norms, values, and goals of the family (Christensen, 2004) which plays the primary role in the acquisition, modification, and improvement of health behaviors, social competency, and cognitive and emotional development during childhood (Sanders & Spencer, 2005). In this period of life, especially mothers act as primary role models for their children and transmit their values, knowledge, and attitudes significant to adaptation to daily life and society (Bandura, 1977; Rossow 1992). In preadolescence, maternal influence is still the most effective agency to care for and educate children in their own health and behavior, including oral health (Poutanen et al., 2005). Parental influence continues through adolescence (Macgregor & Balding, 1987; Traen & Rise, 1990) but in a descending magnitude, so that peers take the primary role of the parents during adolescence, thus increasing the likelihood of encouraging health-detrimental behaviors like drug use, alcohol consumption, and irregular toothbrushing (Jessor, 1984). Hodge et al. (1982) has found that among adolescents, peer group norms exert an important influence on toothbrushing practices, whereas between regular and irregular toothbrushers, family attitudes did not vary.

Modeling may be defined as providing a standard imitation: learning through observation of the frequently repeated behaviors of others, during a certain period of time, with reinforcement by the award or punishment mechanisms of the social environment (Bandura, 1977). The importance of parental modeling in adoption of health-enhancing behaviors such as regular physical activity and a healthy diet during preadolescence was highlighted by Norton et al. (2003). The study by Jessor et al. (1998) found that positive parental modeling and engagement in better psycho-social activities were common protective factors for adolescents' health-enhancing behaviors, including recommended toothbrushing. Parents function as social models for children in habit formation and -maintenance (Rossow, 1992), and for adolescents in improvement of oral health and dietary behaviors (Traen & Rise, 1990; Astrøm & Jakobsen, 1996; Astrøm, 1998). Poutanen et al. (2006) also support the evidence that frequent parental consumption of sweets and infrequent use of xylitol gums were among the predictors of poor oral health behaviors among 11- to 12-year-old preadolescents.

As shown by the model of the "Health Promoting Family" (Christensen, 2004) and the "Bruhn and Parcel Model of Health Promotion" (for review, see Chiu, 2005), there exist several other processes by which parents can influence their children's health beliefs and behaviors: parental oral health status, parental psychology, support, and rearing style, and societal status.

The oral health of school-aged children is negatively affected by both poor maternal oral health behavior (Okada et al., 2002) and maternal high dental caries experience (Mattila et al., 2001) or edentulousness (Bedos et al., 2005). Maternal child-rearing practices and psychology affect the oral health and behavior of children and adolescents; for instance, high levels of maternal punishment lead to increased probability of high dental caries rates (Nicolau et al., 2005), whereas positive and supportive parental rearing affect the perception of adolescents that oral health is good (Östberg, 2002). In addition, poor rearing styles in preadolescence contribute to development of dental anxiety (Locker et al., 2001; Maggias & Locker, 2002) and have a negative impact on psychosocial attributes (chronic stress, life satisfaction) in adulthood. This directly affects the self-perception of the adverse impact of poor oral health on quality of life (Sanders & Spencer, 2005). Parental beliefs and attitudes can also affect the adoption and maintenance of children's health-enhancing behaviors, beliefs, and affective states (Lau et al., 1990; Norton et al., 2003; Srof & Velsor-Friedrich, 2006). Examples are the direct role of maternal self-efficacy beliefs in ensuring the recommended toothbrushing of children (Pine et al., 2000, 2004; Adair et al., 2004; Finlayson et al., 2007) and the direct contribution of high maternal dental anxiety to the corresponding levels of dental anxiety among their children (Klingberg et al., 1995; Locker et al., 1999).

Societal factors also play a significant role in adolescents' oral health and on the behavior that determine those in adulthood (Koivusilta et al., 2001; Poulton et al., 2002; Thomson et al., 2004). Preadolescents and adolescents whose mothers have low educational and occupation levels are more likely to have dental caries and practice less frequently recommended oral health behaviors than those whose mothers have a better socio-economic profile (Wierzbicka et al., 2002; Mattila et al., 2005a; Nicolau et al., 2005; Poutanen et al., 2005, 2006). Oral health in adulthood is negatively affected by poor oral health and socio-economic disadvantages in childhood (Thomson & Mackay, 2004) and in preadolescence, and by preadolescents' mal-adapted health behaviors (irregular toothbrushing, high consumption of sweets) (Koivusilta et al., 2001).

3. Aim of the study

3.1. General Aim

The general aim of the present study was to investigate how non-biologic determinants (behavior, cognition, and affect, maternal and societal influences) of oral health are interrelated with each other and with oral health among preadolescents in two different oral health care and cultural settings, Turkey and Finland. In addition, the association of preadolescents' general well-being with their oral health was assessed.

3.2. Specific objectives

The specific objectives were to analyze:

- 1.** The distribution of oral health and its non-biologic determinants and general well-being measures (I, II, III, V).
- 2.** The interrelation between preadolescents' oral health behaviors, self-efficacy, dental anxiety, and maternal modeling (II, III).
- 3.** The impact of societal influences on the interaction between preadolescents' oral health behaviors and maternal modeling among the Turks (IV).
- 4.** The interrelation between non-biologic determinants and general well-being and self-reported and clinically assessed dental health (I, II, V).

3.3. Working hypothesis

Preadolescents' self-efficacy and dental anxiety are associated with maternal modeling, their own oral health behaviors and societal factors, and, further, all these factors are interrelated with each other and with oral health. Specifically, regardless of cultural and socio-economic differences, self-efficacy contributes positively to oral health and related behaviors, and good general well-being is positively interrelated with oral health.

4. Material and Methods

4.1. Material

A cross-sectional study by self-administered questionnaires for Turkish (n=611) and Finnish (n=338) preadolescents from the fourth, fifth, and sixth grades and for their mothers was undertaken in Kadiköy (a managerial district of Istanbul with local self-government) and in Munkkiniemi (a suburb of the city of Helsinki), respectively, in spring and winter 2004. In Kadiköy, two schools were selected by cluster sampling from high and low socio-economic-level suburbs to represent the general profile of the district, a small profile of the city. Then a representative sample of 611 children from total of 29 189 children aged 10 to 12 years was randomly selected and, proportionally assigned by age groups 10, 11, and 12; the classroom served as the sample unit (WHO, 1998). Sample size was calculated assuming the most unfavorable situation ($P=q=50$) with standard error (SE) 2 (95% CI). The high SE can be attributed to the characteristics of cluster sampling (WHO, 1998). In Helsinki, all the children in the fourth, fifth, and sixth grades in both primary schools of Munkkiniemi were invited to participate in the study.

4.2. Methods

4.2.1 Theoretical Model

Design and analysis of this study were based on a comprehensive conceptual model, the “Oral Health Promotion Model for Preadolescents.” The present conceptual model (A.B. Cinar, H. Murtomaa) was developed as a holistic framework to understand the non-biologic oral health-promoting factors influencing preadolescents’ oral health by recognizing the presence of a complexity and interplay between these causal factors. The model incorporates the four key domains: Preadolescent’s Oral Health Behavior and Cognition-Affect, Maternal and Societal Influences, and Preadolescent’s Well-being (Fig. 8).

The integrated, dynamic, and concrete theoretical framework was developed according to the Social Cognitive Theory (Bandura, 1997), and the concept of Cognition-Affect-Behavior Triad (Bedell & Lennox, 1997). The “societal,” defining the socio-economic factors, was derived from the model of the Health-Promoting Family (Christensen, 2004). The new conceptual model primarily emphasizes an approach to well-known health behavior models (for review, see Glanz et al., 1997) as follows: 1) The “*Maternal modeling*” concept as one of the main components. 2) Emphasis on oral health-related cognition-affect, and societal influences. 3) The concept of preadolescent’s well-being as an “*outcome*” measure. 4) Multiple interaction, not unilateral, pathways between certain components of the model.

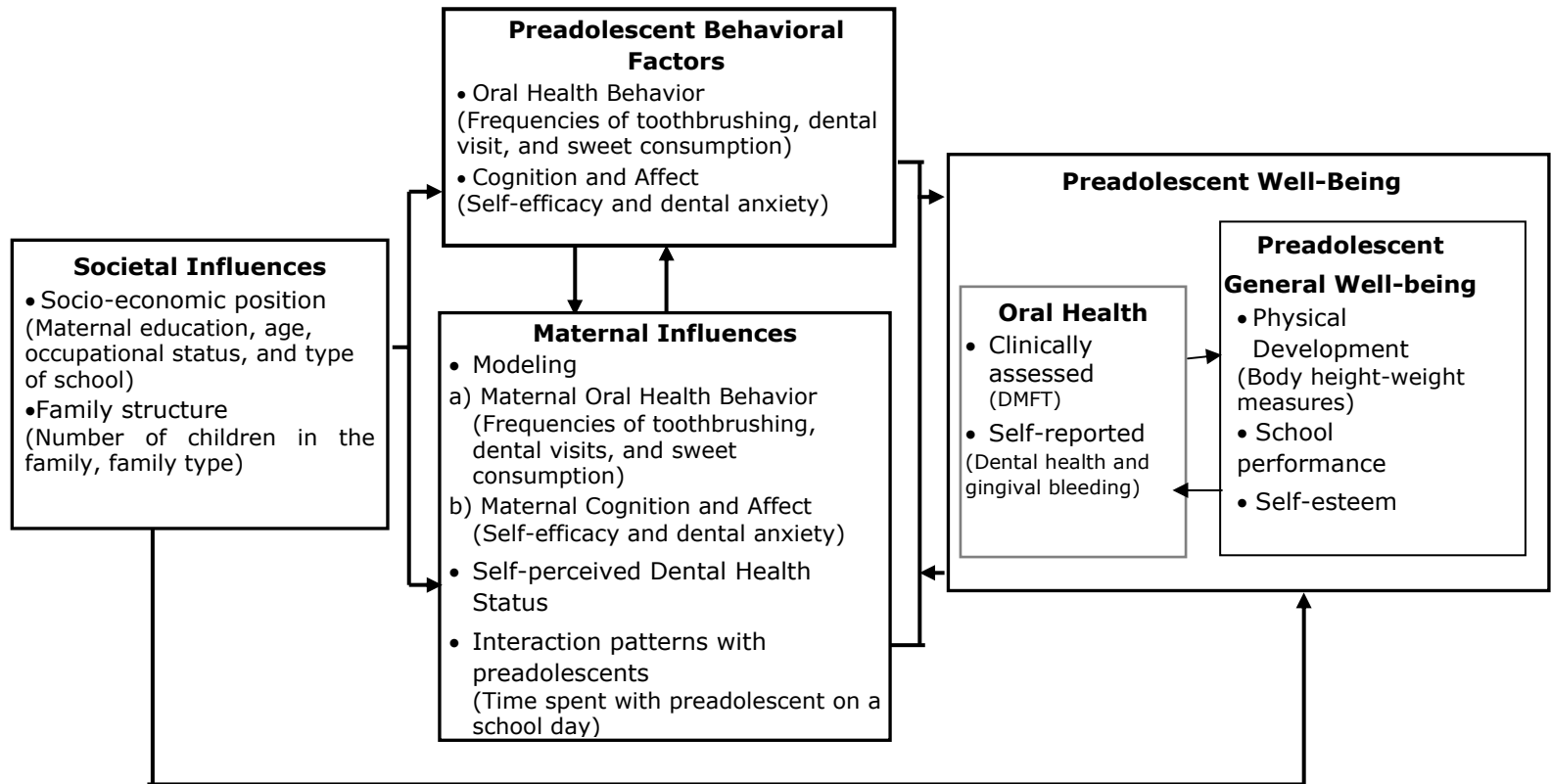


Figure 8 Conceptual model of the study “Oral Health Promotion Model for Preadolescents.”

4.2.2 Pilot Study

The self-administered health behavior questionnaires for preadolescents (PHBQ) and for their mothers (MHBQ) were tested in a pilot study on a sample of fourth-grade elementary school preadolescents and their mothers in Istanbul (n=63) in 2003. Among Finns (n=10), only the feasibility of the questionnaires was tested in 2004.

In the pilot study, Cronbach coefficient measures among Turkish preadolescents for cognitive measures, new Toothbrushing Self-Efficacy (TBSE) Scale, and modified Dietary Self-Efficacy (DSE) Scale (Reynolds, 1993) were, respectively, $\alpha=0.78$ and $\alpha=0.80$. The correlations between test and re-test measures of the scales were high ($r=0.89$, $r=0.82$, $p<0.05$) with normal distribution (One-Sample Kolmogorov-Smirnow test, $p>0.05$). When the scales were re-tested longitudinally to assess their stability after 6 months, correlations between test and re-test measures were, respectively, $r=0.41$ and $r=0.46$ ($p<0.05$).

The Self-Esteem Scale (Macgregor & Balding, 1999) and Modified Dental Anxiety Scale (MDAS) (Wong et al., 1998) for Turkish preadolescents showed acceptable evidence of internal consistency ($\alpha=0.76$, $\alpha=0.80$). The correlations between test and re-test measures of the scales were acceptable ($r=0.81$, $r=0.79$, $p<0.05$) with normal distribution (One-Sample Kolmogorov-Smirnow test, $p>0.05$).

The MDAS for mothers (Humphris et al., 1995) had high internal consistency ($\alpha=0.88$). The Maternal Self-Efficacy Scale, related to implementation of twice daily toothbrushing in daily life of the preadolescent (MSE), was modified from the study of Pine et al. (2000) by extracting the questions with low response rate and with high standard deviation in the pilot study. The modified MSE Scale was tested for validity and reliability among Turkish mothers: The Cronbach correlation coefficient measure was moderate ($\alpha=0.60$). The correlation between test and re-test measures of MSE and MDAS were $r=0.57$ and $r=0.71$ ($p<0.05$) with a normal distribution (One-Sample Kolmogorov-Smirnow test, $p>0.05$).

4.2.3 Questionnaires

The PHBQ, along with the new TBSE and modified DSE Scales (Reynolds, 1993), included questions modified from several studies (Holund, 1991; Freeman et al., 2000) and surveyed individual behavioral factors and psychosocial well-being: preadolescents' oral, dietary, and general hygiene behaviors, dental anxiety (Wong et al., 1998), self-esteem (Macgregor & Balding, 1999), and school performance (Appendix 1). The MHBQ modified from Pine et al. (2000), analyzed societal factors, maternal oral health behaviors, dental anxiety (Humphris et al., 1995), self-efficacy beliefs (Pine et al., 2000), and health beliefs (Freeman et al., 2000) as well as preadolescent's body height-weight measurements and dietary habits (Holund, 1991), (Appendix 2).

4.2.3.1 Preadolescent Factors

Oral health behaviors (Appendix 1) were assessed as follows: The toothbrushing frequency of all preadolescents (ranging on a 6-point Likert scale as never, less than once a week, once a week, more than once a week, once daily, twice daily or more) was dichotomized as recommended (twice daily or more) and non-recommended (less than twice daily) (Løe, 2000;

Pine et al., 2000). Turkish preadolescents' dental visit frequency, measured on a 5-point Likert Scale, was further classified as regular (once in every 6 or 12 months) and irregular (more than 12 months). The corresponding questionnaire was not administered to the Finns, because regular dental visits are provided for every Finnish preadolescent, based on the recall system applied by the school dentist. Sweet consumption per week was assessed on a 4-point Likert Scale (6-7 days, 3-5 days, 1-2 days, never). For further analysis, it was dichotomized as recommended (2 days or less/week) and non-recommended (3 days or more/week) based on the study by Astrøm (2004). Sweet consumption between meals was assessed as a dichotomy, yes and no.

The development process of the cognitive measures, the TBSE and the modified DSE Scales, were guided by the Social Cognitive Theory (Bandura, 1997) and by the guidelines for constructing self-efficacy scales (Bandura, 2003). TBSE and modified DSE Scales consisted of 8 and 11 items, respectively, where each item gave a score on 5-point Likert scale ranging from "not sure at all" (1) to "absolutely sure" (5) (Appendix 1). Sum scores for TBSE and DSE Scales were coded as low and high by taking the medians as the cut-offs (Knecht, 2000) for Turkish (4, 7) and Finnish (9, 16) preadolescents.

The MDAS for preadolescents (Wong et al., 1998), an affective measure with 6 items, ranged from 1="not anxious" to 5="extremely anxious," and its sum scores for Turks and Finns were coded as low or high by taking the means as the cut-offs (10, 7, respectively). Cronbach coefficient measures for the MDAS for Turkish and Finnish preadolescents were $\alpha=0.81$ and $\alpha=0.75$, respectively.

4.2.3.2 Societal Factors

Societal factors were assessed by questions concerning maternal societal factors derived from the MHBQ: maternal education, "secondary school or less" or "at least high school"; maternal age, "39 years of age or less" or "more than 39 years"; employment status, "working" or "housewife"; number of children in the family, "1-2" or "3 or more," and family type, "two-parent" or "single-parent."

4.2.3.3 Maternal Factors

Of the maternal oral health behaviors in the MHBQ (Appendix 2), the following were re-classified: 1) toothbrushing: "daily," "at least once a week," or "rarely" and, further, recommended (twice daily or more) and non-recommended (less than twice daily) (Löe, 2000; Pine et al., 2000), 2) dental visit: regular (once every 6 or 12 months) or irregular (more than 12 months), 3) sweet consumption per week: recommended (2 days or less/week), non-recommended (3 days and more/week) (Astrøm, 2004).

The modified MSE (Pine et al., 2000) was measured by a five-point Likert scale ranging from 0="totally true" to 4="totally wrong" for the negative statements and the reverse coding for the positive (respectively, the items numbered 1, 2, 3 and 4, 5, 6). As the frequency distribution of some items into "totally true" and "mostly true" or "totally wrong" and "mostly wrong" were so small, the range was re-coded into three categories ("totally or mostly true," "do not know," "totally or mostly wrong"). For further analysis, the sum scores of the modified MSE Scale were calculated and coded as high and low by taking the medians as the cut-offs (Knecht,

2000) for Turkish (9) and Finnish subjects (9). Cronbach coefficients showed acceptable evidence of internal consistency and reliability for the modified MSE for the Turkish ($\alpha=0.60$) and Finnish ($\alpha=0.61$) subjects. MDAS for mothers (5 items) (Humphris et al., 1995) were ranged on a 5-point Likert Scale. The sum scores of the scale for Turks and Finns were coded as low and high by taking the means (9, 6, respectively) as the cut-offs. Cronbach coefficient measures for MDAS were $\alpha=0.86$ and $\alpha=0.89$.

Interaction patterns with the preadolescent were measured by maternal time spent with the preadolescent on a school day (<1 hour, 1-2 hours, >2-4 hours, 4-6 hours, >6 hours). Due to the low frequency for "<1 hour" in both groups, the measure was re-classified in 4 groups, "2 hours or less" to ">6 hours." Maternal dental health status was assessed by self-reports on a 5-point Likert scale (very bad, bad, average, good and excellent). For further analysis, it was dichotomized (average or below, above average), as no Finnish mothers reported their dental health status as "bad" or "very bad."

4.2.3.4 Oral Health and General Well-being Measures of Preadolescents

4.2.3.4.1 Oral Health Measures

Self-reported dental health and gingival bleeding were determined as follows: "In what condition do you think your teeth are now?" and "Have you ever observed any bleeding of your gums while brushing your teeth?" These measures were recorded on a 5-point Likert Scale ranging from "very bad" to "excellent" and "always" to "never" (Appendix 1). For the analysis, self-reported dental health was re-classified into: "below average" (included "very bad" and "bad"), "average," and "above average" (included "good" and "excellent"), as Finns did not respond with "very bad" or "bad." Self-reported gingival bleeding was classified into three categories: "never," including "never or rarely," "occasionally," and "usually" consisting of "usually" or "always."

Clinical examinations in Turkey and Finland were based on WHO criteria (1997). In Turkey, two weeks after the questionnaire survey, clinical examinations were performed in the classrooms by two calibrated dentists (A.B. Cinar, S. Kavaloglu) under field conditions using natural light. The preadolescent was seated in a chair with a high backrest; the examiner stood in front of the chair, using plane mouth mirrors and blunt dental probes. Two dentists first recorded caries in terms of DMFT/dmft and DMFS/dmfs on dental charts. Of the study group, 10% were re-examined for inter-examiner and intra-examiner reliability of DMFT by the kappa statistic, and these values were 0.89 for inter-examiner, and 0.96 and 0.92 for intra-examiner reliabilities ($p<0.05$).

In Finland, the DMFT values of the preadolescents were taken from the municipal dental clinics of Munkkiniemi with permission of Health Statistics Department where dental health records of the children are stored. The preadolescents were examined by three dentists according to the guidelines outlined by the Helsinki City Health Department according to WHO (1997) criteria. There were no calibration exercises for the dentists; however, they all were experienced dentists working mainly with children. DMFT values of both groups were dichotomized into healthy (DMFT=0) and diseased (DMFT>0) subgroups for further analysis.

4.2.3.4.2 General Well-Being Measures

In the MHBQ, mothers were asked to measure height to the nearest 0.1 cm and weight to the nearest 0.1 kg, with preadolescents wearing only their underwear, in bare feet, standing erect against a wall-mounted measuring tape. Mothers were not to include earlier measurements available, and they were to make new measurements after the arrival of the questionnaires at their homes. Of the Turkish study group, 10% of mothers were asked to re-complete the MHBQ 2 weeks after the cessation of the survey. Intra-examiner reliability for measurement of height was 0.78, and was 0.74 for weight ($p < 0.05$).

Self-esteem and school performance in the PHBQ were used to measure well-being of preadolescents, as already suggested and used (Konu et al., 2002; Fraillon, 2004; Suldo et al., 2006). The Self-Esteem Scale, with nine items (Macgregor & Balding, 1999), each ranging on a three-point scale (agree=1, to disagree=3), was coded with a median cut-off point of 4 for Turks and 5 for Finns. Cronbach coefficient measures were $\alpha = 0.68$ and $\alpha = 0.70$, respectively. Self-reported school performance, measured on a 5-point Likert scale (very bad, bad, average, good, very good), was dichotomized for further analysis as “average or below” and “above average.”

