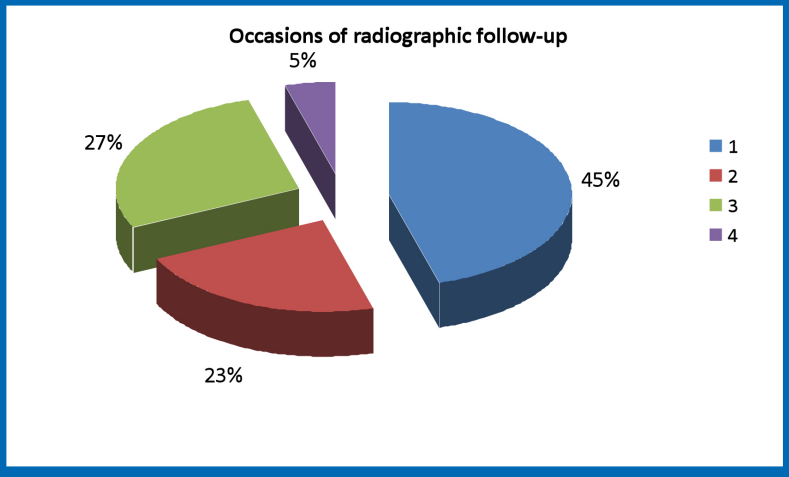
Swedish Dental Journal

Scientific Journal of The Swedish Dental Association

No. 3/12
Vol.36 Pages 109-168



Orthognathic surgery – postoperative follow-up

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Swedish Dental Journal

Scientific journal
of the Swedish Dental Association
and the Swedish Dental Society
ISSN: 0347-9994

Production
Carina Frohm, Tfn +46 (0)8 666 15 16
carina.frohm@tandlakarforbundet.se

Editorial address
Swedish Dental Journal
Odontologiska Institutionen
Box 1030, SE-551 11 Jönköping, Sweden
Tfn: +46 (0)36 32 46 04
Fax: +46 (0)36 71 22 35

Subscription/business address
Swedish Dental Journal
Box 1217, SE-111 82 Stockholm, Sweden
Tfn: +46 (0)8 666 15 00
Fax: +46 (0)8 662 58 42
e-mail: SDJ.tlt@tandlakarforbundet.se
Bank: Skandinaviska Enskilda Banken
Bankgiro: 404-4699 Postgiro: 45 86 34-3

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Sweden: SEK 950 Others: SEK 1 260
(Supplements are not included.)
For subscriptions delivered to adresses within the European Union. Please notice: If you have a VAT registration number you must provide this. Otherwise, please add your local VAT to the above price in SEK.

Printing office
Ljungbergs Tryckeri AB
264 22 Klippan

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Orthognathic surgery – postoperative clinical and radiographic follow-up routines at Swedish oral and maxillofacial surgery departments

EVA MARIA SCHÜTTERT[1], VERA ALSTAD[2], LARS ERIKSSON[1]

Abstract

◉ Orthognathic surgery is a frequent procedure at Swedish Oral and Maxillofacial Surgery Departments. The number of clinical and radiographic postoperative follow-up examinations and the choice of radiographic methods seem to vary. The intention with this study was to find out when postoperative clinical and radiographic follow-up was performed following orthognathic surgery and the type of radiographic examinations that were used.

In 2009, all Swedish Oral and Maxillofacial Surgery Departments in the Public Health Service (25 centres) were given a form containing standardized questions on the time for clinical follow-up after orthognathic surgery and the radiographic examinations used. A pilot study on 49 consecutive patients at one of the centres was performed to determine if the postoperative radiographic examinations added additional information, leading to further procedures compared to the clinical observations only.

A one-year follow-up was the most frequently used clinical control reported by 15 centres, and a six-month follow-up, the next most frequent. At 14 of the 15 centres, radiographic examinations were included at the one-year follow-up. A five-year clinical and radiographic follow-up was reported by two centres. One or, at the most, two postoperative radiographic follow-up sessions were reported by 68% of the centres. Profile and panoramic imaging were most often used. In the evaluation of the postoperative handling of the 49 consecutive patients in the pilot study, a radiolucency around a fixation screw noted radiographically was the only additional postoperative radiological finding that resulted in a surgical procedure.

Postoperative clinical and radiographic follow-up routines following orthognathic surgery vary considerably between the Swedish Oral and Maxillofacial Surgery Departments. There appears to be a need for studies on the value of the information, which repeated postoperative clinical and radiographic follow-up controls add in routine medical attendance.

Key words

Orthognathic surgery, postoperative control, radiography, clinical examination

[1]Department of Oral Surgery and Oral Medicine Faculty of Odontology, Malmö University, Malmö, Sweden

[2] Department of Oral and Maxillofacial Surgery, University Hospital,Linköping, Sweden

Ortognatkirurgi – postoperativa kliniska och röntgenologiska kontroller vid svenska käkkirurgiska kliniker

EVA MARIA SCHÜTTERT, VERA ALSTAD, LARS ERIKSSON

Sammanfattning

◎ Ortognatkirurgi är frekvent förekommande vid svenska käkkirurgiska kliniker. Antalet och tidpunkten för de postoperativa kliniska och radiologiska uppföljningarna liksom röntgenmetoderna förefaller variera mellan de olika klinikerna. Avsikten med studien var att tillfråga samtliga svenska käkkirurgiska kliniker, när postoperativa uppföljningar genomförs och vilken typ av röntgen-undersökningar som används.