4.2.4 Data Collection

Based on results of the pilot study, the questionnaires were revised. Two native speakers translated them from English to Turkish and Finnish to ensure accuracy compared with the original forms in English. The Turkish Ministry of Education, local administration authorities, and the school authorities in Turkey, as well as an ethics committee in Finland granted ethical clearance and written permission to conduct the study. All of the participating mothers and preadolescents provided written informed consent (Appendix 3).

PHBQs were completed in classes, whereas the MHBQs were taken to and from home by the preadolescents in Turkey and Finland, in spring 2004. The survey was carried out in the morning or afternoon on weekdays but excluding Mondays as suggested by Macgregor et al. (1996). It was guided by the researcher (A.B. Cinar) and the teacher in each classroom. The teachers were instructed by this researcher before initiation of the survey, whereas preadolescents were informed about the structure and how to proceed on the questionnaires (Balding, 1990). The period for collecting the data was 3 weeks (not including oral health examinations) for the Turks and one week for the Finns.

The response rate for the PHBQ was 97% ($n = 591$; 345 in public- and 246 in private schools) for the Turks and 65% ($n = 223$) for the Finns (Fig. 9). All Turkish mothers of preadolescents, in public ($n = 360$) and private ($n = 251$) schools, provided permission for the study; and their response rates for the MHBQ were 93% ($n = 334$) and 79% ($n = 199$), respectively. Of the 338 Finnish mothers, 226 (67%) provided written consent and 182 (53%) responded to the MHBQ. The response rates for mother-child paired questionnaires were 86% for the Turkish ($n = 527$; 330 in public- and 197 in private schools) and 54% ($n = 182$) for the Finnish study group. Participation rates in oral health examinations were 95% for Turkish ($n = 584$) and 65% for Finnish preadolescents ($n = 223$). Girls comprised 49% of Turkish (47% in public- and 52% in private schools) and 43% of Finnish preadolescents.

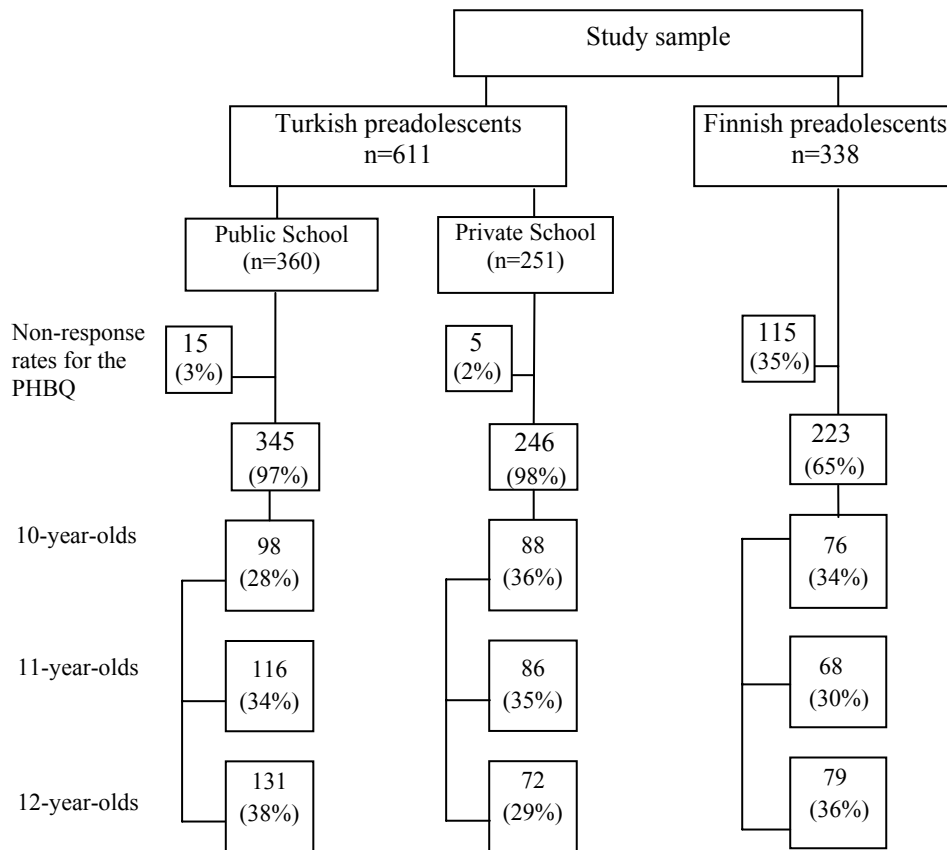


Figure 9 Distribution of Turkish and Finnish preadolescents by age and school type.

4.2.5 Statistical Analysis

To describe the oral health and related behaviors of preadolescents and mothers as well as the societal factors and general well-being measures, frequency distributions were used. In addition, mean, median, and standard deviations were used to describe the patterns of clinical dental health, self-esteem, and body height-weight among preadolescents as well as preadolescents' and mothers' self-efficacy and dental anxiety.

The statistical differences between Turkish and Finnish preadolescents, as well as between Turkish private and public schools, were mostly evaluated by chi-square test, which is suitable for the comparison of frequencies in two or more groups (Dawson & Trapp, 2004). To compare means of clinical dental health, well-being, and cognitive-affective measures between Turkish and Finnish preadolescents, Student's t-test for independent samples was used. A similar procedure was applied for mothers for the cognitive-affective measures. The Spearman rank correlation was used to describe the relationship between two ordinal (or one ordinal and one numerical) characteristics, whereas the Pearson correlation coefficient was used to determine the relationship between two continuous variables.

Binary logistic regression models (Bulman & Osborn, 1989) were applied to evaluate the association of outcome measures with explanatory factors and to calculate corresponding odds ratios (OR) and 95% confidence intervals (CI95%). The overall goodness of fit of the model was checked with the Hosmer and Lemeshow Goodness-of-Fit test. Linear regression models were applied to explain certain outcome measures by explanatory variables. The R-square was calculated for each model to estimate the variation in the outcome variable by explanatory variables in each of the linear regression models. Statistical significance was evaluated at $p=0.05$ throughout the study. The Statistical Package for the Social Sciences (SPSS for Windows) versions 11 and 13.5 (SPSS, Inc., Chicago, IL, USA) was used for statistical analyses.

Principal component analysis with Kaiser Criteria (eigenvalue greater than one) was used in the present study: 1) to validate the TBSE and DSE Scales by demonstrating that their items load on the same factor (Stewart et al., 1997; Schwarzer, 2008), 2) to study the dimensionality of the preadolescent MDAS by detecting its relationships with selected variables.

5. Results

5.1. How oral health and its non-biologic determinants and general well-being measures differentiate between Turkish and Finnish preadolescents (I, II, III, V)

5.1.1 Clinically measured dental and self-assessed oral health

Turkish preadolescents' mean DMFT (2.96 ± 2.03) was higher than that of the Finns (0.74 ± 1.57), ($p < 0.05$). Turkish preadolescents were more dentally diseased (84% having DMFT > 0) than the Finns (33%), ($p < 0.01$). They also reported poorer dental health and more frequent gingival bleeding than the Finns ($p < 0.05$) (Fig. 10).

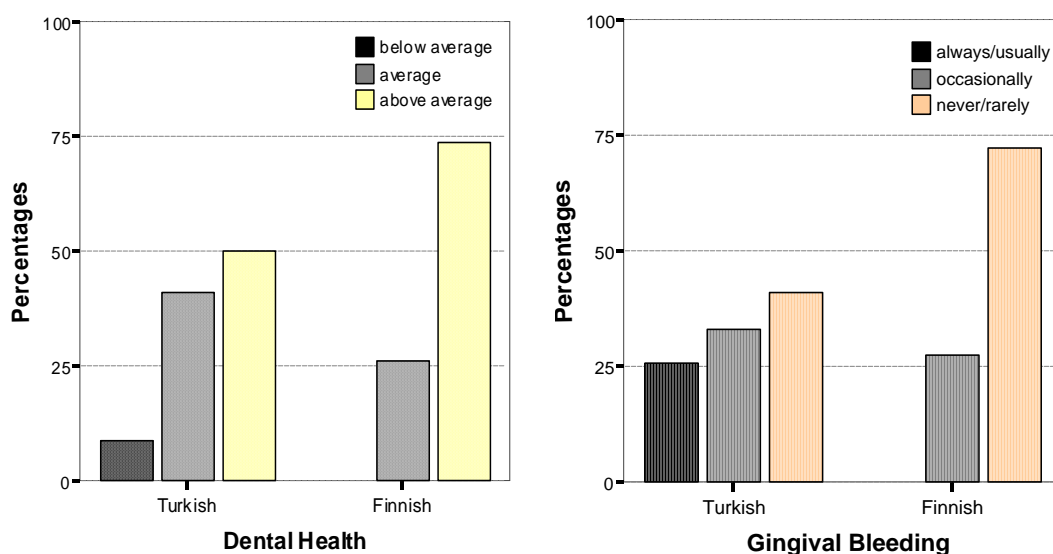


Figure 10 Self-reported dental health and gingival bleeding among Turkish ($n=591$) and Finnish ($n=223$) preadolescents.

DMFT was negatively correlated with better self-reported dental health ($r_s = -0.179$, $p = 0.01$) and less frequent gingival bleeding ($r_s = -0.148$, $p = 0.001$) among Turkish preadolescents. A similar correlation appeared for the Finns ($r_s = -0.138$, $p = 0.05$; $r_s = -0.264$, $p = 0.001$).

5.1.2 General well-being measures

Turkish preadolescents' mean body height (142.7 ± 9.3) and weight (37.7 ± 8.8) were lower than those of the Finns (150.7 ± 9.9 , 41.9 ± 9.2), ($p = 0.001$). Turkish preadolescents reported lower mean values of self-esteem (3.12 ± 3.73) than did their Finnish counterparts (4.42 ± 3.09) ($p = 0.001$). The frequency of school performance as above average among Turkish and Finnish preadolescents were 76% and 74%, respectively ($p > 0.05$).

Better school performance was positively correlated with higher self-esteem among both Turkish ($r_s=0.238$, $p=0.001$) and Finnish ($r_s=0.379$, $p=0.001$) preadolescents.

5.1.3 Oral health behaviors, self-efficacy and dental anxiety

The recommended toothbrushing and sweet consumption frequencies among Turkish preadolescents (36%, 56%) were lower than of those of the Finns (53%, 68%), ($p<0.05$). Turkish preadolescents reported more frequent between-meal sweet consumption (27%) than did the Finns (16%), ($p<0.05$). Turkish and Finnish preadolescents who reported non-recommended sweet consumption were more likely to consume sweets between meals (OR=2.97; CI95% 2.15-4.02 vs. OR=1.61; CI95% 1.10-2.35), ($p\leq 0.001$), than were those with the recommended sweet consumption. Among Turkish preadolescents, 78% reported irregular dental visits, of whom 10% reported never visiting a dentist.

Almost half the Turkish and Finnish preadolescents reported high levels of dental anxiety, TBSE, and DSE. Turkish preadolescents' mean dental anxiety (9.6 ± 6.01) was higher than that of the Finns (7.4 ± 4.51), ($p<0.05$). Mean TBSE (3.5 ± 7.36) and DSE (6.03 ± 8.90) of Turkish preadolescents were lower than those of the Finns (7.7 ± 6.06 vs. 13.8 ± 7.48), ($p<0.05$). Turkish preadolescents with low dental anxiety were more likely to report high TBSE (OR=0.64; CI95% 0.45-0.90) and DSE (OR=0.61; CI95% 0.42-0.87), ($p<0.05$). A similar association appeared among the Finns for DSE (OR=0.35; CI95% 0.18-0.66, $p<0.05$).

Turkish and Finnish preadolescents with a high TBSE were more likely to brush their teeth twice daily compared to those with a low TBSE (OR=8.72; CI95% 5.85-12.97 vs. OR=18.59; CI95% 9.33-37.05), ($p\leq 0.001$). Similarly, a high DSE was associated with recommended toothbrushing (OR=2.25; CI95% 1.56-3.24 vs. OR=1.81; CI95% 1.04-3.15), ($p<0.05$) and sweet consumption (OR=2.25; CI95% 1.56-3.21 vs. OR=1.89; CI95% 1.04-3.45), ($p\leq 0.001$). Turkish and Finnish preadolescents reporting a high DSE were more likely not to consume sweets between meals (OR=1.57; CI95% 1.21-2.04, OR=3.37; CI95% 1.49-7.60), ($p\leq 0.001$). Turkish preadolescents who reported more frequent regular dental visits were more likely to have a high TBSE (OR=2.20; CI95% 1.49-3.41) and low dental anxiety (OR=0.43; CI95% 0.28-0.67), ($p<0.05$). More dentally anxious Turkish preadolescents were more likely to visit a dentist for dental problems (74%) than were their less dentally anxious counterparts (56%), ($p<0.001$).

5.1.4 Maternal and Societal Factors

Frequency of self-reported dental health as above average among Turkish mothers (36%) was lower than that of the Finns (62%), ($p<0.001$) (Fig. 11). Turkish mothers reported lower recommended toothbrushing (38%) and regular dental visits (11%) but more frequent recommended sweet consumption (84%) than did the Finns (85%, 43%, 65%), ($p<0.001$).

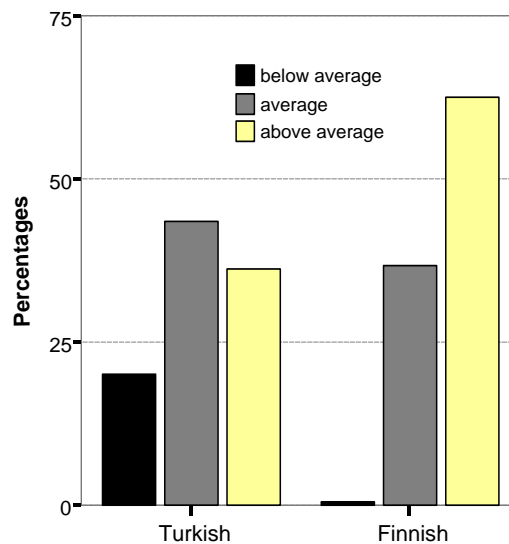


Figure 11 Self-reported dental health among Turkish (n= 527) and Finnish (n=182) mothers.

Turkish mothers, compared to their counterparts in Finland, were more likely to believe that they can support preadolescent toothbrushing by praising and reminding ($p=0.001$), but they believed less frequently in the benefit of preadolescent toothbrushing “twice a day” ($p=0.001$) (Table 3). Turkish mothers believed that they less often had time to check preadolescents’ toothbrushing ($p=0.001$), but they were more likely to spend time with the preadolescent on a school day (67%, 4 hours or more) than did the Finns (52%), ($p=0.001$).

Almost half the Turkish (51%) and Finnish (59%) mothers reported low levels of MSE ($p>0.05$). Turkish mothers were more likely to experience high levels of dental anxiety than were their counterparts in Finland (51% vs. 40%), ($p<0.05$). Their mean values of MSE (8.13 ± 3.41) and maternal dental anxiety (8.70 ± 4.53) were, respectively, lower and higher than those of Finnish mothers (8.61 ± 2.75 , 6.02 ± 5.50), ($p<0.001$).

No association appeared between MSE and toothbrushing frequency for either group ($p>0.05$). Better self-reported dental health, regular dental visits, and of the societal factors in Table 4, better education and lower number of children, and a two-parent family explained the low dental anxiety among Turkish mothers ($R^2=0.264$, $p<0.05$). For the Finns, the explanatory factors were recommended toothbrushing, regular dental visits, lower number of children, and a two-parent family ($R^2=0.214$, $p<0.05$).

Table 3 Characteristics and country differences of statements on maternal self-efficacy beliefs related to preadolescent toothbrushing among the Turkish (n=527) and the Finnish (n=182) mothers.

Statements	Totally or mostly true (%)	Do not know (%)	Totally or mostly wrong (%)	p
1. I can't make my child brush his/her teeth every day.				<0.001
Turkish mothers	14	13	73	
Finnish mothers	5	2	93	
2. I don't feel there is time to check my child's toothbrushing.				0.001
Turkish mothers	16	9	75	
Finnish mothers	7	3	90	
3. I don't feel that it would make any difference if my child brushed twice every day or not.				<0.001
Turkish mothers	7	8	85	
Finnish mothers	1	1	98	
4. I can help prevent tooth decay in my child's teeth by praising him/her for having brushed his/her teeth.				<0.001
Turkish mothers	92	5	3	
Finnish mothers	79	8	3	
5. I can help prevent tooth decay in my child's teeth by encouraging him/her to brush more than once a day.				0.446
Turkish mothers	92	6	2	
Finnish mothers	92	3	5	
6. I can help prevent tooth decay in my child's teeth by reminding him/her to brush every day.				<0.001
Turkish mothers	92	6	2	
Finnish mothers	81	7	12	

Table 4 Distribution of societal factors between the Turks (n=527) and the Finns (n=182).

	Turkish mothers (%)	Finnish mothers (%)	p
Education			0.001
Secondary school or less	57	7	
At least high school	43	93	
Age			0.001
39 years or less	73	29	
Above 39 years	27	72	
Number of children in the family			0.466
1-2	64	65	
3- or more	36	35	
Family type			0.001
Single-parent	6	23	
Two-parent	94	77	

5.2. How maternal modeling contributes to oral health behavior, self-efficacy, and dental anxiety? (II, III)

5.2.1 The effect of maternal modeling on preadolescents' oral health behavior

Turkish mothers who reported non-recommended toothbrushing and sweet consumption were more likely to have preadolescents performing the corresponding non-recommended behaviors (74% vs. 50%) than were the mothers with recommended patterns of these behaviors (58% vs. 41%), ($p=0.001$). Finnish mothers reporting recommended toothbrushing and sweet consumption were more likely to have preadolescents with similar habits (78%, 77%) than were the mothers with non-recommended patterns of corresponding behaviors (59%, 50%), ($p=0.001$).

Binary logistic regression analysis revealed that recommended maternal toothbrushing among Turks, and high MSE among Finns contributed to recommended preadolescent toothbrushing (Table 5).

Table 5 Turkish and Finnish preadolescents' toothbrushing behavior explained by maternal and preadolescent self-efficacy and maternal toothbrushing frequency, by using binary logistic regression.*

	Turkish preadolescents (n=490)**			Finnish preadolescents (n=175)**		
	OR	CI95%	p	OR	CI95%	p
Maternal toothbrushing frequency			0.001			0.657
Non-recommended	1			1		
Recommended	2.21	1.44-3.39		1.27	0.44-3.67	
Maternal self-efficacy related to preadolescent's toothbrushing			0.138			0.012
Low	1			1		
High	0.90	0.59-1.77		2.80	1.25-6.27	
Preadolescent's toothbrushing self-efficacy			0.001			0.001
Low	1			1		
High	7.25	4.71-11.2		20.34	8.97-47.1	
constant	-1.87	0.22		-1.85	0.114	

* Outcome: recommended toothbrushing behavior: twice or more daily vs. non-recommended: Once daily or less

** Goodness of fit for model $P=0.863$ for Turks and $P=0.841$ for Finns

Principal component analysis revealed the clustering of high maternal dental anxiety with irregular preadolescent dental visits for the Turks and with non-recommended preadolescent toothbrushing for the Finns (Table 6).

Table 6 Cognitive, affective, and behavioral clusters related to dental anxiety among Turkish (n=377) and Finnish (n=125) preadolescents.

	Turkish preadolescents		Finnish preadolescents	
	Maternal dental anxiety	Oral health behavior	Preadolescent dental anxiety	Oral health behavior
Preadolescent dental anxiety	.621	*	.838	*
Maternal dental anxiety	.733	*	*	-.461
Self-esteem	-.598	*	-.580	*
Toothbrushing self-efficacy	*	.759	*	.695
Dietary self-efficacy	*	.681	-.567	*
Toothbrushing frequency	*	.580	*	.699
Child regular dental visit frequency	-.700	*	Not applicable	Not applicable

*Loadings below 0.40 extracted for ease of communication

5.2.2 The effect of maternal modeling on preadolescents' self-efficacy and dental anxiety

Turkish and Finnish preadolescents whose mothers reported recommended toothbrushing were more likely to report high TBSE (OR=2.45; CI95% 1.70-3.52 vs. OR=6.76; CI95% 2.21-20.65), (p=0.001). Finnish preadolescents whose mothers reported high levels of self-efficacy were more likely to have high TBSE (OR=2.14; CI95% 1.16-3.93, p=0.014).

Highly anxious Turkish preadolescents were more likely to have mothers with high dental anxiety than were those with low anxiety (OR=2.43; CI95% 1.66-3.57, p=0.01). No such association appeared among the Finns. Principal component analysis revealed the clustering between high maternal dental anxiety and low preadolescent TBSE among the Finns (Table 6).

5.3. What is the role of societal factors in Turkish preadolescents' modeling the maternal oral health behaviors? (IV)

Turkish preadolescents attending public school were more likely to have mothers with a poor education (secondary school or below, 88%) and to live in larger families (≥ 3 children in the family; 57%) than were their counterparts attending private school (5% vs. 6%), (p=0.001). Mothers of public school preadolescents were mostly housewives (85%) and younger (≤ 39 years, 85%) than mothers of private school preadolescents (42% vs. 49%), (p=0.001).

Mothers of public school preadolescents reported poorer oral health behaviors than did mothers of private school preadolescents (p=0.001) (Table 7). A similar trend occurred between public and private school preadolescents (p=0.001). Public school preadolescents reporting non-recommended toothbrushing and sweet consumption were more likely to imitate their mothers than were their counterparts with recommended toothbrushing and sweet consumption (81% vs. 62%, 21% vs. 11%), (p<0.05). Private school preadolescents reporting recommended

toothbrushing were more likely to model themselves on their mothers than were their counterparts with non-recommended toothbrushing (76% vs. 50%, $p=0.001$).

Among the mothers reporting irregular dental visits, mothers of public school preadolescents were more likely to have preadolescents who never visited a dentist (17%) than did mothers of private school preadolescents (6%), ($p<0.05$).

Table 7 Distribution of oral health and dietary behaviors with self-reported dental health among the Turkish preadolescents and their mothers, by school type (n=527).