Till samtliga svenska käkkirurgiska kliniker i offentlig vård, 25 stycken, sändes 2009 ett formulär med standardiserade frågor rörande ovan nämnda frågeställningar. En pilotstudie inkluderande 49 konsekutiva patienter gjordes vid en av klinikerna, för att se om de postoperativa radiologiska undersökningarna tillförde information, som ledde till ytterligare åtgärder jämfört med de observationer, som gjordes enbart vid den kliniska undersökningen.

Alla klinikerna genomförde kliniska och radiologiska uppföljningar. Ettårsuppföljning var den vanligaste kliniska uppföljningen och rapporterades av 15 kliniker och sexmånaderskontrollen den näst vanligaste. Vid 14 av de 15 klinikerna ingick röntgenundersökning i ettårskontrollen. Två kliniker rapporterade även femårskontroller såväl kliniskt som röntgenologiskt. Totalt en eller två röntgenuppföljningar rapporterades av 68% av klinikerna. Vanigast var profil- och panoramaröntgenundersökningar. Vid utvärdering av de 49 konsekutiva patienterna i pilotstudien var en röntgenologiskt iakttagen radiolucens runt en fixationsskruv den enda radiologiska observation, som medförde ett ingrepp.

De postoperativa kliniska och röntgenologiska uppföljningstiderna och röntgenmetoderna efter ortognatkirurgiska ingrepp varierar avsevärt mellan de svenska käkkirurgiska klinikerna. Studier rörande nyttan av den tilläggsinformation, som upprepade postoperativa kliniska kontroller och röntgenundersökningar medför vid rutinsjukvård, förefaller angelägna.

Introduction

Although modern orthognathic surgery can move the jaws and dentoalveolar segments, within limits, in any desired direction, there are major differences in stability and predictability (1). Standardized radiographic examinations used to follow-up all types of orthognathic surgical procedures do not seem to be optimal. The follow-up programs should be adjusted to the hierarchy of predictability and stability for orthognathic surgical procedures. According to *Proffit et al* (5) the procedures can be grouped into four major categories, with the maxilla upwards as one of the most stable procedures and transverse expansion of the maxilla as one of the least stable. In assessing post-treatment stability in a group of patients treated with orthognathic surgery, most of the change usually occurs in just a few of them (1).

There seems to be a lack of uniform postoperative follow-up programs at Swedish Oral and Maxillofacial Centres after orthognathic surgery as well as information on how often radiographic follow-up gives rise to additional clinical procedures, as compared to the observations made at the clinical examination only.

The intention with this study was to find out, via a standardized form sent to all Swedish Oral and Maxillofacial Surgery Departments, when postoperative clinical and radiographic follow-up examinations were undertaken following orthognathic surgery and which type of radiographic examinations were used. To obtain information on how often the postoperative radiographic examinations gave additional information, leading to further surgical procedures, an evaluation of the postoperative handling of the patients was carried out as a pilot study at one centre (Malmö).

Material and methods

In 2009, all Swedish Oral and Maxillofacial Surgery Departments in the Public Health Service (25 centres) were given a form containing standardized questions on the time for clinical follow-up after orthognathic surgery and the radiographic examinations used (see Appendix). Twenty-two of the 25 departments filled in and returned the form. The remaining three departments did not perform any orthognathic surgery.

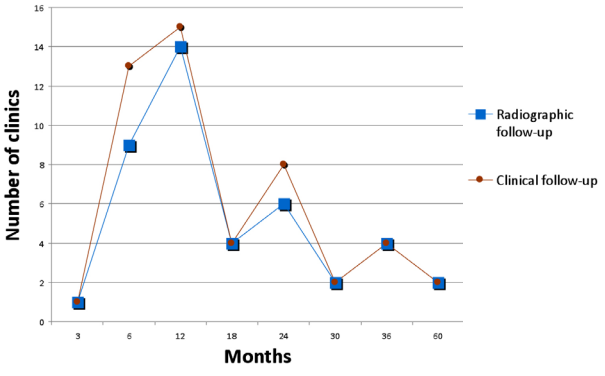
All patients, with postoperative follow-up after orthognathic surgery between 2005-2007 at the Department of Oral and Maxillofacial Surgery, Malmö University Hospital, were included in the retrospective pilot study. In total, 27 men and 35 women (mean age 23 years range 15-73 years) underwent surgery, eleven in the upper, 22 in the lower and 29 in both jaws. Out of the 62 patients, 49 had a complete follow-up (including clinical and radiographic examination) after a mean of 19 months (range 14-29 months). Eight of the 13 patients with incomplete follow-up, either refused follow-up, had moved abroad or had ongoing major implant surgery. The remaining five patients had no radiographic follow-up. Thus 49 patients were examined radiographically with profile and posterior-anterior projections and all patients except four had panoramic imaging performed. The reason for the four missing examinations was technical problems with the panoramic x-ray machine.

Results

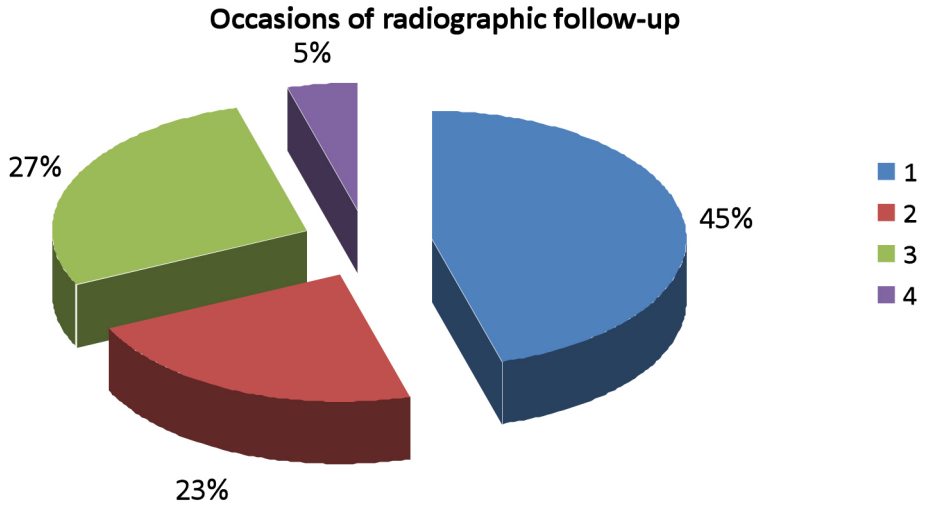
Clinical and radiographic postoperative follow-up was performed at all Swedish Oral and Maxillofacial Centres who undertook orthognathic surgery. A one-year follow-up was the most frequently used clinical control reported by 15 centres out of the 22, and a six-month follow-up was the next most frequent follow-up time. At 14 of the 22 centres, radiographic examinations were included at the one-year follow-up. Two clinics with the longest follow-up routines reported five-year clinical and radiographic controls (Fig. 1).

One or maximum two postoperative radiographic follow-up occasions were reported by 68% of the centres (Fig. 2). Lateral cephalometric and panoramic projections were most frequently used. At four of the centres reporting PA cephalometric projections, this projection was only used at follow-up of patients treated for facial asymmetries (Fig. 3).

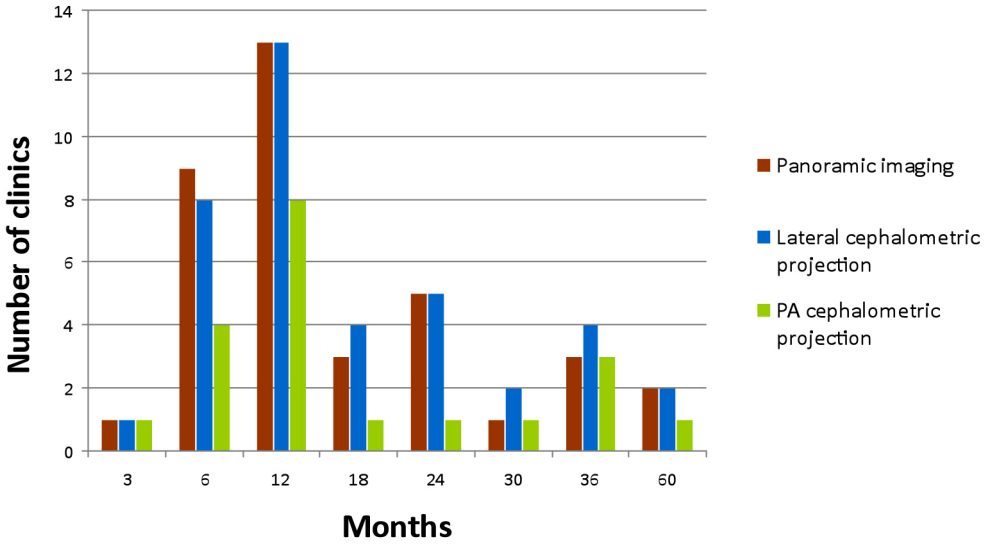
Figure 1. Time for clinical and radiographic follow-up after orthognathic surgery at Swedish Oral and Maxillofacial Surgery Departments (n=22).



◎ **Figure 2.** Radiographic follow-up occasions after orthognathic surgery at Swedish Oral and Maxillofacial Surgery Departments (n=22).



◎ **Figure 3.** Radiographic projections used at follow-up after orthognathic surgery at Swedish Oral and Maxillofacial Surgery Departments (n=22).



None of the centres routinely used CT at the follow-up. The total number of postoperative radiographic examinations per centre varied from two examinations to nine, where 11 centres used two or three examinations and three centres nine.

In the pilot study of the patients at the Malmö clinic no remarks were noted in 39 out of the 49 patients at the radiographic examination 19 months (mean) postoperatively. In the remaining 10 patients minor relapse was noted in four, as observed

clinically. In solitary of the ten patients root resorption, minor areas of radiolucency after removal of fixation screws and radiolucency at a fixation screw were noted. Changed configuration of the posterior mandibular ramus contour and double contour of a condyle were isolated observations. These ten patients with divergent findings were all according to the records satisfied with the postoperative result. The radiolucency around the fixation screw noted radiographically was the only radiographic finding in the 49 patients that initiated a surgical procedure, a removal of the screw.