	Preadolescents			Mothers		
	Public school (n=330) %	Private school (n=197) %	p	Public school (n=330) %	Private school (n=197) %	p
Toothbrushing frequency						
At least once a day	65	79	0.002	73	99	0.001
Less than once a day	35	21		27	1	
Dental visit frequency						
Regular	5	43	0.001	5	25	0.001
Irregular	95	57		95	78	
Sweet consumption						
None	13	13	0.927	36	28	0.323
1-2 days/week	46	47		51	54	
3-5 days/week	29	30		9	14	
6-7 days/week	12	10		4	4	

5.4. How non-biologic determinants, general well-being and oral health are interrelated (I, II, V)

5.4.1 The interrelation between general well-being and non-biologic determinants of oral health

Self-esteem was positively correlated with TBSE ($r_s=0.118$, $p<0.01$) and DSE ($r_s=0.112$, $p<0.05$) among Turkish and among Finnish preadolescents ($r_s=0.187$, $p<0.01$; $r_s=0.255$, $p<0.01$, respectively). Among the Turks, a clustering between high self-esteem and low preadolescent dental anxiety and maternal dental anxiety was observed (Table 6).

Of Turkish preadolescents, those reporting high self-esteem were more likely to spend time with their mothers ($p<0.05$) and less likely to live in families with three or more children than were those with low self-esteem (OR=0.57; CI95% 0.40-0.82, $p=0.002$). No such associations were evident among Finnish preadolescents ($p>0.05$).

School performance was more likely to be better among Turkish and Finnish preadolescents who reported high TBSE (OR=2.05; CI95% 1.34-3.11 vs. OR=2.18; CI95% 1.15-4.15) and DSE (OR=2.18; CI95% 1.41-3.37 vs. OR=2.63; CI95% 1.32-5.23), ($p<0.05$). A similar association emerged for recommended toothbrushing (OR=2.19; CI95% 1.39-3.45 vs. OR=1.96; CI95% 1.05-3.63), ($p<0.05$). Among the Finnish preadolescents, those who reported recommended sweet consumption, and those whose mothers brushed their teeth twice

daily were more likely to have better school performance (OR=3.35; CI95% 1.39-8.04; OR=2.33; CI95% 1.23-4.41), ($p<0.05$).

Among Turkish preadolescents, body height and weight were inversely correlated with number of children in the family ($r_p=-0.154$, $r_p=-0.216$, $p<0.01$).

5.4.2 The interlink between oral health, non-biologic determinants, and general well-being

DMFT was negatively correlated with better school performance among Turkish ($r_s=-0.108$, $p<0.05$) and Finnish ($r_s=-0.143$, $p<0.05$) preadolescents. One explanatory variable accounting for DMFT among both study groups was body height. Among societal factors, were number of children in the family for Turks and family type for the Finns (Table 8).

Table 8 Association of DMFT with selected parameters according to logistic regression analysis among Turkish (n=459) and Finnish preadolescents (n=155).

	Turkish preadolescents			Finnish preadolescents		
	Adjusted OR	CI95%	p	Adjusted OR	CI95%	p
Height (cm)	1.02	1.01-1.13	0.003	1.10	1.02-1.18	0.009
Weight (kg)	1.03	0.99-1.08	0.144	0.98	0.85-0.96	0.002
Toothbrushing self-efficacy						
Low	1			1		
High	1.44	0.83-2.50	0.197	1.28	0.60-3.11	0.460
Self-esteem						
Low	1			1		
High	2.37	1.36-4.10	0.002	1.56	0.69-3.52	0.280
Number of children in family	0.59	0.42-0.85	0.001	0.82	0.51-1.31	0.400
Family type						
Single-parent	1			1		
Two-parent	1.45	0.45-4.63	0.532	3.01	1.16-7.84	0.024
Time spend with mother on a school day	1.18	0.59-1.05	0.100	0.60	1.02-1.18	0.027
Gender						
Girl	1			1		
Boy	0.48	0.27-0.86	0.013	1.69	0.75-3.82	0.200
Age	0.75	0.49-1.12	0.159	0.73	0.44-1.20	0.220

Adjusted OR: by age and gender. Goodness of fit $P=0.372$ for Turks; Goodness of fit $P=0.412$ for Finns

Above-average self-reported dental health and less frequent gingival bleeding were positively correlated with high TBSE among Turks ($r_s=0.353$, $p<0.01$, $r_s=0.093$, $p<0.05$) and the Finns ($r_s=0.275$, $p<0.01$, $r_s=0.164$, $p<0.05$). A similar correlation appeared for DSE in both groups only for above-average self-reported dental health ($r_s=0.318$, $p<0.01$ vs. $r_s=0.171$, $p<0.05$).

TBSE and school performance contributed positively to self-reported dental health, in common, among Turkish and Finnish preadolescents (Table 9). Self-esteem and maternal

sweet consumption among Finns, number of children in the family, and preadolescent toothbrushing among Turks were the other contributors.

Table 9 Association of self-reported dental health with selected parameters according to logistic regression analysis among Turkish (n=459) and Finnish preadolescents (n=155).

	Turkish preadolescents			Finnish preadolescents		
	OR	CI95%	p	OR	CI95%	p
Toothbrushing frequency						
Non-recommended	1			1		
Recommended	3.05	1.88-4.97	0.001	1.68	0.46-6.16	0.432
Toothbrushing self-efficacy	1.79	1.14-2.83	0.012	4.40	1.15-16.82	0.030
Maternal toothbrushing frequency						
Non-recommended	1			1		
Recommended	1.19	0.53-1.33	0.460	2.52	0.67-9.45	0.171
Maternal sweet consumption						
≥3days week	1			1		
≤2 days/week	1.28	0.71-2.29	0.415	3.27	1.05-10.14	0.040
Maternal self-reported dental health	1.42	0.91-2.21	0.117	0.51	0.18-1.39	0.188
Number of children in family	0.53	0.34-0.84	0.007	1.18	0.39-3.54	0.764
Family type						
Single-parent	1			1		
Two-parent	1.46	0.59-3.57	0.408	0.57	0.24-2.19	0.571
Self-esteem	1.39	0.91-2.12	0.132	7.17	2.03-25.2	0.002
School performance	1.52	1.20-1.93	0.001	3.12	1.65-5.87	0.001

Goodness of fit P=0.262 for Turks; Goodness of fit P=0.372 for Finns

6. Discussion

6.1. Results of the study

6.1.1 Oral health status of Turkish and Finnish preadolescents

Among Turkish preadolescents, oral health, assessed in terms of clinical and self-reported measures, was poorer than among the Finns. Mean DMFT and its prevalence were higher among the Turkish preadolescents. These results seem to fall within the range of corresponding Turkish and Finnish national scores for 12-year-olds (respectively, 2.7; 82% and 1.2; 62%) and for 6-year-olds (4.5; 84% and 0.2; 42%) (Saydam et al., 1990; Nordblad, 2004). Among all preadolescents, self-reported oral health was positively correlated with their clinical dental health, which is in line with an earlier study of Östberg et al. (2003). Locker (1996) simplified Kay's (1993) taxonomy of dental care need as normative (clinical measures), subjective (self-assessment), or overlaps of these two. The compatibility of subjective need with the normative is important for directing individuals toward positive oral health behaviors. If the patient is in the overlap subgroup, then adoption of these positive behaviors can be enhanced by raising self-awareness of the poor condition of their dentition. Increasing self-awareness of oral health, leading to self-diagnosis compatible with clinical measures, would be useful in monitoring and assessing the children's oral health. Utilization of self-reported measures, already suggested as indicators of oral health by the European Commission (Bourgeois & Llodra, 2004), may speak for the improvement of children's oral health status, especially in developing countries with poorly organized oral health care services.

6.1.2 Oral health behavior of Turkish and Finnish preadolescents

Reported toothbrushing behavior among Turkish preadolescents was less often as recommended than among the Finnish. However, it was similar to the findings of a nationwide survey of Turkish school children in 2004 that found 33% among 12-year-olds and 38% among 15-year-olds reporting this recommended behavior (Gökalp et al., 2007a) and to the recent finding of WHO's international health behavior survey in school-aged children (HBSC), 38% among 11-year-olds (WHO, 2008). The percentage of the Finnish preadolescents reporting recommended toothbrushing was similar to the findings of Poutanen (2007) but higher than a national sample of Finnish school children aged 11-15 years (42%) (Maes et al., 2006) and than findings of the HBSC among 11-year-olds (46%) (WHO, 2008). Even though sample size was small in the present study, reported behaviors among Turkish and Finnish preadolescents were of the magnitude of earlier national and international studies.

Recommended sweet consumption was more frequently reported by the Finnish preadolescents. For the Finns, this frequency was close to the finding of Haapalahti et al. (2003) who found that 24% of Finnish preadolescents in her study ate sweets daily or almost daily. As no earlier studies were available for sweet-consumption behavior among Turkish children and adolescents, the present findings cannot be compared and generalized nationwide. Poutanen (2007) has found that Finnish preadolescents reporting a poor lifestyle (including for instance less frequently twice daily toothbrushing) were less likely to report sweet consumption once a week or less frequently (61%) than did those in moderate (63%) and favorable (71%) life-style groups. Considering the lower frequency of recommended sweet consumption and

toothbrushing behaviors and higher sweet consumption between meals, Turkish preadolescents may be interpreted as having poorer lifestyles. However, it is noteworthy that most of the Turks and Finns did not report consuming sweets between meals, considered one of the hazardous patterns of sweet intake for oral health (Kandelman, 1997; Rugg-Gunn & Nunn, 1999).

As data concerning dental-visit frequencies for children and adolescents in Turkey are scarce, it is hard to compare the present study findings with earlier ones. The Turkish Dental Association (TDA) reported that the percentage who had never visited a dentist was 13% (TDA, 2004a), which was confirmed in the present study. A nationwide survey conducted in Turkey found that only 1% of 12-year-olds and 2% of 15-year-olds visited a dentist regularly (Gökalp, 2007a). This is compatible with the reports of public school preadolescents in the present study but markedly lower than for those attending private school. This might be due to the fact that the higher societal profile of preadolescents in the latter group enabled more frequent access to and utilization of dental services. In Turkey, more than 70% of the dentists work in the private sector (TDA, 2004b), and one-third of the whole dentist population is in the most industrialized three cities, whereas the rest were unequally distributed in 78 other cities (Ministry of Health, 2001). The unequal distribution of dentists in the population leads to long-term waiting queues, of more than one year in the public sector, and therefore the oral health care needs of the population can be met for only 1 to 10% (TDA, 2004c). This may serve as one of the primary reasons for more irregular dental visits among those with a poor socio-economic status. The other reason may be the poor oral health-related knowledge and attitudes of deprived Turkish families. The most common reason for a dental visit among these families is tooth extraction; either the poor patients prefer tooth extraction rather than dental treatment or their oral health status is so bad that the tooth needs to be extracted (TDA, 2004a).

6.1.3 The interrelation between oral health behaviors and non-biologic determinants among Turkish and Finnish preadolescents

Interrelation between preadolescent determinants (oral health behaviors, cognition, affect)

In the recommended toothbrushing-behavior group, the percentage of Turkish and Finnish preadolescents reporting high levels of TBSE was higher than the percentage of those in the group brushing once daily or less often. Similarly, all preadolescents with a high DSE were more likely to brush their teeth twice daily and consume sweets less frequently each week and between meals. This supports earlier findings concerning the association between positive dietary behaviors and high self-efficacy (Parcel et al., 1995; Reynolds et al., 1999). Increased levels of DSE were related positively to choice and consumption of healthy foods and negatively to choice of snacks (Brug et al., 1995; Parcel et al., 1995; Cusatis & Shannon, 1996; Reynolds et al., 1999). School curricula focusing on development and improvement of positive cognitive skills to foster children's healthy eating habits have been found to enhance their self-efficacy and therefore lead to increased consumption of more healthy food and fewer beverages and snacks (Contento et al., 2007). Similar approaches based on raising individuals' self-efficacy levels are successful in adoption and maintenance of positive oral health among adults (Wolfe et al., 1996); the corresponding research among school children of all ages, has however, been a neglected issue.

According to the Social Cognitive Theory, regardless of the differences in cultural settings, the higher the performance attainments, the stronger the perceived self-efficacy beliefs (Bandura, 1997; Garvin et al., 2004). In this study, the cross-cultural generalisability of this relation was studied for the first time in oral health-related research. Culture may be defined as a system of shared beliefs, values, customs, behaviors, and artifacts that members of society use to cope with their environment (Folayan et al., 2004). In collectivist cultures such as the Turkish, high parental control over and protectiveness of children, and deference to parental authority are the major characteristics. Individualist cultures such as the Finnish cherish individualistic values such as self-reliance, self-autonomy, and self-achievement (Wang & Ollendick, 2001). In the present study, the association of high self-efficacy with recommended toothbrushing and sweet consumption among all preadolescents, despite these cultural differences, speaks for the cross-cultural generalisability of Social Cognitive Theory.

High levels of dental anxiety contributed to less frequent regular dental visits among Turkish preadolescents, which is in line with the earlier findings among preadolescents (Vignarajah, 1997) and adolescents (Bedi et al., 1992, 1993). This association may be due to dentally anxious adolescents' more frequently having past experience of operative dental care (Karjalainen et al., 2003) and pain (Bedi et al., 1992). The present study found that the more dentally anxious Turkish preadolescents reported more frequent dental visits for dental problems than did those with low anxiety.

Interrelation between preadolescent determinants and maternal and societal influences

Both Turkish and Finnish preadolescents reported patterns of oral health behaviors (toothbrushing and sweet consumption) in a manner similar to their mothers. Successful parental performances contribute to the adoption of preadolescents' oral health behaviors directly by a modeling mechanism (Aström & Jakobsen, 1996; Jacobs & Bleeker, 2004) and indirectly by their positive impact on self-efficacy development (Bandura, 1997; Jacobs & Bleeker, 2004). These two mechanisms, as parts of observational learning, are the basic patterns for human acquisition of knowledge, and they work regardless of cultural differences (Bandura, 2002). In the present study, regarding the direct mechanism, Turkish preadolescents, reporting less frequent recommended toothbrushing and sweet consumption, were more likely to model their mothers' corresponding non-recommended oral health behaviors, whereas the Finns, more frequently performing recommended toothbrushing and sweet consumption behaviors, modeled corresponding positive maternal oral health behaviors. The pattern of indirect mechanism may be explained in the present study as follows: observation of maternal recommended oral health behaviors among all preadolescents improved their self-efficacy beliefs, and this in turn was reflected as the recommended toothbrushing and sweet consumption. This finding coincides with Chiu's (2005), who stated that parental modeling increased adolescent's self-efficacy, which had a direct impact on better adherence to diabetes care regimes.

Finnish preadolescents with mothers reporting high MSE more frequently reported recommended toothbrushing behavior and higher TBSE. High MSE plays a direct role in influencing the recommended toothbrushing behavior of children from different cultures (Pine et al., 2000; Adair et al., 2004) and the development of self-efficacy beliefs among adolescents (Stokes et al., 2006). Even though no such relationship regarding MSE and preadolescent

toothbrushing was observed for Turks, still the findings may be evaluated as a contribution, but in a negative manner, to the preadolescents' toothbrushing behavior. According to the Social Cognitive Theory, self-efficacy beliefs do not result in action when individuals have no expectations of a positive outcome by performing the specific tasks (Bandura, 1997), such as compliance with preventive dental advice (Barker, 1994) and eating healthy food (Lau et al., 1990). Turkish mothers reporting very low rates of recommended toothbrushing may have taken no action to support their preadolescent's twice daily toothbrushing, because they less frequently reported a strong belief in the benefit of the corresponding behavior in the preadolescent daily routine. Turkish preadolescents may therefore lack maternal empowerment and motivation for achieving recommended toothbrushing, as already found by Lau et al. (1990), in terms of positive parental beliefs' contribution to adolescents' health-enhancing behaviors.

Turkish preadolescents whose mothers were highly dentally anxious were more likely to report high dental anxiety, which is in line with the earlier studies among children (Klingberg et al., 1995; Locker et al., 1999). Emotional responses such as anxiety are learned from direct experience or acquired observationally (Bandura, 1977). Turkish preadolescents reporting high frequency of irregular dental visits may more often have had experience of negative consequences of dental treatment such as pain and invasive restorations. High dental anxiety may be due to such traumatic dental visits (Klingberg, 1995; Poulton et al., 1997) or to observation of fearful maternal emotions during treatment or verbal expressions in daily life. In Turkey, adults experience dental extraction at a higher rate (Gökalp et al., 2007b), leading to negative conditioning concerning dental visits. It is common among Turkish mothers with low education to scare children by saying they will take them to the dentist for injections or tooth extraction to make them perform some positive behavior such as being quiet or eating promptly. No significant associations appeared between maternal and preadolescent dental anxiety among the Finns, most probably due to regular dental check-ups and prevention-oriented oral health care provided for each child up to 18 years. Finnish preadolescents may be so well-acquainted with the dental environment and procedures that their attitudes are good, and therefore any possible expressions of maternal anxiety do not influence so much their corresponding emotional state.

Societal influences affect the interrelation between preadolescents' and maternal oral health behaviors, cognition, and affect. Turkish preadolescents and their mothers compared to the Finns, reported poorer oral health behaviors and experienced higher dental anxiety and lower self-efficacy, most probably due to the socio-economic inequalities and differing beliefs and attitudes towards oral health among Turkish families. Corresponding studies have found that the contribution of a poor socio-economic profile to oral health behaviors, dental anxiety, and to self-efficacy among adults is negative (Moore et al., 1993; Adair et al., 2004). This is especially important for children's oral health, considering that they mostly imitate their mothers' oral health behaviors (Rossow, 1992; Astrøm & Jakobsen, 1996; Astrøm, 1998; Okada et al., 2002; Poutanen, 2007). A similar impact appeared, in the present study, among public-school preadolescents and their mothers, who had poor societal status, had less frequent recommended toothbrushing and regular dental visits, as compared to their private-school counterparts. In Turkey, dental services are used mostly by those who experience dental problems, and visiting a dentist is positively related to the level of education and income (Mumcu et al., 2004). In addition, the significance of oral health and its contribution to general

health is poorly known. All these consequences thus have a more negative influence on those families with a poor socio-economic status.

6.1.4 The interrelation between non-biologic determinants, general well-being, and oral health among Turkish and Finnish preadolescents

Interrelation between preadolescent determinants, general well-being, and oral health

Recommended toothbrushing among all preadolescents and recommended sweet consumption among Finnish preadolescents contributed to good school performance. Toothbrushing behavior has been found to directly contribute to school performance among school children in international comparative studies (Rise et al., 1991; Kuusela et al., 1997). Koivusilta et al. (2001, 2003) has found that twice daily toothbrushing and less than daily sweet consumption in preadolescents and adolescents predict their better education level in early adulthood, which contributes to better socio-economic and health status in adulthood. The corresponding finding among all preadolescents in the present study should lay a basis for oral health promotion strategies to diminish possible socio-economic and health inequalities during the lives of these young people.

All preadolescents reporting high self-efficacy, TBSE and DSE, had better school performance. The corresponding studies focus mainly on a specific domain of self-efficacy, finding that high academic self-efficacy contributes to better school achievement (Robbins et al., 2004; Skaalvik & Skaalvik, 2004). The role for health-specific self-efficacy measures in school performance has been a neglected issue. Youngsters who are confident of their ability in academic achievement attain superior grades in school (Caprara et al., 2004). This might be the case in the present study, that high self-efficacy, “self-competence,” in maintaining and promoting their own oral health positively affected “self-competence” in their scholastic capacity and therefore contributed to better school achievement. Another explanation might be considered: That high self-efficacy, due to its positive impact on recommended oral health behaviors, leads to better oral health, the consequences of which (like less pain and increased quality of life) contributed to better school performance. In line with this assumption, those Turkish and Finnish preadolescents with better clinical dental health and self-reported dental health reported better school performance, which coincides with earlier studies among school-aged children (Weissenbach et al., 1995; Crowley et al., 2003; Muirhead & Marcenes, 2004; David et al., 2005; Blumenshine et al. 2008).

Among Turkish and Finnish preadolescents, high dental anxiety contributed to low self-esteem and self-efficacy, regardless of cultural differences. In the oral health-related literature, the relationships between these three measures have been studied separately. High dental anxiety is directly associated with low self-esteem (Locker, 2003) and with low self-efficacy among adults (Skaret et al., 2003), and with preadolescents’ self-efficacy beliefs about their positive behaviors during a future dental visit (Liddell & Murray, 1989). Considering the negative impacts of high dental anxiety and low self-efficacy on oral health behaviors, their interrelation may lead to a significant deterioration in oral health and therefore to low self-esteem. This might be the case in the present study; those Turkish and Finnish preadolescents having, respectively, poor clinical- and poor self-reported dental health reported low self-esteem. The corresponding association has been proposed in terms of its significance (Kwan & Petersen,

2003) but studied very rarely. Dumitrescu et al. (2008) found that university students who were less likely to perceive their oral health status as good had higher levels of unstable self-esteem. This association may also contribute to poor school performance, as high self-esteem is interrelated with school performance (Kwan & Petersen, 2003; Suldo et al., 2006). In line with the association between oral health, self-esteem, and school performance seen in the present study, Blumenshine et al. (2008) has found that children with poor general health and oral health are more likely to perform poorly at school.

Interrelation between maternal and societal influences, general well-being, and oral health

The Finnish preadolescents whose mothers showed recommended sweet consumption had better self-reported dental health. This seems to be in line with an earlier finding (Poutanen, 2007) that poor maternal oral health behavior was associated with high dental caries among children. Studies concerning the direct association between high dental caries and poor maternal attitudes towards diet (Skeie et al., 2006b) and oral health behaviors (Okada et al., 2002) provide further evidence. Mothers act as role models for their children not only by their behavior but also by their attitudes-specific emotional responses to certain circumstances (Bandura, 1977). Children observing their mothers' behavior and emotional response learn how to react and behave in similar circumstances. Children whose mothers exhibit poor dietary behaviors and negative attitudes towards healthy eating may model these patterns and therefore have poor oral health. Maternal modeling seemed to contribute to Finnish preadolescents' general well-being, as well. The Finns whose mothers brushed their teeth twice daily had better school performance. This might be a consequence of preadolescents observing their mothers' recommended toothbrushing practices which might have led to brushing their own teeth twice daily, which in turn, might have contributed to their better school performance. It may be proposed that maternal modeling, in terms of recommended maternal health behavior, acts as a common underlying factor for better school performance and oral health.