Discussion

The time for routine clinical and radiographic follow-up after orthognathic surgery and the radiographic methods used vary substantially at Swedish Oral and Maxillofacial Surgery Centres. Sixty-eight percent of the departments had clinical follow-up after one year and 64% had radiographic examinations performed at that time. Lateral cephalometric and panoramic projections dominated. Postoperative CT was not used as a routine. The observations in the study seem to be representative for the follow-up routines after orthognathic surgery at Swedish Oral and Maxillofacial Surgery Departments as all centres answered the questionnaire. Information on additional follow-up at collaborating orthodontic centres was not included in the questionnaire and the clinical and radiographic follow-up frequencies shown in the study might therefore be somewhat low. In designing the study, it was decided to exclude postoperative radiographic examinations carried out during the first two postoperative months as such examinations, except for being a base for future controls, also could include other projections done as a "technical control" of the surgical procedure on that specific patient.

As the surgical procedures used at the different centres vary, some differences in the follow-up programs were expected, but a final time for follow-up varying between 3 months and 6 years for standard procedures indicates that recommendations for national follow-up programs are desirable to gain equivalent information. However as mentioned above, it should be stressed that a stereotype postoperative handling covering all types of orthognathic procedures is not adequate, as the Swedish Radiation Safety Authority states that radiographic examinations should be performed on individual indications (8). The follow-up programs should be adjusted to the hierarchy of predictability and stability for the orthognathic surgical procedures used (1).

The follow-up routines that rendered an account for a variation at the different clinics between two or three radiographic examinations up to nine examinations, further stress the need for a consensus, as such a great variation of the exposure to radiation is not acceptable in routine care. However, it should be observed that according to comments from seven centres in the appendix, an adjustment of the follow-up programs has been initiated in these centres, especially concerning the routines for the radiographic follow-up. Four centres reported as an example that they only used the PA cephalometric projections at the follow-up of corrected asymmetries.

The most frequently published follow-up parameters are stability and predictability of different orthognathic surgery procedures (1-7). The documentation of these parameters seems to be adequate to serve as a base for follow-up programs adapted to the type of anomaly and the surgical method used. Extended studies that address the occurrence of postoperative inflammatory changes at fixation screws and plates, pathological changes of the TMJ, maxillary sinus, and root resorption and how often such radiological findings will have an impact on the clinical handling of the patients are desirable. The observation in our pilot study that only 2% of the patients had radiographic findings that lead to an additional surgical procedure, may serve as an indication that most postoperative radiographic examinations do not add information that will change the clinical handling. According to solitary answering comments in the questionnaire from the Swedish Oral and Maxillofacial Surgery Clinics, radiographic follow-up was carried out at some clinics only when a clinical indication existed. Except future studies on the value of radiographic examinations compared to clinical examinations only, knowledge on the time spent on follow-up both for patients and the professionals as well as economic aspects would be of interest.

In conclusion, postoperative clinical and radiographic follow-up routines following orthognathic surgery show considerable variation between the Swedish Oral and Maxillofacial Surgery Departments. At the majority of the centres, rigid follow-up programs are followed irrespective of the type of jaw anomalies and surgical methods used. For economic reasons, time consumption for the patients and staff and not least irradiation hygiene, it appears timely to introduce differentiated follow-up programs based on scientific support for the methods used.

Acknowledgement
Patrik Keshishian, specialist in oral and maxillofacial surgery, Department of Oral and Maxillofacial Surgery, Skåne University Hospital, Sweden, for administration of the questionnaire. Arne Petersson, professor, Department of Oral and Maxillofacial Radiology, Malmö University, Malmö, Sweden, for valuable advice concerning radiologic questions.

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Corresponding author:
Dr Lars Eriksson
Department of Oral Surgery and Oral Medicine
Faculty of Odontology
Malmö University
SE-205 06 Malmö
Sweden
E-mail: lars.eriksson@mah.se

Appendix
Questionnaire

Maxillofacial Surgery Clinic

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(Information only for registration of answering clinics. Not shown in compilation)

Please, mark below follow-up occasions after orthognathic surgery at your clinic and radiographic methods used. If you have other follow-up periods kindly fill in the empty boxes.

Time for clinical follow-up	Radiographic methods at follow-up			
☐ 6 months	☐ OPG	☐ Profile	☐ PA	☐ CT
☐ 12 months	☐ OPG	☐ Profile	☐ PA	☐ CT
☐ 18 months	☐ OPG	☐ Profile	☐ PA	☐ CT
☐ 24 months	☐ OPG	☐ Profile	☐ PA	☐ CT
☐ 30 months	☐ OPG	☐ Profile	☐ PA	☐ CT
☐ 36 months	☐ OPG	☐ Profile	☐ PA	☐ CT
☐ ....months	☐ OPG	☐ Profile	☐ PA	☐ CT
☐ ....months	☐ OPG	☐ Profile	☐ PA	☐ CT

Comments

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Risk indicators for poor oral health in adolescents born extremely preterm

MARIANNE RYTHÉN[1,2,3], AIMON NIKLASSON[4], ANN HELLSTRÖM[5],
MAGNUS HAKEBERG[6], AGNETA ROBERTSON[1]

Abstract

◎ Children born extremely preterm often suffer from medical complications that have been shown to affect their oral health as toddlers and school children. The aim of this study was to investigate oral health and possible risk indicators for poor oral health in adolescents born extremely preterm compared with a control group and relate the findings to medical diagnoses at the clinical examination. Also in the same groups, compare the frequency of mineralization disturbances and its relation to postnatal morbidity and treatments.

The medical records postnatally, was noted in 45 extremely preterm infants with a gestational age (GA) of <29 weeks, at 12 - 16 years of age and in age and gender matched fullterm controls with 37-43 weeks GA. A dental clinical examination was performed including a salivary examination. Medical diagnoses were noted at the time of the survey. Data from the patient dental records at 3, 6, and 9 years of age was compiled. The findings were related to gestational age, birth weight, neonatal and postnatal medical diagnoses treatments and medical diagnoses at the clinical examination.

The result showed that the prevalence of plaque, gingivitis and the occurrence of Streptococcus mutans were higher among adolescents born extremely preterm compared to matched controls, and the saliva secretion was lower in the extremely preterm infants. The frequency of caries did not differ between the groups. Mineralization disturbances were more frequent in the primary dentition and more severe in the permanent dentition among the children born extremely preterm. No association between dental pathology, neonatal and postnatal morbidity and treatments was found.

In conclusion, adolescents born extremely preterm have an increased number of risk indicators for a poorer oral outcome compared with the controls and more severe mineralization disturbances. These findings may imply an increased vulnerability for poorer oral health later in life.

Key words

Dental caries, enamel hypomineralization, oral hygiene, prematurity

[1]Department of Pediatric Dentistry, Institute of Odontology, at the Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
[2]Specialist Clinic for Pediatric Dentistry and Hospital Dental Care, Public Dental Service, Västra Götaland Region, Mölndal, Sweden
[3]Specialist Clinic for Pediatric Dentistry, Public Dental Service, Västra Götaland Region, Borås, Sweden
[4]Department of Pediatrics, Institute of Clinical Science, at the Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
[5]Department of Ophthalmology, Institute of Neuroscience and Physiology, at the Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden
[6]Department of Behavioral and Community Dentistry, Institute of Odontology, at the Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden.

Riskindikatorer för sämre oral hälsa hos extremt underburna barn i tonåren

Marianne Rythén, Aimon Niklasson, Ann Hellström,
Magnus Hakeberg, Agneta Robertson

Sammanfattning

◎ Extremt underburna barn drabbas av medicinska komplikationer vilket kan påverka tandhälsan hos förskolebarn och skolbarn. Avsikten med studien var att i tonåren, hos en grupp extremt underburna barn födda i Göteborg, undersöka tandhälsan och eventuella riskindikatorer för sämre tandhälsa i framtiden. De extremt underburna barnen jämfördes med en frisk kontrollgrupp med normal gestationsålder och fynden relaterades till diagnoser vid undersökningstillfället. Vidare avsågs att jämföra förekomsten av mineralisationsstörningar i emaljen med samma kontrollgrupp och relatera fynden till förekomst av postnatala sjukdomstillstånd och behandlingar.

Medicinska diagnoser postnatalt och vid undersökningstillfället registrerades hos 45 extremt underburna barn födda före gestationsvecka 29 i åldern 12-16 år och hos, en till ålder, kön och folktandvårdstillhörighet, matchad kontrollgrupp av friska barn med normal gestationsålder (37-43 gestationsvecka). 80 barn undersöktes kliniskt, avseende munhygien, parodontal hälsa, karies, mineralisationsstörningar, salivfaktorer och bakterieförekomst. Uppgifter från tandvårdsjournaler inhämtades för åldrarna 3, 6 och 9 år för 90 barn. Resultaten relaterades till gestationsålder, födelsevikt, postnatala medicinska diagnoser och behandlingar samt diagnoser vid undersökningstillfället.

Resultatet av undersökningen visar att extremt underburna barn i tonåren har en ökad förekomst av plack, gingivit och ökad förekomst av Streptococcus mutans jämfört med kontrollbarnen. Det fanns ingen skillnad i kariesförekomst mellan grupperna. Mineralisationsstörningar i emaljen var vanligare i den primära dentitionen och mer omfattande i den permanenta dentitionen hos de extremt underburna barnen jämfört med kontrollbarnen. Något samband mellan mineralisationsstörningar i emaljen och neo- och postnatal hälsa eller behandlingar kunde inte visas.

Sammanfattningsvis har denna studie visat att extremt underburna barn har ett ökat antal riskindikatorer för sämre oral hälsa som unga vuxna och mer omfattande mineralisationsstörningar i emaljen i permanenta bettet än friska kontrollbarn.

Introduction

The improved survival rate among extremely immature infants (<28 weeks) and the outcome for these infants, has been a subject of several studies these past few years (13, 16, 17,). According to the International Classification of Diseases and Related Health problems, the World Health Organization (36), preterm birth is defined as childbirth occurring at less than 37 completed weeks or 259 days of gestation. Infants born before 28 completed weeks or 196 days of gestation are considered extremely immature. The nomenclature and the definition of subgroups of very preterm (VPT), extremely preterm (EPT) and extremely immature (EI) infants has varied. In an effort to use the same definition used in more recent publications, infants born <29 weeks are considered EPT (7, 27). Growth failure is common among preterm infants but catch-up growth periods during infancy seem to diminish this aberration (24). Being born very preterm is associated with low-birthweight (LBW <1500g) or extremely low birth weight (ELBW<1000g) (36). Young adults born with LBW have persistent neurodevelopment and growth related sequels and showed poorer physical abilities later in life (17).