Maternal interaction pathways with preadolescents contributed to self-esteem. Turkish preadolescents who spent more time with their mothers on a school day were more likely to report high self-esteem. Family factors play an important role in the development of self-esteem (Heinonen et al., 2003). Children's or adolescents' perception of authoritative parenting (Carlson et al., 2000), and parental warmth (Paulson et al., 1991) contribute to high self-esteem. In authoritative parenting, achievement of common family goals cooperatively and spending time with the family are among the significant norms of collectivist culture in Turkey. In the present study, increased time spent with the mother may thus lead to the development of high self-esteem and therefore better oral health among Turkish preadolescents. Increased time spent with mother as well as a two-parent family had a direct impact on better clinical dental health among Finnish preadolescents. Children have a high level of caries if they live in single-parent families (Mattila et al., 2000) and if their mothers show less warmth and have poor parental support (Nicolau et al., 2005; Skeie et al., 2006b) and poor maternal oral and general health attitudes (Pine et al., 2004; Mattila et al., 2005b; Skeie et al., 2006b). Finnish mothers more frequently reported a strong belief in taking time to check preadolescents' toothbrushing and belief in the benefit of adopting corresponding behavior for the preadolescent daily routine. These preadolescents are therefore more likely to have more favourable oral health as they grow up in a family environment that promotes oral health,

comprising positive oral health practices, parental support (trust, love, attention, and understanding), and family connectedness.

Body height, a potential indicator of the long-term cumulative effects of inadequacies of health (United Nations, 1997), was significantly associated with DMFT among both groups. This association, which was also found by Nicolau et al. (2005), is not a cause-effect relationship; it indicates understanding the impact of family-related disadvantages, either economic or social or both, on the preadolescent's developmental patterns and dental health over a whole life-span. A higher number of children in the family reflects early-life socio-economic disadvantages in the life-course-approach: As family size grows, human and material resources diminish (Chittleborough et al., 2006). The Turkish preadolescents living in families with a higher number of children were more likely to have caries and shorter body height, compatible with an earlier finding among adolescents (Nicolau et al., 2005). Additionally, the negative correlation found between weight and number of children in the family among Turkish preadolescents may result from the contribution of low societal status to consumption of a nutritionally inadequate diet (Keskin et al., 2005; Vereecken et al., 2005).

Finnish preadolescents with high levels of caries were more likely to be of lower body height and higher weight, to come from single-parent families, and to spend less time with the mother. Finnish adolescents living in single-parent families, a situation increasing in Finland, are more likely to be at increased risk for health problems (Finnish Heart Association, 2005). They are also more likely to consume snacks if they spend less time with their parents (Ministry of Social Affairs & Health, 2006). These patterns may signal the association between caries and obesity, as found by Willershausen et al. (2004) and Cinar & Murtomaa (2008), in the light of early studies that have found obesity and higher caries rates to be associated with family-related societal disadvantages such as a single-parent family and poor parenting (Nicolau et al., 2005; Gibson et al., 2007).

6.2. Methodological aspects of the study

For assessment of how non-biologic determinants of oral health are interrelated with each other and with oral health among preadolescents in one country lacking a well-established health care and social welfare system, a survey conducted in such a country (e.g. Turkey) may help to assess the corresponding relations. Turkey has high inequalities in socio-economic and health status: those of low family affluence comprise 70% (WHO, 2008). Finland, with low family affluence at 13% (WHO, 2008), was chosen as a positive control group to represent better oral health and socio-economic conditions, and therefore Munkkiniemi, where people with a high economic level, and education, was preferred. In addition, Munkkiniemi is one of the areas of Helsinki where the DMFT is lower than the national mean value.

The questionnaires were distributed to Turkish and Finnish preadolescents in the fourth, fifth, and sixth grades at the schools participating in the survey. Since, in Turkey, the public and private schools differ in some respects, such as the higher number of students in public school classrooms, the classroom served as the sample unit, as suggested by WHO (1998), and then proportional assignment by age groups was performed. The main reason for non-response and non-participation for the questionnaires and oral health examinations, were, respectively, absence from school on that particular date and dental anxiety. The high participation in oral

health examinations (95%), and relatively high response rates for preadolescents (97%) and their mothers (87%), supported by personal visits in each classroom, improved the representativeness of the sample. Response rates of Finnish preadolescents (65%) and their mothers (58%) were moderate. The main reason for non-response was that the mothers did not provide their written consent.

The preadolescents and mothers filled out their questionnaires individually, which also enhances the strength of this study. Systematic measurement errors are less likely than if the respondents report health-related attitudes, beliefs, and behaviors for other family members (Poutanen, 2007). For increased validity and reliability of the data, the contents of the carefully designed questionnaires were revised based on discussions with four academicians, and ten children and their mothers in Finland.

In order to receive accurate responses, the questionnaires were distributed either at early hours in the morning or after lunch-time on school days (Macgregor & Balding, 1999). Further information on the content of questionnaires and how to answer the questions was explained on each questionnaire. The questionnaires included mostly close-ended questions with several answers to improve the accuracy of responses. In order to motivate the preadolescents to reply to the questionnaires, all participants in the survey were rewarded with small oral health-promotion gifts.

In questionnaire surveys, non-response can induce bias, leading to distortion in the results (Locker, 2000). Non-response means a failure to collect data from some of the individuals or on some of the items. Item non-response may introduce considerable error, even when the response rate is high among individuals (Locker, 2000). In the present study, for Turkish and Finnish preadolescents, an average of 4.8% and 2.9%, respectively, of the item-specific values were missing. Corresponding rates for mothers were, respectively, 5.2% and 1.6%. The questionnaires were extensive, consisting of structured questions and psychometric scales for preadolescents and mothers. Among all preadolescents, non-response was found most often for the item "How do you rate your school performance?" and among all mothers, "If you were about to have a tooth drilled, how would you feel?"

A self-assessment questionnaire was used as a survey instrument, since it is a quick, practical, and economical means of data collection (Pitiphat et al., 2002). In addition, self-reported measures comprising oral health behaviors (toothbrushing behavior, intake frequency of snacks, consumption of sweets, use of dental services) and societal factors are among the essential oral health indicators in Europe (Bourgeois & Llodra, 2004). However, the tendency towards giving positive and socially acceptable answers may be a source of bias (Sjöstrom & Holst, 2002). The explanation was included in oral and written form, respectively to preadolescents and to their mothers, that there were no right or wrong answers for the survey items, and further, that the identity of the respondents would remain anonymous.

The direct association between preadolescents' poor self-reported dental health and high DMFT indicates that the corresponding questions were valid, as already found by Östberg et al. (2002). Earlier studies provide evidence that the reliability of self-reports of toothbrushing frequencies from mothers (Pine et al., 2004), preadolescents (Koivusilta et al., 2003), and adolescents is good (Brener et al., 1995).

Psychometric measures in the present study were tested in the pilot study and had moderate to high validity and reliability. Psychometric tools developed to assess two health-specific self-efficacy variables, namely TBSE- and DSE scales, indicated high-level internal consistency, test-re-test reliability, and evidence for construct validity. Cronbach coefficients showed acceptable evidence of internal consistency and reliability for the modified MSE Scale among the Turks and the Finns. “To the best of our knowledge,” this was the first time that these maternal and preadolescent self-efficacy scales specific to the oral health behavior of preadolescents have been analyzed for different cultures. In logistic regression analysis where TBSE, MSE, and maternal toothbrushing were assessed as the explanatory variables for preadolescent toothbrushing, high OR defining the association between TBSE and preadolescent toothbrushing among the Finns may sound like an overlap. This therefore needs further study.

Self-report measures of anxiety are inexpensive, flexible, and easy to administer (Streiner & Norman, 1989). The MDAS, instead of the widely employed Corah’s Dental Anxiety Scale (CDAS), was used for preadolescents and their mothers. The MDAS, compared to CDAS, is easier to understand and respond to. Further, the CDAS, unlike the MDAS, can provide meaningful measures of extremely high or extremely low dental anxiety only (Humphris et al., 1995, 2000). The MDAS for children was employed with children in a school setting directly and was found reliable and valid (Wong et al., 1998). Among all mothers, the highest item-specific non-response rate for the MDAS was 8.8% among the Turkish and 2.2% among the Finnish mothers. All preadolescents replied to the MDAS separately from their mothers in school settings, and non-response was most common for the item “How do you feel about having a tooth taken out?” as 2.6% for the Turks and 15.8% for the Finns. The high non-response rate among Finns can be explained, as the caries experience is low among these children due to regular check-ups and increased awareness of oral health. A dental extraction is rarely experienced, making extraction unfamiliar to some Finnish preadolescents. In addition to the high validity and reliability of the MDAS for preadolescents and their mothers, and its low item-specific nonresponse rates, MDAS, in general, seems to prove a uniform and comprehensible method.

Global self-esteem, generally measured by Rosenberg’s Self-Esteem Scale (Rosenberg, 1965), is unidimensional, measuring one’s overall positive-negative attitude toward one’s self. However, self-esteem, personal judgment of an individual’s worth, is derived from the reflected appraisal of others (Macgregor & Balding, 1991), and it thus has a social link. Tafarodi & Swann (1995) have noted individual and social dimensions of self-esteem. The self-esteem scale used in the present study examines these two dimensions: How preadolescents “view themselves” in the eyes of their school friends and teachers, and how they feel about themselves and their lives. Its association with individual, maternal, and societal factors in the present study speaks for its bi-dimensional structure. Its direct association with self-efficacy and dental anxiety among Turkish and Finnish preadolescents, despite the cultural differences, provides some evidence for the global character of self-esteem and of the interrelation of these measures. In addition, the findings supporting the well-known better school performance — high self-esteem relationship among all preadolescents indicates the validity and reliability of this self-esteem scale.

Although the measurements of body height and weight by self-report may hide possible biases, parent-reported body measurements for adolescents have been shown to be reliable and valid (Sekine et al., 2002). As the aim concerned the association between body height-weight and DMFT separately for Turkish and Finnish preadolescents, genetic or other factors that may lead to differences on these measures between these countries was of no concern.

In both countries, dental health data were collected by use of WHO-standardized recording criteria that are also practical and reliable under field conditions (WHO, 1997). Use of such criteria facilitates other comparisons such as the study performed concerning Estonia and Denmark, countries respectively without and with a national dental data bank (Dragheim et al., 2000). Due to the low caries prevalence in Finland, one can doubt whether separate clinical examinations would have yielded information that was more reliable regarding dental status. In Turkey, before the oral health examinations, and on that particular date, each preadolescent was informed about the oral examination instruments and procedures, to reduce any non-participation due to dental anxiety. To prevent any possible bias in oral health examinations by questionnaire, these were performed two weeks after the cessation of the survey. The Kappa statistic is used to measure intra- and inter-examiner reliability, as already mentioned (Dawson & Trapp, 2004) and is widely used in oral health examinations (Amarante et al., 1998; Assaf et al., 2006). Reliability is required to be in the range of 0.85 to 0.95 (WHO, 1997). The good reliability of DMFT data (inter-examiner agreement 0.89; intra-examiner agreement 0.96, and 0.92) recorded in Turkey may be explained by the examiners' being two pediatric dentists who have routinely used WHO diagnostic criteria for clinical examinations. Some earlier studies among children, preadolescents, and adolescents have reported similar kappa values as in the present study (Amarante et al., 1998; Assaf et al., 2006). Prevalence of DMFT can be affected by gender, and by age (Aleksejuniene et al., 1996; Alvarez-Arenal et al., 1998) and therefore, an age- and gender-adjusted odds ratio was used to assess the effect of selected parameters on dental health status of preadolescents independent of either age or gender.

Factor analysis is used to uncover the latent dimensions of a set of variables. It reduces a larger number of variables to a small number of factors, and it does not assume that a dependent variable is specified. Principal component analysis, the most common form of factor analysis, seeks a linear combination of variables such that the maximum variance is extracted. It then removes this variance, categorizing this as the first factor, and seeks a second linear combination which explains the maximum proportion of the remaining variance. The eigenvalue measures the amount of variation in the total sample accounted for by each factor; a smaller value for a factor means that it contributes little to the explanation of variances in the variables (Garson, 2008). In the pilot study, validation of the TBSE and DSE was performed by Principal Component analysis, using Kaiser Criteria (eigenvalue greater than one) that worked well—as in earlier studies (Stewart et al., 1997; Schwarzer, 2008).

7. Conclusions

The self-efficacy scales studied may serve as holistic measures by which maintenance, adoption, and improvement of oral health and the behavior related to it may be sustained through interventions. To verify the potential of these measures requires further research.

Building high self-esteem and high self-efficacy and reducing dental anxiety can lead preadolescents to think and to feel that they have control over their oral health and behaviors as well as well-being; it can therefore help them become empowered individuals. These three measures should not be considered in isolation: The reciprocal interaction patterns between self-esteem, self-efficacy, and dental anxiety should be explored further, along with maternal and societal influences, and integrated into oral health-promotion programs.

The present study findings emphasize the significance of maternal factors and self-efficacy as determinants of toothbrushing behavior, despite cultural differences. It underlines the need for integration of preadolescent and maternal self-efficacy as well as the mothers' toothbrushing behavior into oral health intervention programs.

Mothers act as role models for the oral health behavior, self-efficacy, and dental anxiety of their preadolescents. This important role of mothers in adoption of healthy lifestyles among preadolescents should be evaluated in conjunction with maternal interaction patterns with preadolescents and societal influences. There exists a need for empowerment of mothers in healthy lifestyles including positive oral health behaviors, high self-efficacy beliefs, and reduction of dental anxiety, in order to enhance the oral health and general well-being of preadolescents, in developing countries in particular.

Schools play a pivotal role in a child's social and psychological well-being. A child's oral health is intricately intertwined with self-esteem and success in school. Oral health-related contributors to this interrelation, found in the present study as preadolescent, maternal, and societal influences, should be explored further. Holistic health promotion programs, including oral health and general well-being, should be implemented in schools.

Attempts to reduce oral health inequalities among preadolescents through mere alteration in behaviors will not be likely to be very influential if the individual cognitive-affective, maternal, and societal determinants, and also well-being measures, are not considered as well, according to holistic behavioral theories.

8. Recommendations

Many health-detrimental behaviors arise from the school age years and are unlikely to change later. Schools have powerful influences on children's development and well-being. Therefore, oral health promotion in schools should be integrated into general health promotion, school curricula, and other activities.

Health promotion messages should be reinforced in schools, enabling children and their families to develop lifelong sustainable positive health-related skills (self-esteem, self-efficacy) and behaviors.

School health services should be established and developed, especially in developing countries, to monitor the oral health and well-being of children and to educate them, with their families, in preventive health care approaches and healthy lifestyles. Special care and health promotion activities should be implemented for the deprived.

Placing more emphasis on the behavioral sciences, preventive approaches, and community-based education should encourage social responsibility and health-promoting roles among dentists, especially in developing countries.

Further cross-national and national surveys should be performed based on health promotion/behavior models specific for children, in order to assess opportunities and threats to oral health and the general well-being of children.

Regular, systematic, and standardized health surveys comprising self-reported oral and general health measures, behavior, cognition, and affect, as well as maternal influences, should be performed among school-children, especially in developing countries such as Turkey with no data bank for oral health, because these self-reports closely reflect oral and general well-being.

Specifically, in Turkey, with no prevention-oriented oral health care system, the cooperation of pediatricians and dentists is necessary to enhance preadolescents' well-being. In addition, health centers and posts as well as maternal health clinics, in collaboration with dental clinics, should provide information on oral health and on reinforcement of oral health-related skills for mothers.

In Turkey, congresses and seminars as well as media participation in various aspects of oral health should be integrated into general health promotion, especially for families. The content of these activities should be designed to consider the behavioral, cognitive, affective, and societal differences between those of higher and lower socio-economic status.

9. Summary

Inequalities in the oral and general well-being of children are increasing among and within the developed and developing countries. Empowerment of children, the fundamental principle and the objective and outcome of health promotion, serves as a key tool in reducing these inequalities and providing a better quality of life for all. To achieve these goals, the need is to improve ways of feeling (affect), thinking (cognition), and behaving related to oral and general well-being among children and to create supportive social environments for these. Improvement of these psycho-social gradients in oral and general well-being are even more important in developing countries, like Turkey, with poorly organized and treatment-oriented health systems and with lack of social awareness of the oral health—general well-being interaction.

The general aim of the present study was to investigate how non-biologic determinants of oral health (behavior, cognition, and affect, maternal and societal influences) were interrelated with each other and with oral health among preadolescents in two quite different oral health care and cultural settings, Turkey and Finland. In addition, the interrelation between preadolescents' self-efficacy and general well-being and the contribution of both to their oral health was explored. The working hypotheses that were fulfilled were as follows: a) Preadolescents' self-efficacy and dental anxiety are associated with maternal modeling, their own oral health behaviors and societal factors, and, further, all these factors are interrelated with each other and with oral health. b) Specifically, regardless of cultural and socio-economic differences, self-efficacy contributes positively to oral health and related behaviors, and good general well-being is positively interrelated with oral health.

The cross-sectional study of Turkish (n=611) and Finnish (n=223) school preadolescents, from the fourth, fifth, and sixth grades, aged 10 to 12, was based on self-administered and pre-tested health behavior questionnaires for preadolescents and their mothers and preadolescents' oral health records. Both questionnaires assessed self-reported dental health and dental health-related behaviors along with cognitive-affective factors (self-efficacy and dental anxiety). In addition, health behavior questionnaires for preadolescents (PHBQ) included questions on self-esteem and self-reported gingival health measures whereas those for mothers (MHBQ) surveyed socio-economic factors, dietary habits, and body-weight and -height measurements of preadolescents. The PHBQs were completed in classes, whereas the MHBQs were taken to and from home by the preadolescents. The dental examinations in Turkey, based on WHO criteria (1997), were carried out in the classrooms two weeks after the questionnaire survey by two calibrated pediatric dentists who worked professionally in dental university clinics. Finnish preadolescents' oral health data came from the records kept at the Helsinki City Health Department, with permission.

Among the Turks, PHBQ was 97% (n=591) and 87% for MHBQ (n=533). The corresponding rates for the Finns were 65% (n=223) and 53% (n=182). Rates for oral health examinations were 95% for Turks (n=584) and 65% for Finns (n=223).

Clinically assessed dental (DMFT) and self-reported oral health of Turkish preadolescents were significantly poorer than those of the Finns. Similar associations were observed for well-being measures (body height and weight, self-esteem), except for the school performance. Turkish preadolescents also reported more frequent non-recommended oral health behaviors and lower

self-efficacy but higher dental anxiety than did the Finns. A similar association was observable between Turkish and Finnish mothers.

The results showed that non-biologic determinants of oral health (behavior, cognition, and affect, maternal and societal influences) were interrelated with each other in various patterns among Turkish and Finnish preadolescents. Of these preadolescents, those with high toothbrushing self-efficacy (TBSE) were more likely to report recommended toothbrushing. Similarly, all preadolescents with high dietary self-efficacy (DSE) were more likely to report recommended toothbrushing and sweet consumption. High levels of these two self-efficacy measures contributed to low dental anxiety in various patterns among Turkish and Finnish preadolescents.

Mothers were role models for toothbrushing and sweet consumption behaviors of all preadolescents, regardless of cultural differences. All preadolescents reporting high TBSE were more likely to have mothers practicing recommended toothbrushing. Among Finns, better cognitive and affective maternal characteristics (high self-efficacy and low dental anxiety) contributed positively to preadolescents' recommended toothbrushing and high TBSE. Among the Turks, a significant association appeared between maternal and preadolescent high dental anxiety.

The impact of societal influences was very significant among the Turks. Mothers of public school preadolescents reported a poorer societal profile and oral health behavior than did mothers of private school preadolescents. Public school preadolescents were more likely to imitate the non-recommended toothbrushing and sweet consumption behaviors of their mothers, whereas their counterparts in private school followed a similar trend for recommended maternal toothbrushing.

In addition, the interrelation between preadolescents' self-efficacy and general well-being and its contribution to their oral health was explored. General well-being measures, self-esteem, and school performance, were positively correlated with self-efficacy measures among all preadolescents. Clustering between high self-esteem and low preadolescent- and maternal- dental anxiety was evident in various patterns for Turkish and Finnish preadolescents. Among all preadolescents, the common predictor for better school performance was recommended toothbrushing.

Oral health and general well-being of preadolescents were interrelated. Among all preadolescents, DMFT was negatively correlated with better school performance. Body height and the societal factors were the common explanatory variables accounting for DMFT. TBSE and school performance contributed positively to self-reported dental health, similarly, among all preadolescents. Self-esteem and maternal sweet consumption among Finns, but number of children in the family and preadolescent toothbrushing among Turks were the other contributors of self-reported dental health.

Based on these findings, a need exists for improvement in Turkish preadolescents' and their mothers' oral health behaviors, cognition, and affect. Separately studied associations in the literature (in pairs); self-efficacy—behavior, child—mother health behavior, general well-being—oral health, self-esteem—school performance; were all found by a holistic theoretical framework, regardless of differing cultural, socio-economic, and health-care systems in the two countries, Turkey and Finland. This may demonstrate that the respective associations are turning

out to be part of the global health culture, and therefore the need exists for further similar research including also the complex interaction pathways between these associations in countries with different developmental, cultural, and health-care characteristics. Attempts to increase general well-being and to reduce oral health inequalities among preadolescents will remain unsuccessful if the individual factors, as well as maternal and societal influences, are not considered by psychosocial holistic approaches.

10. Acknowledgements

The present study was executed under the auspices of the Department of Oral Public Health, Institute of Dentistry, University of Helsinki, Finland, from 2003 to 2008. I am grateful to the institute for all the facilities it provided me for the completion of my studies. A study grant by L'Oreal UNESCO Women in Science 2004 is greatly appreciated. I am grateful to the Pediatric Dentistry Department, Faculty of Dentistry, University of Yeditepe, Istanbul, Turkey, for support, help, and encouragement in conduct of this study in Turkey.

I am greatly indebted to my supervisor, Professor Heikki Murtomaa, DDS, MPH, PhD, Head of the Department of Oral Public Health, Institute of Dentistry, University of Helsinki, for his expert supervision, challenging comments, constructive criticism, and constant support throughout my studies. He has been more than a supervisor for me, and his deep knowledge and enormous experience in the profession of oral public health care, and his continuous encouraging support in my study has made the carrying out and finalizing of my research possible. It is a privilege and honor for me to have been his student.

I am deeply grateful to my official referees, Associate Professor Sisko Honkala, DDS, PhD, Institute of Dentistry, University of Turku, and Associate Professor Ossi Rahkonen, DDS, PhD, Department of Public Health, University of Helsinki, for devoting their valuable time to reviewing my work. Their supportive criticism and constructive advice greatly improved the thesis.

I also express my deepest thanks to Professor Nuket Sandalli, DDS, MPH, PhD, Head of the Pediatric Dentistry Department, Faculty of Dentistry, University of Yeditepe, for all her support and help during my research process in Turkey.

I am also thankful to Associate Professor Nilufer Kosku, DDS, PhD, for teaching me the principles of biostatistics and her support during the process of the pilot study in Turkey. I am also thankful to my research colleague Dr. Helena Kuusama for her help and support in performance of the survey in Helsinki, Finland. My warm thanks go to my Turkish colleagues Dr. Sule Kavaloglu, DDS, and Dr. Gozde Isiksal, DDS, for their continuous and friendly support during the clinical examinations in Turkey.

Many thanks are due to my colleague Dr. Battsetseg Tseveenjav, DDS, MPH, PhD, for her continuous support, scientific and social, during my studies, and for help in access to Finnish Oral Health Data. I am very grateful to Dr. Carol Norris, PhD, University of Helsinki, for introducing to me and teaching me the principles of English scientific writing and for carefully editing the language of my work. Numerous people in the Turkish Ministry of Education and Turkish and Finnish primary schools helped me during the study. In addition, all the pre-adolescents and their mothers were cooperative during the study. I thank them for their invaluable help.

I would like to thank our Dean Professor Jarkko Hietanen and Vice Dean Professor Jukka H Meurman for their support in my research. I am grateful to Dr. Kimmo Suomalainen, DDS, PhD, Institute of Dentistry, University of Helsinki, for the clinical advice. I express my deepest thanks to Dr. Heikki Tuutti for his encouragement during the very early stages of my research.

I am also thankful to Arja Wickman for her continuous help and support during my studies. My warm thanks go to the companies in Finland—Colgate, Decubal Clinic, Elmex, Pepsodent, Leaf— and to those in Turkey—KENT (Sweet & Chewing Gum Company), BANAT— for their support of the survey by their oral health- promotion gifts.

My sincere thanks are also extended to my friends and colleagues who contributed in one or another way to work on this thesis and in my stay in Finland during these years. Their love, friendship, and support throughout the years have been invaluable.

I can never thank my father, mother, and my dearest friend-Pamuk-, enough for their love, support, and encouragement. Without their continuous encouragement and belief in my study, my research could have never been completed.

I dedicate this work to my father, mother, as well as to my grand-father and -mother with my love and devotion, and to Mustafa Kemal Ataturk, the founder of Turkish Republic, who presented me as well as all other Turkish women with the right to and the opportunity for advanced and modern studies in a global world.

Ayse Basak Cinar
Helsinki
October 2008

11. References

- Aarø LE, Laberg JC, Wold B. Health behaviors among adolescents: towards a hypothesis of two dimensions. *Health Educ Res* 1995; 10: 83-93.
- Acs G, Lodolini G, Kaminsky S, Cisneros GJ. Effect of nursing caries on body weight in a pediatric population. *Pediatr Dent* 1992; 14: 302-5.
- Acs G, Shulman R, Ng MW, Chussid S. The effect of dental rehabilitation on the body weight of children with early childhood caries. *Pediatr Dent* 1999; 21: 109-13.
- Adair PM, Pine CM, Burnside G, Nicoll AD, Gillett A, Anwar S et al. Familial and cultural perceptions and beliefs of oral hygiene and dietary practices among ethnically and socio-economical diverse groups. *Community Dent Health* 2004; 21(1 Suppl): 102-11.
- Addy M, Hunter ML, Kingdon A, Dummer PMH, Shaw WC. An 8-year study of changes in oral hygiene and periodontal health during adolescence. *Int J Paediatr Dent* 1994; 4: 75-80.
- Agartan TI. Health Sector Reform in Turkey: Old Policies New Politics [Internet]. Paper presented at: Annual meeting of the Midwest Political Science Association; 2005; Chicago, Illinois [cited 23.03.2008]. Available online: http://www.cevipof.msh-paris.fr/rencontres/jours/200509-ante/palier/clegg/YR_papers/Agartan.pdf
- Aggeryd T. Goals for oral health in the year 2000: cooperation between WHO, FDI and the national dental associations. *Int Dent J* 1983; 33: 55-9.
- Alvarez-Arenal A, Alvarez-Riesgo JA, Peña-Lopez JM, Fernandez-Vazquez JP. DMFT, dmft and treatment requirements of schoolchildren in Asturias, Spain. *Community Dent Oral Epidemiol* 1998; 26:166-9.
- Aleksejuniene J, Arneberg P, Eriksen HM. Caries prevalence and oral hygiene in Lithuanian children and adolescents. *Acta Odontol Scand* 1996; 54:75-80.
- Amarante E, Raadal M, Espelid I. Impact of diagnostic criteria on the prevalence of dental caries in Norwegian children aged 5, 12 and 18 years. *Community Dent Oral Epidemiol* 1998; 26: 87-94.
- Anderson R, Ross V. Questions of Communication, A Practical Introduction to Theory. New York: St. Martin's Press Inc; 1998. p. 40-3.
- Antonovsky A. Health, stress and coping: New perspectives on mental and physical well-being. Jossey-Bass: San Francisco; 1979.
- Antonovsky A. Untraveling the mystery of health-how people manage stress and stay well. London: Jossey-Bass; 1987.
- Antonovsky A. The salutogenic model as a theory to guide health promotion. *Health Promot Int* 1996; 11: 11-8.
- Ashley FP, Allen CD. Oral health promotion. In: Murray JJ (ed). *Prevention of oral diseases*. Oxford: Oxford University Press; 1996. p. 139- 46.
- Aspelund A. Förslag till intättandet av en folkskolentand kliniki Helsingfors. Helsinki: 1907. In Mattila ML. Quality-related outcome of pediatric dental health care [dissertation]. University of Turku, Finland; 2001. p. 12-3.
- Aspelund A, Weber T. Till Stadsfullmäktige Helsingfors. Helsinki:1907. In Mattila ML. Quality-related outcome of pediatric dental health care [dissertation]. University of Turku, Finland; 2001. p. 12-3.
- Assaf AV, de Castro Meneghim M, Zanin L, Tengan C, Pereira AC. Effect of different diagnostic thresholds on dental caries calibration- a 12 month evaluation. *Community Dent Oral Epidemiol* 2006; 34: 213-9.
- Astrøm AN, Jakobsen R. The effect of parental dental health behaviour on that of their adolescent offspring. *Acta Odontol Scand* 1996; 54: 235-41.
- Astrøm AN. Parental influences on adolescents' oral health behavior: two-year follow-up of the Norwegian Longitudinal Health Behavior Study participants. *Eur J Oral Sci* 1998; 106: 922-30.
- Astrøm AN, Jakobsen R. Stability of dental health behavior: a 3-year prospective cohort study of 15- and 18-year-old Norwegian adolescents. *Community Dent Oral Epidemiol* 1998; 26: 129-38.
- Astrøm AN, Rise J. Socio-economic differences in patterns of health and oral health behavior in 25 year old Norwegians. *Clin Oral Investig* 2001; 5: 122-28.
- Astrøm AN, Samdal O. Time trends in oral health behaviors among Norwegian Adolescents: 1985-97. *Acta Odonto Scand* 2001; 59: 193-200.
- Astrøm AN. Stability of oral health-related behaviour in a Norwegian cohort between the as of 15 and 23 years. *Community Dent Oral Epidemiol* 2004; 32: 354-62.
- Ayhan H, Suskan E, Yildirim S. The effect of nursing or rampant caries on height, body weight and head circumference. *J Clin Pediatr Dent* 1996; 20: 209-12.
- Baelum V, Lopez R. Periodontal epidemiology: towards social science or molecular biology? *Community Dent Oral Epidemiol* 2004; 32: 239-49.
- Balding J. The health behaviour related questionnaire (version 15). Exeter, UK: University of Exeter, Schools Health Education Unit; 1990.

- Baldwin SA, Hoffmann JP. The Dynamics of Self-Esteem: A Growth-Curve Analysis. *Youth Adolesc* 2002; 31: 101-13.
- Bandura A. *Social Learning Theory*. USA: Prentice-Hall; 1977.
- Bandura A. *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice-Hall; 1986.
- Bandura A. Self-efficacy; The exercise of control. USA: WH Freeman and Company; 1997. p. 5-8.
- Bandura A. Social Cognitive Theory in Cultural Context. *Appl Psychol* 2002; 51: 269-90.
- Bandura, A. Guide for Constructing Self-Efficacy Scales. In Pajares F, Urdan T (eds). *Self-Efficacy Beliefs of Adolescents*. Greenwich: Information Age Publishing; 2006. p. 307-37. (draft available in 2003 by permission of the author).
- Barker T. Role of health beliefs in patient compliance with preventive dental advice. *Community Dent Oral Epidemiol* 1994; 22: 327-30.
- Bartley M, Blane D, Montgomery S. Health and the life course: why safety nets matter. *BMJ* 1997; 19: 314: 1194-6.
- Batchelor P, Sheiham A. The limitations of a 'high-risk' approach for the prevention of dental caries. *Community Dent Oral Epidemiol* 2002; 30: 302-12.
- Bauer G, Davies JK, Pelikan J, Noack H, Broesskamp U, Hill C. Advancing a theoretical model for public health and health promotion indicator development. *Eur J Public Health* 2003; 13(Supplement 1): 107-13.
- Bedell JR, Lennox SS. *Handbook for Communication and Problem-Solving Skills Training: A Cognitive-Behavioral Approach*. USA: John Wiley and Sons; 1997. p. 58-64.
- Bedi R, Sutcliffe P, Donnan PT, McConnachie J. Preventive oral health related behaviour of dentally anxious schoolchildren aged 13-14 years in Lothian, Scotland. *Community Dent Health* 1992; 9: 19-29.
- Bedi R, Sutcliffe P, Donnan PT, McConnachie J. Oral cleanliness of dentally anxious schoolchildren and their need for periodontal treatment. *ASDC J Dent Child* 1993; 60: 7-21.
- Bedos C, Brodeur JM, Arpin S, Nicolau B. Dental caries experience: a two-generation study. *J Dent Res* 2005; 84: 931-6.
- Ben-Shlomo, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspective. *Int J Epidemiol* 2002; 31: 285-93.
- Bergman MM, Scott J. Young adolescents' wellbeing and health-risk behaviours: gender and socio-economic differences. *J Adolesc* 2001; 24: 183-97.
- Best A, Moor G, Holmes B, Clark PI, Bruce T, Leischow S et al. Health promotion dissemination and systems thinking: towards an integrative model. *Am J Health Behav* 2003; 27 Suppl 3:S206-16.
- Bhuyan KK. Health promotion through self-care and community participation: Elements of a proposed programme in the developing countries. *BMC Public Health* 2004, 4:11.
- Brener ND, Collins JL, Kann L, Warren CW, Williams BI. Reliability of the Youth Risk Behavior Survey Questionnaire. *Am J Epidemiol* 1995; 141: 575-80.
- Blumenshine SL, Vann WF Jr, Gizlice Z, Lee JY. Children's School Performance: Impact of General and Oral Health. *J Public Health Dent*. Forthcoming 2008. (draft is available by permission).
- Bolin AK, Bolin A, Jansson L, Calltorp J. Children's dental health in Europe. *Swed Dent J* 1997; 21: 25-40.
- Bong M, Clark RE. Comparison between self-concept and self-efficacy in academic motivation research. *Educational Psychologist* 1999; 34: 139-53.
- Bourgeois D, Llodra JC (eds). *European Global Oral Health Indicators Development Project*. France: Quintessence International; 2004. p. 8-10.
- Brug J, Lechner L, De Vries H. Psychosocial determinants of fruit and vegetable consumption. *Appetite* 1995; 25: 285-96.
- Brug J, Oenema A, Ferreira I. Theory, evidence and intervention mapping to improve behavior nutrition and physical activity interventions. *Int J Behav Nutr Phys Act* [Internet]. 2005 [cited 24.03.2008]; 2: 7p. Available online: <http://www.ijbnpa.org/content/pdf/1479-5868-2-2.pdf>
- Bruhn JG, Parcel GS. Current knowledge about the health behavior of young children: A conference summary. *Health Education Quarterly* 1982; 9: 142-165.
- Bulman JS, Osborn JS. *Statistics in Dentistry*. London: BDJ Books; 1989. p. 58-106.
- Bunton R, Murphy S, Bennett P. Theories of behavioural change and their use in health promotion: some neglected areas. *Health Educ Res* 1991; 2: 153-62.
- Burt A. Prevention policies in the light of the changed distribution of dental caries. *Acta Odontol Scand* 1998; 56: 179-86.
- Burt BA. Concepts of risk in dental public health. *Community Dent Oral Epidemiol* 2005; 33: 240-7.
- Byrne DG, Mazanov J, Gregson RAM. A Cusp Catastrophe Analysis of Changes to Adolescent Smoking Behaviour in Response to Smoking Prevention Programs. *Nonlinear Dynamics Psychol Life Sci* 2001; 5:pp. 115-37.

- Caprara GV, Barbaranelli C, Pastorelli C, Cervone D. The contribution of self-efficacy beliefs to psychosocial outcomes in adolescence: predicting beyond global dispositional tendencies. *Pers Individ Dif* 2004; 37: 751-63.
- Carver SC, Scheier MF. *On the Self-Regulation of Behavior*. Cambridge: Cambridge University Press; 1998. p. 275-95.
- Carlson, C, Uppal S, Prosser EC. Ethnic differences in processes contributing to the self-esteem of early adolescent girls. *J Early Adolesc* 2000; 20: 44-68.
- Chiu HJ. A test of the Bruhn and Parcel Model of Health Promotion. *J Nurs Res* 2005; 13: 184-96.
- Christensen P. The health-promoting family: a conceptual framework for future research. *Soc Sci Med* 2004; 59:377-87.
- Chittleborough CR, Baum FE, Taylor AW, Hiller JE. A life-course approach to measuring socioeconomic position in population health surveillance systems. *J Epidemiol Community Health* 2006; 60: 981-92.
- Cinar AB. Agiz-Dis Sagligi Hizmetlerinde İletisimin Yeri, Onemi ve Hastaların Saglik Davranisina Yonelik Bir Model [Communication; its vitality and essence: Patient-Doctor Relations and A New Health Behavior Model] [master's thesis]. Istanbul, Turkey: University of Istanbul, Business Administration Faculty; 2001. p. 165 (Turkish).
- Cinar AB, Murtomaa H. Clustering of Obesity and Dental Health with Life-Style Factors among Turkish and Finnish Pre-adolescents. *Obesity Facts* 2008; 1: 196-202.
- Clarke M, Locker D, Berall G, Pencharz P, Kenny DJ, Judd P. Malnourishment in a population of young children with severe early childhood caries. *Pediatr Dent* 2006; 28: 254-9.
- Clair S. A Cusp Catastrophe Model for Adolescent Alcohol Use: An Empirical Test. *Nonlinear Dynamics Psychol Life Sci* 1998; 2: 217- 41.
- Conner M, Norman P. *Predicting health behaviour research and practice with social cognition models*. Buckingham: Open University Press; 2003.
- Contento IR, Koch PA, Lee H, Sauberli W, Calabrese-Barton A. Enhancing personal agency and competence in eating and moving: formative evaluation of a middle school curriculum--Choice, Control, and Change. *J Nutr Educ Behav* 2007; 39 (5 Suppl):S179-86.
- Coopersmith S, Feldman R. Fostering a positive self-concept and high self-esteem in the classroom. In Coop RH, White K (eds.). *Psychological concepts in the classroom*. New York: Harper and Row; 1974. p. 192-225.
- Crowley E, O'Brien G, Marcenes W. School league tables: a new population based predictor of dental restorative treatment need. *Community Dent Health* 2003; 20: 78-82.
- Cubukcu EC. Neden Koruyucu Dis Hekimligi? [Why Preventive Dentistry?]. *Hacettepe Toplum Hekimligi Bulteni* [Internet]. 2003 [cited 24.03.2008]; 1: 8p. Available online: <http://www.thb.hacettepe.edu.tr/2003/20034.shtml/> (Turkish)
- Cullen M, Whiteford H. The Interrelations of Social Capital with Health and Mental Health [Internet]. Australia: Commonwealth of Australia; 2001[cited 23.03.2006]. p. 4-13. Available online: [http://wbIn0018.worldbank.org/HDNet/hdocs.nsf/c840b59b6982d2498525670c004def60/b1b679b17824a86a85256c1c006261b7/\\$FILE/social%20capital.pdf](http://wbIn0018.worldbank.org/HDNet/hdocs.nsf/c840b59b6982d2498525670c004def60/b1b679b17824a86a85256c1c006261b7/$FILE/social%20capital.pdf)
- Cusatis DB, Shannon BM. Influences on Adolescent Eating Behavior. *J Adolesc Health* 1996; 18: 27-34.
- David J, Wang NJ, Aström AN, Kuriakose S. Dental caries and associated factors in 12-year-old schoolchildren in Thiruvananthapuram, Kerala, India. *Int J Paediatr Dent* 2005; 15: 420-8.
- Dawson B, Trapp GR. *Basic & Clinical Biostatistics*, 4th ed. USA: The McGraw-Hill Companies, Inc.; 2004. p. 149-52.
- DeBlase CA. *Dental Health Education: Theory and Practice*. Pennsylvania: Lea & Febiger; 1991. p. 83-97.
- Department of Health. *Choosing better oral health: An oral health plan for England* [Internet]. London: Department of Health; 2005 [cited 23.03.2008]. Available online: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4123251/
- Department of Human Services. *Promoting Oral Health 2000-2004: Strategic directions and framework for action*. Melbourne: Health Development Section; 1999. In Department of Health. *Choosing better oral health: An oral health plan for England* [Internet]. London: Department of Health; 2005.
- Donovan JE, Jessor R, Costa FM. Structure of health-enhancing behavior in adolescence: a latent-variable approach. *J Health Soc Behav* 1993; 34: 346-62.
- Downie RS, Tannahill C, Tannahill A. *Health Promotion: Models and Values*. Oxford: Oxford University Press; 1996. p. 67-8.
- Dragheim E, Petersen PE, Kalo I, Saag M. Dental caries in schoolchildren of an Estonian and a Danish municipality. *Int J Paediatr Dent* 2000; 10: 271-7.
- Dumitrescu AL, Dogaru CB, Dogaru CD. Instability of self-esteem and affective lability as determinants of self-reported oral health status and oral health-related behaviors. *J Contemp Dent Pract* 2008; 9: 38-45.