Many neonatal and postnatal complications and treatments have been associated with aberrations in the primary and permanent dentitions, such as eruptional and mineralization disturbances, smaller crown size and caries (7, 8, 18, 25, 26, 28 30). There are, to this date, no studies showing how increased morbidity among extremely preterm infants affects the permanent dentition or the oral situation in adolescents.

The aim of this study was to investigate oral health and possible risk indicators for developing pathology in teeth and periodontal tissues in a group of extremely preterm adolescents, compared with healthy matched adolescents born at term. Further, to compare the frequencies of enamel mineralization disturbances between the same groups and relate this to neonatal and postnatal morbidity and treatments.

The hypothesis was that preterm children have more affected oral health, poor oral hygiene and more enamel mineralization disturbances associated with neonatal morbidity and treatments, compared with healthy children born at term.

Material and methods

Subjects

The preterm group consisted of all consecutive surviving infants (n=56) who had previously participated in earlier published studies (14, 19, 24). The children were born before a gestational age (GA) of 29 weeks with LBW, during 1988-1991 at the Östra Sjukhuset in Göteborg, Sweden. Five children were excluded from the study since they did not fulfill the inclusion criteria, i. e. having available medical records. The adolescents and their parents were invited, by letter, to participate in the present study. Three patients did not wish to participate and three were not possible to reach. Five extremely preterm children of the remaining 45 (28 boys, 17 girls) did not wish to attend the clinical examination but agreed to give permission for the collecting of information from the dental and medical records. The eleven dropouts (5+6) in the clinical study and six in the retrospective study (seen from material, earlier published (14, 19, 24)), did not differ significantly regarding GA, birth weight (BW), and no differences were found regarding postnatal medical health and treatments compared with the participating adolescents. Thus, 40 extremely preterm children (25 boys, 15 girls) participated in the clinical study (Table 1) and 45 (28 boys, 17 girls) in the retrospective study. Ten were born as twins (two twin siblings did not survive). The age range was 12.3-16.4 years at the dental examination.

The extremely preterm children (n=40/45) were individually matched with full term healthy children forming a control group, regarding age at examination (± 5 months), gender and catchment area of the same Public Dental Service Clinic.

Medical history

The neonatal and postnatal medical diagnoses and treatments were retrieved from hospital medical records for the extremely preterm children and from the Swedish Medical Birth Registration for the controls. A standard deviation score for birth weight (BWsds = actual birth weight – mean value of birth weight/standard deviation of respective gestational age at birth and gender) was calculated. Small for gestational age (SGA) was considered when the BWsds was below -2.0 sds (23). Weight differences between birth, one month and two months of age were calculated. Medical diagnoses were registered at the clinical examination and the daily intake of medicines was noted.

Odontological registrations

The clinical examination (n=40/40) was performed under working light in a dental chair by a single examiner (MR).

Table 1. Demographic and medical data in the clinical study (data from the retrospective study in brackets). EPT = extremely preterm, Age = at the clinical study, GA = gestational age, BW = birth weight, BWsds = standard deviation score for birth weight. BPD = bronchopulmonary dysplasia, NEC = necrotizing enterocolytis, IVH = intraventricular haemorrhage, ADHD = attention deficiency hyperactivity disorder, CP = cerebral palsy. (*=p<0.05, ***=P<0.001).

	EPT n=40 (n=45)	Controls n=40 (n=45)
Sex		
Boys	25 (28)	25 (28)
Girls	15 (17)	15 (17)
Age		
Mean	14.2 (14.2)	14.3 (14.4)
SD	1.3 (1.3)	1.3 (1.3)
Median	14.0 (14.0)	14.3 (14.4)
Range	12.3-16.4 (12.3-16.4)	12.3-16.3 (12.3-16.3)
GA		
Mean	27.4 (27.4)	40.0 (40.0)
SD	1.2 (1.2)	1.8 (1.7)
Median	27.7 (27.9) ***	40.0 (40.0)
Range	24.3-28.9 (24.3-28.9)	37.0-43.0 (37.0-43.0)
BW		
Mean	1006 (1030)	3585 (3602)
SD	252.9 (258.0)	438.4 (432.7)
Median	1008 (1020) ***	3540 (3550)
Range	450-1450 (450-1520)	2875-4560 (2875-4560)
BWsds		
Mean	-1.05 (-0.94)	-0.32 (-0.28)
SD	1.41 (1.39)	0.86 (0.87)
Median	-0.53 (-0.51) *	-0.33 (-0.29)
Range	-5.59-1.49 (-5.59-1.49)	-2.84-1.47 (-2.84-1.47)
Morbidity at birth		
BPD	9 (10)	0
Sepsis	17 (20)	0
NEC	4 (4)	0
Hyperbilirubinemia	18 (22)	0
IVH	4 (5)	0
Treatments at birth		
Blood transfusion	36 (39)	0
Hospitalized >90days	11 (12)	0
Artificial nutrition >60days	26 (28)	0
Post hospital treatments within the first year	35 (39)	
Weight gain 1st month		
1-200g	3 (4)	
201-400g	22 (24)	
401-600g	14 (17)	
601-1000	1 (2)	
Weight gain 2nd month		
201-400g	3 (4)	
401-600g	6 (6)	
601-1000g	24 (27)	
1000g-	3 (4)	
Anamnesis at clinical examination		
Asthma	7	0
Heart disease	3	0
Growth deficiency	3	0
Allergy	7	2
Pierre Robins Syndrome	1	0
Turner Syndrome	1	0
Medicines (growth hormone steroides, broncholytic substances, stimulants, neuroleptica)	7	0
Dysfunctions at clinical examination		
ADHD	5	0
Autism	2	0
CP	2	0
Hearing, visual impairments	11	0
Perception, learning difficulties	6	0