- Eriksen HM, Dimitrov V. Ecology of oral health: a complexity perspective. *Eur J Oral Sci* 2003; 111: 285-90.
- Eriksen HM, Dimitrov V, Rohlin M, Petersson K, Svensater G. The oral ecosystem: implications for education. *Eur J Dent Educ* 2006; 10: 192-6.
- Eriksson M, Lindström B, Lilja J. A sense of coherence and health. Salutogenesis in a societal context: Aland, a special case? *J Epidemiol Community Health* 2007; 61:684-8.
- FDI. Dental Facts about Turkey, 2004 [Internet]. [cited 25.03.2007]. Available online: http://www.fdiworldental.org/resources/3_0facts.html/
- Fejerskov O. Strategies in the design of preventive programs. *Adv Dent Res* 1995; 9: 82-8.
- Fejerskov O, Kidd E (eds). *Dental Caries: The Disease and its Clinical Management*. USA: Blackwell Munksgaard; 2003. p. 165-77.
- Filstrup SL, Briskie D, da Fonseca M, Lawrence L, Wandera A, Inglehart M. Early childhood caries and quality of life: child and parent perspectives. *Pediatr Dent* 2003; 25: 431-40.
- Finlayson TL, Siefert K, Ismail AI, Sohn W. Maternal self-efficacy and 1-5-year old children's brushing habits. *Community Dent Oral Epidemiol* 2007; 35: 272-81.
- Finnish Heart Association. Action plan for promoting Finnish heart health for the years 2005-2011 [Internet]. Helsinki: Finnish Heart Association; 2005 [cited 19.11.2007]. Available online: http://www.sydänliitto.fi/ajankohtaista/en_GB/
- Flay BR, Petraitis J. The Theory of Triadic Influence. *Adv Med Sociol* 1994; 4: 19-44.
- Folayan MO, Idehen EE, Ojo OO. The modulating effect of culture on the expression of dental anxiety in children: a literature review. *Int J Paediat Dent* 2004; 14: 241-5.
- Forss H (ed). *High Risk Strategy in Dentistry: Proceedings of a Workshop held in Kuopio, Finland*. Kuopio: University of Kuopio; 1994. p. 46-53.
- Fraillon J. Measuring Student Well-Being in the Context of Australian Schooling [Internet]. Australia: The Australian Council for Educational Research; 2004 [cited 24.03.2008]. Available online: http://www.curriculum.edu.au/verve/_resources/Measuring_Student_Well-Being_in_the_Context_of_Australian_Schooling.pdf/
- Freeman R, Maizels J, Wylie M, Sheiham A. The relationship between health-related knowledge, attitudes and dental health behaviours in 14-16 year old adolescents. *Community Dent Health* 1993; 10: 397-404.
- Freeman R, Heronen H, Speedy P, Tuutti H. Determinants of cariogenic snacking in adolescents in Belfast and Helsinki. *Eur J Oral Sci* 2000; 108: 504-10.
- Freire MC, Sheiham A, Hardy R. Adolescents' sense of coherence, oral health status, and oral health-related behaviors. *Community Dent Oral Epidemiol* 2001; 29: 204-12.
- Freire MC, Hardy R, Sheiham A. Mothers' sense of coherence and their adolescent children's oral health status and behaviors. *Community Dent Health* 2002; 19: 24-31.
- Freud A. Selected writings by Anna Freud. In Etkins R, Freeman R (eds) *Selected Writings by Anna Freud*. UK: Penguin Group; 1998. p. 165-9.
- Garson DG. Factor Analysis [Internet]. [cited 24.03.2008]. Available online: <http://www2.chass.ncsu.edu/garson/pa765/factor.htm/>
- Garvin CC, Cheadle A, Chrisman N, Chen R, Brunson E. A community-based approach to diabetes control in multiple cultural groups. *Ethn Dis* 2004; 14(3 Suppl 1): 83-92.
- Gibson LY, Byrne SM, Davis EA, Blair E, Jacoby P, Zubrick SR. The role of family and maternal factors in childhood obesity. *Med J Aust* 2007; 186: 591-5.
- Gift HC, Reisine ST, Larach DC. The social impact of dental problems and visits. *Am J Public Health* 1992; 82: 1663-8.
- Giray UA. Health System in Turkey, 2002 [Internet]. Ankara, Turkey: Ministry of Health; 2003 [cited 24.04.2008]. Available online: http://www.saglik.gov.tr/EN/Tempdosyalar/409_0135_35.pdf/
- Glanz K, Lewis FM, Rimer BK. *Health Behavior and Health Education: Theory, Research, and Practice*. San Francisco: Jossey- Bass Publishers; 1997.
- Glass TA, McAtee JM. Behavioral science at the crossroads in public health: Extending horizons, envisioning the future. *Soc Sci Med* 2006; 62: 1650-71.
- Gochman DS. Labels, systems and motives, Some perspectives for future research. *Health Educ Q* 1982; 9: 167-74.
- Gökalp S, Dogan GB, Tekcicek M, Berbereoglu A, Ünluer S. Oral Health Profile of 5, 12 and 15 Year Olds, Turkey-2004 (Abstract in English). *Hacettepe Dis Hekimligi Dergisi* 2007a; 31: 3-10.
- Gökalp S, Doğan GB, Tekcicek M, Berbereoglu A, Ünluer S. Oral Health Profile among the Adults and Elderly-Turkey-2004 (Abstract in English). *Hacettepe Dis Hekimligi Dergisi* 2007b; 31: 11-8.
- Gray MM, Davies-Slowik J. Changes in the percentage of 5-year-old children with no experience of decay in

- Dudley towns since the implementation of fluoridation schemes in 1987. *Br Dent J* 2001; 190: 30-2.
- Haapalahti M, Mykkanen H, Tikkanen S, Kokkonen J. Meal patterns and food use in 10- to 11-year-old Finnish children. *Public Health Nutr* 2003; 6: 365-70.
- Hall-Lande JA, Eisenberg ME, Christenson SL, Neumark-Sztainer D. Social isolation, psychological health, and protective factors in adolescence. *Adolescence* 2007; 42: 265-86.
- Hancioglu A, Alyanak IY. Infant and Child Mortality. In Turkey Demographic and Health Survey TDHS-2003. Ankara, Turkey: Hacettepe University Institute of Population Studies, Ministry of Health General Directorate of Mother and Child Health and Family Planning, State Planning Organisation and European Union; 2004. p. 108-16.
- Harris NO, Christen AG. Primary Preventive Dentistry, 4th Edition. USA: Appleton and Lange; 1994.
- Hattie J. Self-concept. Hillsdale, NJ: Lawrence Erlbaum; 1992.
- Haugejorden O, Birkeland JM. Evidence for reversal of the caries decline among Norwegian children. *Int J Paediatr Dent* 2002; 12: 306-15.
- Hausen H, Karkkainen S, Seppa L. Application of the high-risk strategy to control dental caries. *Community Dent Oral Epidemiol* 2000; 28: 26-34.
- Heinonen K, Räikkönen K, Keltikangas-Järvinen L. Maternal perceptions and adolescent self-esteem: a six-year longitudinal study. *Adolescence* 2003; 38: 669-87.
- Helminen SKJ. Long-term change in dental prevention and check-up intervals in public dental service in Helsinki, Finland [dissertation]. University of Helsinki; 2002.
- Hertzman C, Power C. Health and human development: understandings from life-course research. *Dev Neuropsychol* 2003; 24: 719-44.
- Hobdell M, Petersen M, Clarkson J, Johnson N. Global goals for oral health 2020. *Int Dent J* 2003; 53: 285-8.
- Hodge HC, Holloway PJ, Bell CR. Factors associated with toothbrushing behaviour in adolescence. *Br Dent J* 1982; 152: 49-51.
- Holst D. Delivery of oral health care in the Nordic countries. In Pine CM (ed). *Community Oral Health*. Oxford: Reed Educational and Professional; 1997. p. 283-91.
- Holund U. Explanation and change of adolescents' dietary behaviour [thesis]. The Royal Dental College; 1991.
- Honkala E, Kuusela S, Rimpela A, Rimpela M, Jokela J. Dental services utilization between 1977 and 1995 by Finnish adolescents of different socioeconomic levels. *Community Dent Oral Epidemiol* 1997; 25: 385-90.
- Honkala S, Honkala E, Al-Sahli N. Consumption of sugar products and associated life- and school- satisfaction and self-esteem factors among schoolchildren in Kuwait. *Acta Odontol Scand* 2006; 64:79-88.
- Honkala S, Honkala E, Al-Sahli N. Do life- or school-satisfaction and self-esteem indicators explain the oral hygiene habits of schoolchildren. *Community Dent Oral Epidemiol* 2007; 35: 337-47.
- Humphris GM, Morrison T, Lindsay SJ. The Modified Dental Anxiety Scale: validation and United Kingdom norms. *Community Dent Health* 1995; 12: 143-50.
- Humphris GM, Freeman R, Campbell J, Tuutti H, D'Souza V. Further evidence for the reliability and validity of the Modified Dental Anxiety Scale. *Int Dent J* 2000; 50: 367-70.
- Inchley J, Todd J, Bryce C, Currie C. Dietary trends among Scottish schoolchildren in the 1990s. *J Hum Nutr Dietet* 2001; 14: 207-16.
- Inglehart M, Tedesco LA. Behavioral research related to oral hygiene practices: a new century model of oral health promotion. *Periodontol* 2000 1995; 8: 15-23.
- Jacobs JE, Bleeker MM. Girls' and boys' developing interests in math and science: do parents matter. *New Dir Child Adolesc Dev* 2004; 106: 5-21.
- Jessor R. Adolescent development and Behavioral Health. In *Behavioral Health: A Handbook Of Health Enhancement and Disease Prevention*. Matarazzo JD, Weiss SM, Herd AJ, Miller NE, Weiss SM (eds). USA: John Wiley & Sons Inc; 1984. p. 69-90.
- Jessor R, Turbin MS, Costa FM. Protective factors in adolescent health behavior. *J Pers Soc Psychol* 1998; 75: 788-800.
- Jones CM, Woods K, Taylor GO. Social deprivation and tooth decay in Scottish schoolchildren. *Health Bull* 1997; 55:11-5.
- Järvelin J, Rico A, Cetani T [compiles & eds]. *Health Care Systems in Transition: Finland* [Internet]. European Observatory on Health Care Systems 2002 [cited 24.03.2008]; 4 (1): 1-12. Available online: <http://www.euro.who.int/document/e74071.pdf>
- Kallio PJ. Health promotion and behavioral approaches in the prevention of periodontal disease in children and adolescents. *Periodontol* 2000 2001; 26: 135-45.
- Kandelman D. Sugar, alternative sweeteners and meal frequency in relation to caries prevention: new perspectives. *Br J Nutr* 1997; 77 (Suppl 1):S121-8.
- Karjalainen S, Olak J, Söderling E, Pienihäkkinen K, Simell O. Frequent exposure to invasive medical care in early childhood and operative dental treatment associated with dental apprehension of children at 9 years of age. *Eur J Paediatr Dent* 2003; 4: 186-90.

- Kay EJ. Patients' needs--more than meets the eye. *Br Dent J* 1993; 174: 212-14.
- Kelder SH, Perry CL, Klepp KI, Lyttle LL. Longitudinal Tracking of adolescent Smoking, Physical Activity, and Food Choice Behavior. *Am J Public Health* 1994; 84: 1121-6.
- Kenealy PM, Kingdon A, Richmond S, Shaw WC. The Cardiff dental study: a 20-year critical evaluation of the psychological health gain from orthodontic treatment. *Br J Health Psychol* 2007; 12: 17-49.
- Kerkkonen K. Hammastilastoa Lapin piirin kansakoululapsista. Helsinki: 1911. In Mattila ML. Quality-related outcome of pediatric dental health care [dissertation]. University of Turku, Finland; 2001. p. 12-3.
- Keskin Y, Moschonis G, Dimitriou M, Sur H, Kocaoglu B, Hayran O et al. Prevalence of iron deficiency among schoolchildren of different socio-economic status in urban Turkey. *Eur J Clin Nutr* 2005; 59: 64-71.
- Kinirons MJ, Stewart C. Factors affecting levels of untreated caries in a sample of 14-15-year-old adolescents in Northern Ireland. *Community Dent Oral Epidemiol* 1998; 26: 7-11.
- Klingberg G. Dental fear and behavior management problems in children. A study of measurement, prevalence, concomitant factors, and clinical effects. *Swed Dent J* 1995; 103 (Suppl): 1-78.
- Klingberg G, Berggren U, Carlsson SG, Noren JG. Child dental fear: cause-related factors and clinical effects. *Eur J Oral Sci* 1995; 103: 405-12.
- Knecht M. Psychological features characterizing oral health behavior, diabetes self-care and health status among IDDM patients [dissertation]. University of Oulu, Finland; 2000. p. 30-1.
- Koivusilta LK, Rimpelä AH, Rimpelä M, Vikat A. Health behavior-based selection into educational tracks starts in early adolescence. *Health Educ Res* 2001; 16: 201-14.
- Koivusilta LK, Rimpelä A, Vikat A. Health behaviors and health in adolescence as predictors of educational level in adulthood: a follow-up study from Finland. *Soc Sci Med* 2003; 57: 577-93.
- Konu AI, Rimpelä MK. Well-being in schools: a conceptual model. *Health Promot Int* 2002; 17: 79-87.
- Konu AI, Lintonen TP, Rimpelä MK. Factors associated with schoolchildren's general subjective well-being. *Health Educ Res* 2002; 17: 155-65.
- Kotler LA, Cohen P, Davies M, Pine DS, Walsh BT. Longitudinal relationships between childhood, adolescent, and adult eating disorders. *J Am Acad Child Adolesc Psychiatry* 2001; 40: 1434-40.
- Kruger E, Thomson WM, Poulton R, Davies S, Brown RH, Silva PA. Dental caries and changes in dental anxiety in late adolescence. *Community Dent Oral Epidemiol* 1998; 26: 355-9.
- Kuh D, Ben-Shlomo Y. A Life Course Approach to Chronic Diseases Epidemiology. Oxford: Oxford University Press; 1997. p. 3-14.
- Kuh D, Ben-Shlomo Y, Lynch J, Hallqvist J, Power C. Life course epidemiology. *J Epidemiol Community Health* 2003; 57: 778-83.
- Kuusela S, Honkala E, Rimpelä A. Toothbrushing frequency between the ages of 12 and 18 years--longitudinal prospective studies of Finnish adolescents. *Community Dent Health* 1996; 13: 34-9.
- Kuusela S, Honkala E, Kannas L, Tynjälä J, Wold B. Oral hygiene habits of 11-year-old schoolchildren in 22 European countries and Canada in 1993/1994. *J Dent Res* 1997; 76: 1602-9.
- Kvaavik E, Tell GS, Klepp KI. Predictors and tracking of body mass index from adolescence into adulthood: follow-up of 18 to 20 years in the Oslo Youth Study. *Arch Pediatr Adolesc Med* 2003; 157: 1212-8.
- Kwan S, Petersen PE. Oral health promotion: an essential element of a health-promoting school [Internet]. Geneva: WHO; 2003; [cited 26.03.2008]. Available online: http://www.who.int/oral_health/publications/doc11/en/
- Källestål C, Dahlgren L, Stenlund H. Oral health behavior and self-esteem in Swedish children. *Soc Sci Med* 2000; 51: 1841-9.
- Källestål C, Dahlgren L, Stenlund H. Oral health behavior and self-esteem in Swedish adolescents over four years. *J Adolesc Health*. 2006; 38: 583-90.
- Lalonde MA. New Perspective on the Health of Canadians [Internet]. Ottawa, Canada: Minister of Supply and Services, 1974 [cited 27.03.2007]. Available online: http://www.hc-sc.gc.ca/hcs-sss/alt_formats/hpb-dgps/pdf/pubs/1974-lalonde/lalonde_e.pdf/
- Lamas MA, Virtanen JI, Bloigu RS. Timing of first restorations in permanent teeth: a new system for oral health determination. *J Dent* 1995; 23: 347-52.
- Larsson B, Johansson I, Weinehall L, Hallmans G, Ericson T. Cardiovascular disease risk factors and dental caries in adolescents: effect of a preventive program in Northern Sweden (the Norsjö project). *Acta Paediatr* 1997; 86: 63-71.
- Lau RR, Quadrel MJ, Hartman KA. Development and change of young adults' preventive health beliefs and behavior: influence from parents and peers. *J Health Soc Behav* 1990; 31: 240-59.

- Leavell HR, Clark EG. Preventive Medicine for the Doctor in His Community, 3rd ed. New York: McGraw-Hill; 1965.
- Lee A, Cheng FFK, St Leger L. Evaluating health-promoting schools in Hong Kong: development of a framework. *Health Promot Int* 2005; 20: 177-86.
- Liddel A, Murray P. Age and sex differences in children's reports of dental anxiety and self-efficacy in relation to dental visits. *Can J Behav Sci* 1989; 21: 270-9.
- Lindström B, Eriksson M. Contextualizing salutogenesis and Antonovsky in public health development. *Health Promot Int* 2006; 21: 238-44.
- Locker D. Applications of self-reported assessments of oral health outcomes. *J Dent Edu* 1996; 60: 494-500.
- Locker D, Liddel A, Dempster L, Shapiro D. Age of onset of dental anxiety. *J Dent Res* 1999; 78: 790-6.
- Locker D. Response and nonresponse bias in oral health surveys. *J Public Health Dent* 2000; 60: 72-81.
- Locker D, Thomson WM, Poulton R. Psychological disorders and dental anxiety in a young adult population. *Community Dent Oral Epidemiol* 2001; 29: 456-63.
- Locker D. Psychosocial consequences of dental fear and anxiety. *Community Dent Oral Epidemiol* 2003; 31: 144-51.
- Lõe H. Oral hygiene in the prevention of caries and periodontal disease. *Int Dent J* 2000; 50: 129-39.
- Lynch J, Smith GD. A Life Course Approach to Chronic Disease Epidemiology. *Annu Rev Public Health* 2005; 26: 1-35.
- Macgregor IDM, Balding JW. Toothbrushing frequency and personal hygiene in 14-year-old schoolchildren. *Br Dent J* 1987; 162: 141-44.
- Macgregor IDM, Balding JW. Self-esteem as a predictor of toothbrushing behavior in young adolescents. *J Clin Periodontol* 1991; 18: 312-6.
- Macgregor IDM, Balding JW, Regis D. Toothbrushing schedule, motivation and 'lifestyle' behaviours in 7,770 young adolescents. *Community Dent Health*. 1996; 13: 232-7.
- MacGregor IDM, Balding J. The Health related Behaviour Questionnaire (Version 21). University of Exeter, Schools Exeter Health Education Unit; 1999.
- Maes L, Vereecken C, Vanobbergen J, Honkala S. Tooth brushing and social characteristics of families in 32 countries. *Int Dent J* 2006; 56: 159-67.
- Maggirias J, Locker D. Five-year incidence of dental anxiety in an adult population. *Community Dent Health* 2002; 19: 173-9.
- Markus H, Nurius P. Possible selves. *Am Psychol* 1986; 41: 954-69.
- Mattila ML, Rautava P, Sillanpää M, Paunio P. Caries in five-year-old children and associations with family-related factors. *J Dent Res*. 2000; 79: 875-81.
- Mattila ML, Rautava P, Paunio P, Ojanlatva A, Hyssala L, Helenius H et al. Caries experience and caries increments at 10 years of age. *Caries Res* 2001; 35: 435-41.
- Mattila ML, Rautava P, Aromaa M, Ojanlatva A, Paunio P, Hyssala L et al. Behavioral and demographic factors during early childhood and poor dental health at 10 years of age. *Caries Res* 2005a; 39: 85-91.
- Mattila ML, Rautava P, Ojanlatva A, Paunio P, Hyssälä L, Helenius H et al. Will the role of family influence dental caries among seven-year-old children? *Acta Odontol Scand* 2005b; 63: 73-84.
- McQueen DV. The search for theory in health behavior and health promotion. *Health Promot Int* 1996; 11: 27-32.
- Mechanic D, Hansell S. Adolescent competence, psychological well-being, and self-assessed physical health. *J Health Soc Behav* 1989; 28: 364-74.
- Menghini G, Steiner M, Marthaler T, Helfenstein U, Brodowski D, Imfeld C et al. Caries prevalence among students in 16 Zurich districts in the years 1992 to 2000 [Article in German]. *Schweiz Monatsschr Zahnmed*. 2003; 113: 267-77.
- Ministry of Social Affairs & Health. Health Care in Finland [Internet]. Helsinki: Ministry of Social Affairs and Health, 2004 [cited 27.03.2008]. Available online: <http://www.stm.fi/Resource.phx/publishing/store/2004/12/aa1106916032942/passthru.pdf>
- Ministry of Social Affairs & Health. Trends in Social Protection in Finland 2005-2006 [Internet]. Helsinki: Ministry of Social Affairs and Health; 2006; [cited 27.03.2008]. p. 126-85. Available online: <http://www.stm.fi/Resource.phx/publishing/store/2005/04/hu1113547327264/passthru.pdf>
- Ministry of Health. Sağlık Bakanlığı Sağlık Personelinin Illere Göre Dağılımı, 2001 [The Statistics for the Health Care Personnel, Turkey, 2001]. [cited 27.03.2008]. Available online: <http://www.saglik.gov.tr/TR/BelgeGoster.aspx?F6E10F8892433CFF7A2395174CFB32E118C82ACCF4E77751/>
- Moore R, Bim H, Kirkegaard E, Brødsgaard I, Scheutz F. Prevalence and characteristics of dental anxiety in Danish adults. *Community Dent Oral Epidemiol* 1993; 21: 292-6.
- Muirhead V, Marcenes W. An ecological study of caries experience, school performance and material deprivation in 5-year-old state primary school children. *Community Dent Oral Epidemiol* 2004; 32: 265-70.