Oral hygiene and periodontal status
Plaque was noted using a probe passing on the buccal and lingual surfaces of the upper and lower incisors and upper and lower first molars along the gingival margin. Plaque was noted as general, if registered both at the incisors and the molars and local, if registered either at the incisors or the molars. In all other cases, it was noted as plaque free.

The periodontal examination was performed using a Hu-Friedy 4 color-coded probe (Hu-Friedy Europe, Rotterdam). Periodontal registrations were made according to the WHO guidelines for clinical examinations (35). The following registrations were made: Bleeding on probing (BoP) and pocket depths ≥ 4mm, for each site (mesial, buccal, distal and lingual) on the upper and lower incisors and upper and lower first molars. Three extremely preterm children and one control child did not cooperate to probing.

Caries
Caries was registered with the aid of a mouth mirror and X-ray bite-wings. The index used for the diagnosis of caries in the permanent teeth was DMFT (Decayed Missing Filled Teeth). Manifest occlusal caries was registered in a fissure when seen as a cavity or clearly noted as a radiolucency in the dentine on radiographs. Approximal caries was registered according to *Shwartz et al.* (31). Caries on smooth surfaces buccally or lingually was defined as initial when the surfaces were demineralized with the loss of translucency along the gingival margin, and as manifest when seen as a cavity.

The examiner's reliability to perform caries diagnostics on bite-wing radiographs was tested using bite-wing radiographs from 30 randomly selected patients not involved in the study. The radiographs were diagnosed for caries according to the above mentioned criteria, twice, with a four week interval.

Mineralization disturbances
Enamel mineralization disturbances were diagnosed according to the developmental defects in the enamel index (1). Hypomineralized enamel was noted as single, multiple, or affecting all teeth. Hypomineralized enamel with enamel breakdown (severe hypomineralization) was noted separately. Fluorosis was diagnosed when confirmed from the odontological history. Enamel hypoplasia was noted as local or affecting all teeth.

Salivary examination
Stimulated saliva was collected during five minutes with the patient sitting in an upright position. The amount of saliva was measured in ml/min and registered as normal if ≥ 1ml/min (9). A chair side strip test was used to measure the pH in saliva and for the cultivation of Streptococcus mutans (S. mutans) and Lactobacilli (Dentobuff® Strip, Dentocult SM Strip Mutans™, Dentocult LB dip slides, Orion Diagnostica, Sweden) according to the manufacturer instructions (4, 12, 21). If no cultivation was seen, it was noted as no growth. At the statistical analysis for S. mutans, the groups low and medium were analyzed together.

Dental records at 3, 6 and 9 years of age
From the dental records provided from the clinics in the Swedish Public Dental Service and in five cases from private dental clinics, information concerning decayed, missing and filled teeth, and mineralization disturbances were compiled for 3, 6 and 9 years of age (n=45/45), respectively.

At the age of 3 years, deft (deft=decayed, extracted, filled primary teeth) was noted. At the age of 6 and 9 years, deftm (deftm = decayed, extracted, filled primary teeth, molars) and DMFT were registered.

Statistical methods
SPSS version 15 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis with regard to descriptive analysis and hypotheses testing. Non-parametric methods were used since the measured values did not have a normal distribution. The Mann-Whitney U-test, Chi Square test and Fisher´s Exact were used. Spearman`s correlation analyses were performed between neonatal variables and mineralization disturbances in the extremely preterm group. Intra observer reliability was evaluated with the Cohen's Kappa test. The level of significance was set to $p < 0.05$.

Ethical aspects
Informed, written consent was obtained from the extremely preterm children, the control children and their parents. Ethical consent was given by the Ethical Research Committee at the University of Gothenburg, Dnr: S 675-02.

Results
Medical history and anamnesis
Postnatal diagnoses, treatments and medical anamnesis at the time of the clinical examination are shown in Table 1. The extremely preterm infants were hospitalized (range 41-441 days) and treated

with artificial ventilation, blood transfusions, antibiotics, artificial nutrition and in some cases, surgery. All medical information may be obtained from the author upon request.

Thirty-three control children had no birth complications, six children had signs of mild hypoxia or transient tachypnéa and one child had a haemolytic disease. None of these conditions caused prolonged hospitalization.