- Muirhead VE, Locker D. School performance indicators as proxy measures of school dental treatment needs: a feasibility study. *J Public Health Dent* 2006; 66: 269-72.
- Mumcu G, Sur H, Yildirim C, Soylemez D, Ati H, Hayran O. Utilisation of dental services in Turkey: a cross-sectional survey. *Int Dent J* 2004; 54: 90-6.
- Neumark-Sztainer D, Story M, Toporoff E, Himes JH, Resnick MD, Blum RW. Covariations of Eating Behaviors with Other Health-Related Behaviors among Adolescents. *J Adolesc Health* 1997; 20: 450-8.
- Newton JT, Bower EJ. The social determinants of oral health: new approaches to conceptualizing and researching complex causal network. *Community Dent Oral Epidemiol* 2005; 33: 25-34.
- Nicolau B, Marcenes W, Hardy R, Sheiham A. A life-course approach to assess the relationship between social and psychological circumstances and gingival status in adolescents. *J Clin Periodontol* 2003a; 30: 1038-45.
- Nicolau B, Marcenes W, Bartley M, Sheiham A. A life course approach to assessing causes of dental caries experience: the relationship between biological, behavioral, socio-economic and psychological conditions and caries in adolescents. *Caries Res* 2003b; 37: 319-26.
- Nicolau B, Marcenes W, Allison P, Sheiham A. The life course approach: explaining the association between height and dental caries in Brazilian adolescents. *Community Dent Oral Epidemiol* 2005; 33: 93-8.
- Nordblad A. Changes in epidemiologic pattern of dental caries in cohorts of schoolchildren in Espoo, Finland, during a 3-year period. *Community Dent Oral Epidemiol* 1986; 14: 126-7.
- Nordblad A, Suominen-Taipale L, Rasilainen J, Karhunen T. Suun terveyden-huolto terveystieteiden tutkimuskeskuksissa 1970-luvulta vuoteen 2000. Helsinki: STAKES; 2004. p. 34.
- Norton DE, Froelicher ES, Waters CM, Carrieri-Kohlman V. Parental influence on models of primary prevention of cardiovascular disease in children. *Eur J Cardiovasc Nurs* 2003; 2: 311-22.
- Nutbeam D, Aaro L, Catford J. Understanding Children's Health Behavior: The implications for Health Promotion for Young People. *Soc Sci Med* 1989; 29: 317-25.
- O'Dea JA, Wilson R. Socio-cognitive and nutritional factors associated with body mass index in children and adolescents: possibilities for childhood obesity prevention. *Health Educ Res* 2006; 21: 796-805.
- OECD. Selection of OECD Social Indicators: How does Turkey compare?: 2003 [Internet]. [cited 28.03.2008]. Available online: <http://www.oecd.org/dataoecd/13/35/34557093.xls/>
- Ogden J. *Health Psychology, a textbook*. Buckingham: Open University Press; 1997. p. 17-41.
- Okada M, Kawamura M, Kaihara Y, Matsuzaki Y, Kuwahara S, Ishidori H, et al. Influence of parents' oral health behaviour on oral health status of their school children: an exploratory study employing a causal modelling technique. *Int J Paediatr Dent* 2002; 12: 101-8.
- Östberg AL. On self-perceived oral health in Swedish adolescents [academic dissertation]. Sweden: University of Malmö; 2002. p. 26.
- Östberg AL, Eriksson B, Lindblad U, Halling A. Epidemiological dental indices and self-perceived oral health in adolescents: ecological aspects. *Acta Odontol Scand* 2003; 61: 19-24.
- PAHO. Health For All by the Year 2000. Indicators. *Epidemiological Bulletin* [online], 1997 [cited 26.03.2008]; 18: 4. Available online: http://www.paho.org/english/sha/epibul_95-98/be974goa.htm/
- Parcel GS, Edmundson E, Perry CL, Feldman HA, O'Hara-Tompkins N, Nader PR et al. Measurement of self-efficacy for diet-related behaviors among elementary school preadolescents. *J Sch Health* 1995; 65: 23-7.
- Patton GC, Coffey C, Sawyer SM. The outcome of adolescent eating disorders: findings from the Victorian Adolescent Health Cohort Study. *Eur Child Adolesc Psychiatry* 2003; 12 (Suppl1): 25-9.
- Pattussi MP, Marcenes W, Croucher R, Sheiham A. Social deprivation, income inequality, social cohesion and dental caries in Brazilian school children. *Soc Sci Med* 2001; 53: 915-25.
- Pattussi MP, Hardy R, Sheiham A. The potential impact of neighbourhood empowerment on dental caries among adolescents *Community Dent Oral Epidemiol* 2006; 34: 344-50.
- Paulson SE, Hill JP, Holmbeck GN. Distinguishing between perceived closeness and parental warmth in families with seventh-grade boys and girls. *J Early Adolesc* 1991; 11: 276-93.
- Pender NJ, Murdaugh CL, Parsons MA. *Health promotion in nursing practice*, 5th ed. Upper Saddle River, NJ: Prentice Hall; 2005.
- Peres MA, de Oliveira Latorre Mdo R, Sheiham A, Peres KG, Barros FC, Hernandez PG, et al. Social and biological early life influences on severity of dental caries in children aged 6 years. *Community Dent Oral Epidemiol* 2005; 33: 53-63.
- Petersen PE. The world oral health report 2003. *World Oral Health Report 2003: continuous improvement of oral health in the 21st century—the approach of the WHO Global Oral Health Programme*. Geneva: WHO;

- 2003; [cited 26.03.2008]. Available online: http://www.who.int/oral_health/publications/report03/en/print.html/
- Petersen PE, Estupinan-Day S, Ndiaye C. WHO's action for continuous improvement in oral health. *Bull World Health* 2005a; 83: 641-720.
- Petersen PE, Bourgeois D, Ogawa H, Estupinan-Day S, Ndiaye C. The global burden of oral diseases and risks to oral health. *Bull World Health* 2005b; 83: 661-9.
- Petersen PE. Changing oral health profiles of children in Central and Eastern Europe [Internet]. [cited 24.03.2008]. Available online: http://www.who.int/entity/oral_health/media/en/orh_eastern_europe.pdf/
- Piko B, Fitzpatrick KM. Does class matter? SES and psychosocial health among Hungarian adolescents. *Soc Sci Med* 2001; 53: 817-30.
- Pine CM (ed). *Community Oral Health*. Oxford: Butterworth-Heinemann; 1997. p. 189-205.
- Pine CM, McGoldrick PM, Burnside G, Cumov MM, Chesters RK, Nichol森 J et al. An intervention programme to establish regular toothbrushing: understanding parents' beliefs and motivating children. *Int Dent J* 2000; 50: 312-23.
- Pine CM, Adair PM, Nicoll AD, Burnside G, Petersen PE, Beighton D et al. International comparisons of health inequalities in childhood dental caries. *Community Dent Health* 2004; 21(1 Suppl): 121-30.
- Pitiphat W, Garcia RI, Douglass CW, Joshipura KJ. Validation of self-reported oral health measures. *J Public Health Dent* 2002; 62: 122-8.
- Pitts NB, Boyles J, Nugent ZJ, Thomas N, Pine CM. The dental caries experience of 11-year-old children in Great Britain. Surveys coordinated by the British Association for the Study of Community Dentistry in 2004/2005. *Community Dent Health* 2006; 23: 44-57.
- Poulsen S, Scheutz F. Dental caries in Danish children and adolescents 1988-1997. *Community Dent Health* 1999; 16: 166-70.
- Poulton R, Thomson WM, Davies S, Kruger E, Brown RH, Silva P. Good teeth, bad teeth and fear of the dentist. *Behav Res Ther* 1997; 35: 327-34.
- Poulton R, Caspi A, Milne BJ, Thomson WM, Taylor A, Sears MR, et al. Association between children's experience of socioeconomic disadvantage and adult health: a life-course study. *Lancet* 2002; 360 (9346): 1640-5.
- Poutanen R, Lahti S, Hausen H. Oral health-related knowledge, attitudes, and beliefs among 11 to 12 year-old Finnish schoolchildren with different oral health behaviors. *Acta Odontol Scand* 2005; 63:10-6.
- Poutanen R, Lahti S, Tolvanen M, Hausen H. Parental influence on children's oral health-related behavior. *Acta Odontol Scand* 2006; 64: 286-92.
- Poutanen R. Boys and girls as health-promoting actors—determinants of oral health related lifestyle among 11- to 12-year-old schoolchildren [dissertation]. University of Oulu, Finland: 2007.
- Prättälä R, Rahkonen O, Rimpela A. Consumption patterns of some sugar-containing foods among Finnish adolescents in 1981-1985. *Nutr Res* 1988; 8: 3-11.
- Raadal M, Espelid I. Caries prevalence in primary teeth as a predictor of early fissure caries in permanent first molars. *Community Dent Oral Epidemiol* 1992; 20: 30-4.
- Randall EO. *Self: An Eclectic Approach*. Boston: Allyn & Bacon; 1996. p. 5-20.
- Regis D, Macgregor ID, Balding JW. Differential prediction of dental health behavior by self-esteem and health locus of control in young adolescents. *J Clin Periodontol* 1994; 21: 7-12.
- Reisine S, Litt M. Social and psychological theories and their use for dental practice. *Int Dent J* 1993; 43 (3 Suppl 1): 279-87.
- Reynolds K. *Child and Adolescent Trial for Cardiovascular Health: Health Behaviour Questionnaire*. (019) Form Version, 1993.
- Reynolds KD, Hinton AW, Shewchuk R, Hickey CA. A social cognitive model of fruit and vegetable consumption in elementary school preadolescents. *J Nutr Educ* 1999; 31: 23-30.
- Rise J, Wold B, Aarö LE. Determinants of dental health behaviors in Nordic schoolchildren. *Community Dent Oral Epidemiol* 1991; 19: 149.
- Robbins SB, Lauer K, Le H, Davis D, Langley R, Carlstrom A. Do psychosocial and study skill factors predict college outcomes? A meta-analysis. *Psychol Bull* 2004; 130: 261-88.
- Rose G. Sick individuals and sick populations. *Int J Epidemiol* 1985; 14: 32-8.
- Rose G. *The Strategy of Preventive Medicine*. Oxford: Oxford University Press; 1992.
- Rosenberg M. *Society and the Adolescent Self-Image*. Princeton, N.J.: Princeton University Press; 1965.
- Rossow I. Intrafamily influences on health behavior. A study of interdental cleaning behavior. *J Clin Periodontol* 1992; 19: 774-8.
- Rugg-Gunn AJ, Hackett AF, Appleton R, Jenkins GN, Eastoe JE. Relationship between dietary habits and caries increment assessed over two years in 405

- English adolescent school children. *Arch Oral Biology* 1984; 29: 983-92.
- Rugg-Gunn AJ, Nunn JH. Nutrition, diet, and oral health. Oxford: Oxford University Press; 1999.
- Sanders AE, Spencer AJ. Childhood circumstances, psychosocial factors and the social impact of adult oral health. *Community Dent Oral Epidemiol* 2005; 33: 370-7.
- Sanders AE, Spencer AJ, Stewart JF. Clustering of risk behaviors for oral and general health. *Community Dent Health* 2005; 2: 133-40.
- Santrock JW. Adolescence. New York: McGraw-Hill; 2007.
- Savas SB, Karahan O, Saka O. In Thomson S, Mossialos S (eds.). *Health Care Systems in Transition: Turkey* [internet]. Copenhagen: European Observatory on Health Care Systems; 2002 [cited 27.03.2007]; 4(4). Available online: <http://www.euro.who.int/document/e79838.pdf>
- Savolainen JJ, Knuutila ML, Suominen-Taipale AL, Martelin TP, Nordblad A, Niskanen MC, et al. A strong sense of coherence promotes regular dental attendance in adults. *Community Dent Health* 2004; 21: 271-6.
- Savolainen JJ, Suominen-Taipale AL, Uutela AK, Martelin TP, Niskanen MC, Knuutila ML. Sense of coherence as a determinant of toothbrushing frequency and level of oral hygiene. *J Periodontol* 2005; 76: 1006-12.
- Saydam G, Oktay I, Möler I. Oral health in Turkey-situation analysis. Report sponsored by Ministry of Health and WHO regional office for Europe. Istanbul; 1990. p. 28-40.
- School Health Law, Koulaki 1956.
- Schunk DH, Hanson AR, Cox, PD. Peer-model attributes and children's achievement behaviors. *J Educ Psychol* 1987; 79: 54-61.
- Schwarzer R. Health Behaviour Scale [Internet]. [Cited 27.03.2008]. Available online: <http://userpage.fu-berlin.de/~health/healself.pdf>
- Sekine M, Yamagami T, Hamanishi S, Kagamimori S. Accuracy of the estimated prevalence of childhood obesity from height and weight values reported by parents: results of the Toyama Birth Cohort study. *J Epidemiol* 2002; 12: 9-13.
- Selwitz RH, Ismail AI, Pitts NB. Dental caries. *Lancet* 2007; 369: 51-9.
- Seppa L, Hausen H, Pollanen L, Karkkainen S, Helasharju K. Effect of intensified caries prevention on approximal caries in adolescents with high caries risk. *Caries Res* 1991; 25: 392-5.
- Sheiham A. Theories explaining health behavior. In: Gjermo P (ed). *Promotion of Self Care in Oral Health: Scandinavian Working Group for Preventive Dentistry*. Oslo: 1986. p. 105-24.
- Sheiham A, Joffe M. Public health strategies for identifying and controlling dental caries in high and low risk populations. In Johnson NW (ed). *Risk Markers for Oral Diseases. Volume I. Dental Caries*. Cambridge: University Press; 1991.
- Sheiham A, Watt RG. The common risk factor approach: a rational basis for promoting oral health. *Community Dent Oral Epidemiol* 2000; 28: 399-406.
- Sheiham A, Netuveli GS. Periodontal diseases in Europe. *Periodontol* 2000 2002; 29: 104-21.
- Sheiham A. Oral health, general health and quality of life. *Bull World Health* 2005; 83: 641-720.
- SIGN. Quick Reference Guide: Targeted prevention of dental caries in the permanent teeth of 6-16 year olds presenting for dental care [Internet]. SIGN Publication, 2000 [cited 28.03.2008]. Available online: <http://www.sign.ac.uk/guidelines/published/index.html/>
- Siven G. Något om tandförhållandena bland skolbarnen I H:fors. Helsinki: 1914. In Mattila M-L. *Quality-related outcome of pediatric dental health care* [dissertation]. University of Turku, Finland; 2001. p. 12-3.
- Sjöström O, Holst D. Validity of a questionnaire survey: response patterns in different subgroups and the effect of social desirability. *Acta Odontol Scand* 2002; 60: 136-40.
- Skaalvik EM, Skaalvik S. Self-concept and self-efficacy: a test of the internal/external frame of reference model and predictions of subsequent motivation and achievement. *Psychol Rep* 2004; 95: 1187-202.
- Skaret E, Raadal M, Berg E, Kvale G. Dental anxiety and dental avoidance among 12 to 18 year olds in Norway. *Eur J Oral Sci* 1999; 107: 422-8.
- Skaret E, Kvale G, Raadal M. General self-efficacy, dental anxiety and multiple fears among 20-year-olds in Norway. *Scand J Psychol* 2003; 44: 331-7.
- Skeie MS, Raadal M, Strand GV, Espelid I. The relationship between caries in the primary dentition at 5 years of age and permanent dentition at 10 years of age - a longitudinal study. *Int J Paediatr Dent* 2006a; 16: 152-60.
- Skeie MS, Riordan PJ, Klock KS, Espelid I. Parental risk attitudes and caries-related behaviours among immigrant and western native children in Oslo. *Community Dent Oral Epidemiol* 2006b; 34: 103-13.
- Speechley M, Johnston DW. Some evidence from Ontario, Canada, of a reversal in the dental caries decline. *Caries Res* 1996; 30: 423-7.
- Srof BJ, Velsor-Friedrich B. Health promotion in adolescents: a review of Pender's health promotion model. *Nurs Sci Q* 2006; 19:366-73.

- Stecksen-Blicks C, Holm AK. Between meal eating, toothbrushing frequency and dental caries in 4-year-old children in the North of Sweden. *Int J Paediatr Dent* 1995; 5: 67-72.
- Stewart JE, Wolfe GR, Maeder L, Hartz GW. Changes in dental knowledge and self-efficacy scores following interventions to change oral hygiene behavior. *Patient Educ Couns* 1996; 27: 269-77.
- Stewart JE, Strack S, Graves P. Development of oral hygiene self-efficacy and outcome expectancy questionnaires. *Community Dent Oral Epidemiol* 1997; 25: 337-42.
- Stokes E, Ashcroft A, Platt MJ. Determining Liverpool adolescents' beliefs and attitudes in relation to oral health. *Health Educ Res* 2006; 21: 192-205.
- Streiner DL, Norman GR. Health measurement scales: a practical guide to their development and use. New York: Oxford University Press; 1989.
- Suldo SM, Riley KN, Shaffer EJ. Academic Correlates of Children and Adolescents' Life Satisfaction. *Sch Psychol Int* 2006; 27: 567-82.
- Sutton S. Predicting and Explaining Intentions and Behavior: How Well Are We Doing? *J Appl Soc Psychol* 1998; 2: 1317-38.
- Syrjala AM, Knecht MC, Knuutila ML. Dental self-efficacy as a determinant to oral health behavior, oral hygiene and HbA1c level among diabetic patients. *J Clin Periodontol* 1999; 26: 616-21.
- Tafarodi RW, Swann WB. Self-Liking and Self-Competence as Dimensions of Global Self-Esteem: Initial Validation of a Measure. *J Pers Assess* 1995; 65: 322-42.
- Tannahill A. What is health promotion? *Health Educ J* 1985; 44: 167-8.
- Tatar M. Community Participation in Health Care: The Turkish Case. *Soc Sci Med* 1996; 42: 1493-500.
- Tatar M, Tatar F. Primary health care in Turkey: a passing fashion? *Health Policy Plan* 1997; 12: 224-33.
- Taylor S. Oral Health for All: Policy for available, accessible and acceptable care [Internet]. *Community Voices: Health Care for the Underserved of Morehouse School of Medicine*; 1993 [cited 28.03.2008]. Available on: <http://www.communityvoices.org/>
- TDA, Turkish Dental Association. Agiz Dis Sagliginda Yeni Yaklasimlar, 2004 (a) [New Approaches in Oral Health] [Internet]. [Cited 28.03.2008]. Available online: <http://www.tdb.org.tr/tdb/sayfa4.php?s1=1&ac=1&es=2&sayfa=94&grup=7>. (Turkish)
- TDA, Turkish Dental Association. Dishekimi Dagilimi, 2004 (b) [Distribution of Dentists, 2004] [Internet]. [cited 27.03.2008]. Available online: <http://www.tdb.org.tr/cm/nesgor/istatistik/Dishekimagilimi.htm#Illere%20Göre%20Odalara%20Kayitli%20Disheki mi%20Sayilari>. (Turkish)
- TDA, Turkish Dental Association. Agiz Dis Sagligi Hizmetlerinin Sunumu, 2004(c) [Provision of Oral Health Care Services] (Turkish) [Internet]. [cited 27.03.2008]. Available online: <http://www.tdb.org.tr/tdb/sayfa4.php?s1=1&ac=1&es=1&sayfa=65&grup=13>. (Turkish)
- Thomson WM, Mackay TD. Child dental caries patterns described using a combination of area-based and household-based socio-economic status measures. *Community Dent Health* 2004; 21: 285-90.
- Thomson WM, Poulton R, Milne BJ, Caspi A, Broughton JR, Ayers KM. Socioeconomic inequalities in oral health in childhood and adulthood in a birth cohort. *Community Dent Oral Epidemiol* 2004; 32: 345-53.
- Tones K. The health promoting school: some reflections on evaluation. *Health Educ Res* 1996; 11: i-viii.
- Traen B, Rise J. Dental health behaviours in a Norwegian population. *Community Dent Oral Epidemiol* 1990; 7: 59-68.
- Trzesniewski KH, Donnellan MB, Moffitt TE, Robins RW, Poulton R, Caspi A. Low self-esteem during adolescence predicts poor health, criminal behavior, and limited economic prospects during adulthood. *Dev Psychol* 2006; 42: 381-90.
- UNICEF. Preventing Child Poverty [Internet]. Ankara, Turkey: UNICEF; 2006; [cited 19.11.2007]. Available online: <http://www.unicef.org/turkey/pdf/cp28c.pdf/>
- United Nations. Third Report on the World Nutrition Situation [Internet]. Geneva: ACC/SCN publications; 1997; [cited 19.11.2007]. Available online: <http://www.unsystem.org/scn/archives/rwns03/index.htm/>
- U.S. National Cancer Institute. School Age Children Background [Internet]. [cited 28.03.2008]. Available online: <http://riskfactor.cancer.gov/tools/children/review/agegroups/schoolage/>
- Vehkalahti MM, Solavaara L, Rytomaa I. An eight-year follow-up of the occlusal surfaces of first permanent molars. *J Dent Res* 1991; 70: 1064-7.
- Vehkalahti M, Tarkkonen L, Varsio S, Heikkilä P. Decrease in and polarization of dental caries occurrence among child and youth populations, 1976-1993. *Caries Res* 1997; 31: 161-5.
- Vereecken CA, Inchley J, Subramanian SV, Hublet A, Maes L. The relative influence of individual and contextual socio-economic status on consumption of fruit and soft drinks among adolescents in Europe. *Eur J Public Health* 2005; 15: 224-32.

- Vignarajah S. Oral health knowledge and behaviours and barriers to dental attendance of school children and adolescents in the Caribbean island of Antigua. *Int Dent J* 1997; 47: 167-72.
- Von Bertalanffy L. The theory of open systems in physics and biology. *Science* 1950; 11:23-9.
- Zabinski MF, Daly T, Norman GJ, Rupp JW, Calfas KJ, Sallis JF et al. Psychosocial correlates of fruit, vegetable, and dietary fat intake among adolescent boys and girls. *J Am Diet Assoc* 2006; 106: 814-21.
- Wang Y, Ollendick TH. A cross-cultural and developmental analysis of self-esteem in Chinese and Western children. *Clin Child Fam Psychol Rev* 2001; 4: 253-71.
- Watt RG, Sheiham A. Inequalities in oral health: a review of the evidence and recommendations for action. *BDJ* 1999; 187: 6-12.
- Watt RG. Emerging theories into the social determinants of health: implications for oral health promotion. *Community Dent Oral Epidemiol* 2002; 30: 241-7.
- Watt RG. Strategies and approaches in oral disease prevention and health promotion. *Bull World Health Organ* 2005; 83: 711-8.
- Watt RG. From victim blaming to upstream action: tackling the social determinants of oral health inequalities. *Community Dent Oral Epidemiol* 2007; 35:1-11.
- Weissenbach M, Chau N, Benamghar L, Lion C, Schwartz F, Vadot J. Oral health in adolescents from a small French town. *Community Dent Oral Epidemiol* 1995; 23:147-54.
- WHO. Constitution. New York: WHO; 1946. In Downie RS, Tannahill C, Tannahill A. *Health Promotion: Models and Values*. Oxford: Oxford University Press; 1996. p.9.
- WHO. Declaration of Alma-Ata [Internet]. International Conference on Primary Health Care; 6-12 September 1978; Alma-Ata; [cited 26.03.2008]. Available online: http://www.euro.who.int/AboutWHO/Policy/20010827_1?
- WHO. Ottawa Charter for Health Promotion [Internet]. First International Conference on Health Promotion; 21 November 1986; Ottawa, Canada – WHO/HPR/HEP/95.1; [cited 26.03.2008]. Available online: http://www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf
- WHO. Jakarta Declaration [Internet]. 4th International Conference on Health Promotion; 21- 25 July 1997; Jakarta, Indonesia; [cited 26.03.2008]. Available online: <http://www.who.int/healthpromotion/conferences/previous/jakarta/en/index.html/>
- WHO. Oral Health Survey: Basic methods, 4th ed. Geneva; 1997.
- WHO. Health Behavior in School-Aged Children: a WHO Cross-National Study (HBSC) Research Protocol for the 1997/98 Survey. Edinburgh: University of Edinburgh; 1998.
- WHO. WHO Oral Health Country/Area Profile Programme 2004 [Internet]. [Cited 26.03.2008]. Available online: <http://www.whocollab.od.mah.se/euro.html/>
- WHO. Data Bank for Oral Health Expenditure Countries of European Union (EU) and European Economic Area (EEA) [Internet]. [Cited 27.03.2008a]. Available online: <http://www.whocollab.od.mah.se/euro/eu/eurofr.html>
- WHO. Global Conferences on Oral Health Promotion [online]. [Cited 26.03.2008b]. Available online: <http://www.who.int/healthpromotion/conferences/en/>
- WHO. Inequalities in young people's health: Health behavior in school-aged children; International report from the 2005/2006 survey [Internet]. [Cited 24.08.2008c]. Available online: <http://www.hbsc.org/>
- Widström E, Eaton KA. Oral Healthcare Systems in the Extended European Union. *Oral Health Prev Dent* 2004; 2: 155-94.
- Wierzbicka M, Petersen PE, Szatko F, Dybizbanska E, Kalo I. Changing oral health status and oral health behavior of schoolchildren in Poland. *Community Dent Health* 2002; 19: 243-50.
- Wild LG, Flisher AJ, Bhana A, Lombard C. Associations among adolescent risk behaviours and self-esteem in six domains. *J Child Psychol Psychiatry* 2004; 45: 1454-67.
- Willershausen B, Haas G, Krummenauer F, Hohenfellner K. Relationship between high weight and caries frequency in German elementary school children. *Eur J Med Res* 2004; 9: 400-4.
- Williams PG, Holmbeck GN, Greenley R. Adolescent health psychology. *J Consult Clin Psychol* 2002; 70: 828-42.
- Wolfe GR, Stewart JM, Maeder LA, Hartz GW. Use of Dental Coping Beliefs Scale to measure cognitive changes following oral hygiene interventions. *Community Dent Oral Epidemiol* 1996; 24: 37-41.
- Wong HM, Humphris GM, Lee GT. Preliminary validation and reliability of the Modified Child Dental Anxiety Scale. *Psychol Rep* 1998; 83: 1179-86.
- Woodcock M, Narayan D. Social Capital: Implications for Development Theory, Research, and Policy. *The World Bank Res Obs* 2000; 15: 225-49.

12. Appendix

Appendix 1

PRE-ADOLESCENT HEALTH BEHAVIOR QUESTIONNAIRE 2004

DEPARTMENT OF ORAL PUBLIC HEALTH

Hi,

The purpose of this questionnaire is to plan health care for young people. To do this, we need your help. If you could please give us information about yourself, that would be a great help.

➤ **You may ask for advice or help from your teacher and supervisor**

➤ **Please answer all the questions honestly**

➤ **Just tick only one choice unless it says "click all that apply"**

➤ **You may specify another alternative if it has been among the multiple choices in addition to click- one choice**

EXAMPLES THAT WILL GUIDE YOU HOW TO ANSWER

There are 3 kinds of questions:

Example 1: If your favorite color is "blue" then you should answer in this way.

"What is your favorite color?"

- red
- yellow
- blue

Example 2: If it stated "tick all that apply" after question, that means you can choose more than one choice and also write an alternative option.

"What are your favorite colors?" (Tick all that apply)

- red
- yellow
- blue
- any other please specify, ...**green**.....

Hei!

Tämän kyselylomakkeen tarkoituksena on suunnitella terveydenhuoltoa nuorille. Siksi tarvitsemme apuasi. Auttaisit kovasti, jos voisit kertoa joitakin tietoja itsestäsi

➤ **Voit pyytää neuvoa tai apua opettajaltasi.**

➤ **Vastaa kaikkiin kysymyksiin rehellisesti.**

➤ **Rastita vain yksi vaihtoehto paitsi jos kysymyksessä on mainittu, että voi rastittaa useamman.**

➤ **Voit myös kirjoittaa vaihtoehdoisen vastauksen, jos siihen on annettu tilaa.**

Esimerkkejä, jotka opastavat Sinua vastaamaan:

Esimerkki 1: Jos lempivärisi on sininen, sinun pitäisi vastata: seuraavalla tavalla

"Mikä on lempivärisi?"

- punainen
- keltainen
- sininen

Esimerkki 2: Jos kysymyksessä on mainittu, että voit vastata useamman kuin yhden vaihtoehdon, se tarkoittaa sitä, että voit valita useamman kuin yhden vaihtoehdon ja kirjoittaa vielä vaihtoehdoisen kohdan.

"Mitkä ovat lempivärejäsi?" (Rastita niin monta vaihtoehtoa kuin tarvitaan.)

- punainen
- keltainen
- sininen
- jokin muu, mikä ...**vihreä**

--	--	--	--	--	--	--

PREADOLESCENT HEALTH BEHAVIOR QUESTIONNAIRE

1. In what condition do you think your teeth are now?

- very bad
- bad
- average
- good
- excellent

2. How often do you brush your teeth?

- never
- less than once a week
- once a week
- more than once a week
- once a day
- twice a day or more

3. Have you ever observed any bleeding of your gums while brushing your teeth?

- always
- usually
- occasionally
- rarely
- never

4. What are the most important reasons for taking care of your teeth? Please mark all that apply.

- I want my teeth to look nice.
- I want my breath to smell fresh.
- I want to avoid cavities and dental treatment.
- I want my teeth to feel clean.
- I want to avoid dentures.
- My mother and father make me brush my teeth.
- other reason, please tell what _____

5. How often do you visit the dentist?*

- never
- whenever I have problems with my teeth
- once a year
- every 6 months
- more than once in 6 months

6. What is your most usual reason for visiting the dentist?*

- regular check-up
- problems with my teeth/gums
- my parents make me visit

7. What do you usually drink when you are thirsty between meals? Please circle all the alternatives that apply.

- soft drink (Coca-cola, Fanta, etc.)
- juice or fruit juice
- milk
- water
- something else; please tell what _____

8. What are your favorite snacks (for instance, when coming home from school)? Tick more than one alternative if needed.

- sweets or chocolate
- coffee bread, cake, cookies
- popcorn, potato chips
- bread, sandwich, toast
- yoghurt, villi**
- fresh vegetables
- fruit or berries
- pizza, hamburgers, French fries
- something else, what _____

9. How often have you eaten sweets or chocolate in the past week (7 days)?

- on 6-7 days
- on 3-5 days
- on 1-2 days
- not at all

10. How often have you drunk soft drinks or juice in the past week (7 days)?

- on 6-7 days
- on 3-5 days
- on 1-2 days
- not at all



11. When do you go to bed on school days?

- I usually go to bed regularly on school days, at _____ o'clock.
- I usually go to bed irregularly on schooldays.

12. What do you eat at breakfast on weekdays? Tick more than one alternative if needed.

- porridge**
- cereals, corn-flakes
- fruit juice
- milk
- fruit or vegetable
- sandwich or toast
- warm breakfast (omelettes, boiled eggs, sausages, etc..)*
- I drink a cup of coffee or tea, but I do not eat anything.
- I do not eat or drink anything.

13. What do you usually eat for dinner on weekdays? Tick only one alternative.

- warm home-prepared meal
- ready-made food like pizza or meat pie
- sandwiches
- snacks like potato chips or sweets
- I do not eat dinner.
- Something else; please specify _____

14. What do you usually eat for lunch on weekdays? Tick only one alternative.*

- food prepared at home
- school meal
- food from a cafeteria like hamburger, hot-dogs, etc.
- nothing

15. How much pocket money do you receive per week?

- less than 5 Euros / 5 YTL
- 5-15 Euros / 5-15 YTL
- more than 15 Euros / 15 YTL
- I do not get pocket money .

16. How much money do you usually spend on sweets, chocolate, and soft drinks per week?

- more than a half of my pocket money
- about half of my pocket money
- less than half of my pocket money
- I do not spend my pocket money on sweets or soft drinks.

17. When do you usually wash your hands? (Please mark all the alternatives that apply.)

- when I come home
- before meals
- after visiting the toilet
- after meals
- when my mother or father tells me to
- some other time; please tell when _____

18. How many showers or baths (including sauna) did you take last week?

- none
- 1
- 2-5
- 6 or more

19. What do you think about your own school performance?

- very bad
- bad
- average
- good
- very good

20. How much time do you spend watching TV and videos on an average school day?

- more than 2 hours
- 1-2 hours
- less than 1 hour
- not at all

21. How much time do you spend playing computer and video games on an average school day?

- more than 2 hours
- 1-2 hours
- less than 1 hour
- not at all

22. We would like to know how sure you are that you can brush your teeth under certain circumstances. In each situation, please tick the alternative that describes you best



	NOT SURE AT ALL	SOMEWHAT UNCERTAIN	I DO NOT KNOW	SOMEWHAT SURE	ABSOLUTELY SURE
Even if I am in a hurry to go to school in the morning, I can brush my teeth before leaving home.					
Even when I am extremely tired at night I still can brush my teeth.					
Even when I have exams/lots of homework for the next day I still can brush my teeth before sleep.					
Even at times that I am ill I am able to brush my teeth in the evening.					
Even at times I am ill, I can brush my teeth twice a day.					
Even when there are lots of interesting things to do on weekends/holidays, I still can brush my teeth twice a day.					
I can keep brushing my teeth twice a day as a daily routine just like eating or watching TV.					
I cannot go to bed without brushing my teeth first.					
Even when I am not able to brush my teeth after eating snacks, I am able to take care of my teeth at least by rinsing my mouth.					

23. How anxious do you feel in the following situations connected with the dentist? On each line tick the alternative that describes your anxiety best.

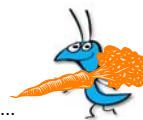
<i>How do you feel about...?</i>	NOT ANXIOUS	SLIGHTLY ANXIOUS	FAIRLY ANXIOUS	VERY ANXIOUS	EXTREMELY ANXIOUS
going to the dentist generally?					
having your teeth looked at?					
having your teeth scraped and polished?					
having an injection in the gum?					
having a filling?					
having a tooth taken out?					

24. Could you please tell us how sure you are that you can eat or resist eating the following foods?

	NOT SURE AT ALL	SOMEWHAT UNCERTAIN	I DO NOT KNOW	SOMEWHAT SURE	ABSOLUTELY SURE
I can resist buying sweets even when I have money for them.					
I can resist buying soft drinks even when I have got money for them.					
At dinner I can eat fruits I like as dessert when they are served.					
At dinner I can eat vegetables I like when they are served.					
I can drink a glass of milk*/water with my dinner even when a family member has a soft drink.					
I can snack on fruits I like instead of sweets.					
I can snack on vegetables I like instead of potato- or corn chips.					
Each day I can eat at least 2 fruits (for instance, an apple and a banana).					
Each day I can eat at least 2 vegetables (for instance a carrot and a tomato).					
Each day I can drink at least 2 glasses of milk.					

25. You are continuously living with your ((Please mark all the alternatives that apply.) *

- | | |
|--------------------------------------|---|
| <input type="checkbox"/> father | <input type="checkbox"/> sister/s |
| <input type="checkbox"/> mother | <input type="checkbox"/> grandmother |
| <input type="checkbox"/> step mother | <input type="checkbox"/> grandfather |
| <input type="checkbox"/> step father | <input type="checkbox"/> anyone else, please specify..... |
| <input type="checkbox"/> brother/s | |



26. Do you agree or disagree with the following statements? Tick one box on each line according to whether you agree or disagree with the statement.

	DISAGREE	NOT SURE	AGREE
There are lots of things about myself that I would like to change.			
When I have something to say in front of a teacher in class, I usually feel uneasy.			
I often fall out with pupils at school.			
I often feel lonely at school.			
I think other pupils say nasty things about me.			
When I want to tell a teacher something I usually feel shy.			
I often have to find new friends because my old ones are with somebody else.			
I usually feel foolish when I talk with my parents.			
I feel uncomfortable talking to other pupils at school.			

We would like to thank you for your participation. If you would like to suggest on oral health and dietary behaviours, we would appreciate them

**only for the Turks*
***only for the Finns*

Appendix 2

MATERNAL HEALTH BEHAVIOR QUESTIONNAIRE

Dear Parent,

The questionnaires sent are part of a cooperative research project with the Institute of Dentistry, University of Helsinki. The goal is to understand the factors affecting oral health behaviour and dietary patterns among preadolescents (age 10-12). In Turkey, the study is under the supervision of Yeditepe Dental Faculty and Yeditepe Medical Faculty, Yeditepe University.

This study is one of the firsts in collaborative international studies that represents Turkey in a medical field. It will reveal new aspects for the improvement of dental and general well-being of Turkish children. Your child's school is chosen to be representative of Turkey; your full and honest participation will provide information about the present dental status and behavior of Turkish children and of their mothers. Your participation is important for better understanding of oral diseases and preventive oral health behaviors and therefore aid in the organization of effective preventive health interventions in Turkey. The study is not only for the improvement of oral health but also for solving the health problems related to obesity that has an increasing prevalence today among Turkish children, and cardiovascular diseases that are becoming more common at older ages.

All questionnaires from mothers will be used for the research as a whole, and no individual answer can be identified. Replying to the questions not ideally but exactly according to your experience is essential for the validity and reliability of the research.

Please send back questionnaires sealed in the envelopes, carried by your child to the school teacher, at the latest by..... When the completed questionnaires are received, we will send you a thank-you letter and a small promotional gift.

HEIKKI MURTOMAA
PROFESSOR

HELENA KUUSAMA
RESEARCHER

A.BASAK CINAR
RESEARCHER

ORAL PUBLIC HEALTH DEPARTMENT
INSTITUTE OF DENTISTRY, UNIVERSITY OF HELSINKI

NUKET SANDALLI
PROFESSOR
FACULTY OF DENTISTRY

NİLÜFER KOSKU
ASSISTANT PROFESSOR
FACULTY OF MEDICINE

YEDITEPE UNIVERSITY

ÄIDIN SUUTERVEYDEN KYSELYLOMAKE

Hyvä koululaisen äiti!

Lapsenne koululuokka on valittu edustamaan helsinkiläisiä koululaisia Helsingin yliopiston hammaslääketieteen laitoksen toteuttamaan kansainväliseen tutkimukseen, jossa pyritään selvittämään koululaisten ja heidän perheidensä suuterveyskäyttäytymiseen liittyviä asioita. Tavoitteena on saada tietoa, jonka avulla voidaan kehittää parempia menetelmiä lasten ja nuorten suu- ja hammassairauksien ehkäisyyn ja hoitoon.

Tutkimuksessa hyödynnetään koululaisille ja heidän äideilleen suunnattuja kyselylomakkeita sekä Helsingin kaupungin kouluhammashoidon rekistereitä lasten suuterveiden osalta. Tutkimukseen osallistuminen on vapaaehtoista.

Pyydämme suostumustanne siihen, että lapsenne voi kouluaikana osallistua suuterveyskyselyyn sekä siihen, että lapsenne hammashoidon rekisteritietoja voidaan käyttää tutkimuksessa. Pyydämme Teitä ystävällisesti palauttamaan täyttämäne ja allekirjoittamanne suostumuksen siihen, että lapsenne voi osallistua tutkimukseen. Olkaa hyvä ja palauttakaa suostumuslomake viimeistään 5.2.2004 lapsenne mukana kouluun opettajalle. Palauttakaa lomake myös siinä tapauksessa, että ette halua antaa suostumustanne tutkimukseen osallistumiselle.

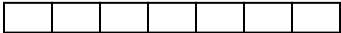
Tutkimuksessa saatavat tiedot ovat luottamuksellisia. Vastauksia käsitellään vain tilastollisina kokonaisuuksina siten, että yksittäisiä vastauksia ei voi tunnistaa. Jokainen vastaus on tärkeä ja hyödyllinen. Kysymyksiinne, jotka koskevat tätä tutkimusta, vastaavat mielellään sihteeri Arja Wickman tai erikoistuva hammaslääkäri Helena Kuusama, Helsingin yliopisto, hammaslääketieteen laitos, puhelin 19127343 ja 19127401.

Kiitämme lämpimästi yhteistyöstä.

HEIKKI MURTOMAA
PROFESSORI

HELENA KUUSAMA
ERIKOISTUVA
HAMMASLÄÄKÄRI

A.BASAK CINAR
TUTKIJA



MATERNAL HEALTH BEHAVIOR QUESTIONNAIRE

In questions 2-10 and 12-13 please circle the number of the alternative/alternatives that describe you best

A. Background information

1. Would you please tell us how many people live in your home permanently?

_____ adults
_____ children

2. Please indicate your age group

- 29 years or under
- 30-39 years
- 40-49 years
- 50 years or over

3. What is your educational level?

- illiterate
- secondary school or equivalent
- high school
- commercial/technical/nursing college or equivalent
- university degree
- other; please indicate _____

3a* Your occupation: (Please also indicate if you are not working at present)

3b Are you.....**

- married
- divorced
- co-habiting

3c*The place of residence and the area code

- rent
 - own
-

4. How much time do you usually spend with your child on a school day?

- less than 1 hour
- 1-2 hours
- 2-4 hours
- 4-6 hours
- more than 6 hours

B. Dental history

5. When was your most recent dental appointment?

- less than one year ago
- 1-2 years ago
- more than 2 years ago
- I do not remember.

6. What is the most usual reason for you to visit a dentist?

- pain or another acute reason
- regular check-up
- occasional check-up
- another reason, please tell what _____

7. In what condition do you think your teeth are now?

- very bad
- bad
- average
- good
- excellent

8. *Is there a dentist whom you regularly visit?

- yes
- no

9. How often do you brush your teeth?

- never
- less than once a week
- once a week
- more than once a week
- once daily
- twice daily or more

10. How often do you visit the dentist?

- never
- when I have pain or another problem
- once in 2-3 years
- once in 1 year
- once in 6 months
- more than once in 6 months

C. Dietary habits

11. What do you eat at breakfast on weekdays?

Tick more than one alternative if needed.

- porridge**
- cereals, corn-flakes
- fruit juice
- milk
- fruit or vegetable
- sandwich or toast
- warm breakfast (omelettes, boiled eggs, sausages, etc..)*
- I drink a cup of coffee or tea, but I do not eat anything.
- I do not eat or drink anything.

12. How often have you eaten sweets or chocolate

in the past seven days?

- not at all
- on 1-2 days
- on 3-5days
- on 6-7 days

13. What is the most usual way to have dinner in your family?

- The whole family eats a prepared meal together.
- We have a prepared meal, but we do not eat together.
- We do not have a prepared meal, everyone takes something for himself / herself.
- some other way; please tell what _____

D. Information about the child

14. Please indicate the present height and weight of your child.

The height _____ cm
The weight _____ kg

15. Has your child ever had a toothache?

- yes
- no

16. How often does your child brush his/her teeth?

- never
- less than once a week
- once a week
- more than once a week
- once daily
- twice daily or more
- I do not know.

17. Could you please give us some information about your child's toothbrushing? Please tick one box on each line

	EVERY DAY	MOST DAYS	OCCASIONALLY	RARELY	NEVER
Does your child brush his/her teeth when you do not remind him/her?					
Do you check that your child has brushed his/her teeth?					
Do you check whether your child's teeth are healthy or not?					

18. For each of the next set of questions, could you please tick one box on each line to tell us how strongly you agree or disagree with the statement?

	DISAGREE	NOT SURE	AGREE
I am in charge of my health.			
If I keep healthy, that's just because of luck.			
If I take care of myself, I will stay healthy.			
Even if I look after myself I can still easily fall ill.			

19. For each of the next set of questions could you please tick one box on each line to tell us how strongly you agree or disagree with the statement?

	TOTALLY WRONG	MOSTLY WRONG	NOT SURE	MOSTLY TRUE	TOTALLY TRUE
1. I cannot make my child brush his/her teeth every day.					
2. I do not feel there is time to check my child's toothbrushing.					
3. I do not feel it would make any difference if my child brushed twice daily or not.					
4. I can help prevent tooth decay in my child's teeth by praising him/her for having brushed his/her teeth.					
5. I can help prevent tooth decay in my child's teeth by encouraging my child to brush more than once a day.					
6. I can help prevent tooth decay in my child's teeth by reminding him/her to brush every day.					
7. If my child brushes his/her teeth once a day, it will prevent future tooth decay.					
8. I can help prevent tooth decay in my child's teeth by encouraging him/her to spit out toothpaste rather than rinse after brushing.					

20. Could you please tell us how anxious you get, if at all, at a dental visit? Please indicate by inserting X on one box for each statement

<i>How would you feel, ...?</i>	ANXIOUS	SLIGHTLY ANXIOUS	FAIRLY ANXIOUS	VERY ANXIOUS	EXTREMELY ANXIOUS
If you went to your dentist for TREATMENT TOMORROW.					
If you were sitting in the WAITING ROOM (waiting for treatment).					
If you were about to have a TOOTH DRILLED.					
If you were about to have your TEETH SCALED AND POLISHED.					
If you were about to have A LOCAL ANESTHETIC INJECTION into your gum, above an upper back tooth.					

21. The next questions concern the dietary patterns of your child. How often does your child eat the following (school meals excluded)?

	NEVER	RARELY	ONCE A WEEK	MORE THAN ONCE A WEEK	ONCE A DAY	MORE THAN ONCE A DAY
meat or fish						
milk						
other dairy produces (cheese, yoghurt, etc.)						
chips or French fries						
sugar-coated cereals						
high-fiber cereals or muesli						
salads or vegetables						
hamburgers, hotdogs, fast food						
vegetarian meals						
soft drinks or coca cola						
sweets/chocolate						
fruit						
whole meal bread/rye crisp bread						
cake, cookies, pastry, donuts						

We would like to thank you for your participation. If you would like to suggest on oral health and dietary behaviours, we would appreciate them

**only for the Turks, **only for the Finns*

Appendix 3

SUOSTUMUSLOMAKE

Olkaa hyvä ja valitkaa haluamanne vaihtoehto.

Suostun siihen, että lapseni _____

_____ (lapsen nimi, koulu ja koululuokka) voi osallistua Helsingin yliopiston hammaslääketieteen laitoksen lasten ja äitien suu-terveyskäyttäytymistä ja suu-terveyttä koskevaan tutkimukseen ja että lapseni kouluhammashoidon rekisteritietoja voi käyttää tutkimuksessa.

En suostu, että lapseni _____

_____ (lapsen nimi, koulu ja koululuokka) osallistuu Helsingin yliopiston hammaslääketieteen laitoksen lasten ja äitien suu-terveyskäyttäytymistä ja suu-terveyttä koskevaan tutkimukseen.

Helsingissä _____

Allekirjoitus ja nimen selvennys

INFORMED CONSENT

Please choose one of the following options:

I give my consent that my child _____

_____ (the child's name, school, and class) can participate in the research study conducted at the Institute of Dentistry, University of Helsinki, and that the register data of school dental care can be utilized in the study. The study investigates children's and their parents' oral health and behavior related to it.

I do not give my consent to my child's participation

_____ (the child's name, school, and class) in the above-mentioned study.

Helsinki _____

Signature and name clearly printed.