Odontological registrations

Oral hygiene and periodontal status

There was a significant difference between the extremely preterm children and the control group (Table 2) in the occurrence of plaque (p=0.007) and BoP (0.024). No significant difference in the number of children with periodontal pockets (≥4mm) was found (Table 2).

The BoP - sites were significantly more frequent in the extremely preterm children compared with the controls (Mann-W=521.5; p=0.011), however, the frequency of pockets ≥4mm did not differ between the groups (Table 3).

Caries

The frequencies of the different caries indices are given in Tables 2 and 4. There were no statistically significant differences in the frequency of caries in the permanent dentitions between the two groups.

The intra-examiner agreement resulted in Cohen's kappa value of 0.81.

Mineralization disturbances in the permanent dentition

The total frequency of mineralization disturbances, enamel hypoplasia and enamel hypomineralization is shown in Table 2. There was no statistically significant difference between the two groups. However, there was a significant difference in the total number of teeth with enamel hypomineralization and breakdown between the two groups, 11 and one teeth, respectively (Mann-W =681.5; p= 0.028). Enamel hypomineralization affecting all teeth in one of the controls was diagnosed as fluorosis according to odontological history and clinical appearance. Two children in the preterm group each had one permanent molar extracted due to enamel hypomineralization and caries according to notes in their dental records and one was waiting for an extraction.

No single medical diagnose or postnatal treatment was associated with mineralization disturbances.

Table 2. Results of the clinical examination. EPT = extremely preterm.

	EPT n=40	Controls n=40	p
Salivary secretion			
<1ml/min	20	7	
≥1ml/min	20	33	0.004
pH			
>5.5	31	31	
4.5-5.5	9	7	
<4.5	0	1	
missing	0	1	
S mutans			
No growth	3	12	
<1000 000	27	25	
>1000 000	8	3	0.032
missing	2	0	
Lactobacillus			
No growth	8	4	
1000	18	14	
10 000	8	9	
100 000	5	12	
Plaque			
None	7	19	
Local	23	18	
General	10	3	0.007
Periodontal			
BOP	16	7	0.024
Pockets >4mm	6	2	
missing	3	1	
Hypoplasia	2	5	
Local	2	4	
All teeth affected	0	1	
Hypomineralization	16	12	
Single	6	5	
Multiple	8	5	
All teeth affected	2	2	
Severe hypomineralization	7	1	
Decayed Teeth			
Initial	15	12	
Manifest	7	5	
Filled Teeth	12	18	

Table 3. Number of extremely preterm children/control children with sites of bleeding on probing (BoP) and pockets ≥ 4mm. (Extremely preterm children/controls; n=37/39).

Sites	BoP	Pockets ≥4mm
0	21/32	31/37
1	2/3	2/1
2	4/1	2/1
3	2/0	1/0
4	0/2	0/0
5	2/0	0/0
8	3/0	0/0
11	1/0	0/0
12	1/0	0/0
14	0/0	1/0
16	1/1	0/0

Table 4. Number of extremely preterm children/control children with caries, filled and missing teeth. (FT = filled teeth; DTia = decayed teeth approximal only in the enamel; DTibl = decayed teeth buccal and/or lingual only in enamel; DT= decayed teeth in dentin; MT = missing teeth, extraction due to caries). (Extremely preterm children/controls; n=40/40).

No of teeth	DTia	DTibl	DT	MT	FT
0	27/29	30/36	33/35	38/39	28/22
1	3/6	0/1	4/2	2/1	4/7
2	2/2	3/0	2/2	0/0	4/6
3	0/1	1/1	1/1	0/0	3/4
4	2/1	1/1	0/0	0/0	1/0
5	4/0	4/0	0/0	0/0	0/0
6	2/0	1/0	0/0	0/0	0/1
10	0/1	0/1	0/0	0/0	0/0

Table 5. Oral health and risk indicators among twins (n=8). Number of teeth. (n.r=non registered) (BoP = bleeding on probing, DT= decayed teeth in dentin FT = filled teeth, MT = missing teeth, extraction due to caries.

	Plaque	BoP	DT	FT	MT	Severe hypomin	Saliva<1ml/min
Twin pair I	local	0	0	2	1	2	no
	local	n.r	3	3	0	2	yes
Twin pair II	local	0	0	1	0	0	yes
	local	0	0	2	0	0	yes
Twin pair III	local	0	0	1	0	0	no
	local	0	0	0	0	0	no
Twin pair IV	local	5	0	0	0	0	yes
	none	0	0	0	0	0	no

Table 6. Number of extremely preterm children/control children related to caries, filled, and missing teeth. (dt3, dt6, dtm9 = decayed teeth at 3 and 6 years of age and decayed molars at 9 years of age in the primary dentition; DT6 and DT9 = decayed teeth at 6 and 9 years of age in the permanent dentition; ft6 and ftm9 = filled teeth at 6 years of age and filled molars at 9 years of age in the primary dentition; FT9 = filled teeth at 9 years of age in the permanent dentition; etm9 = extracted molars at 9 years of age in the primary dentition. MR = missing records). (Extremely preterm children/controls, n=45/45) (*=p<0.05). Mean ages of extremely preterm children/controls were 3.41/3.27, 6.21/6.08 and 8.94/9.08.

No teeth	dt3	dtm 6*	DT6	dtm9	DT9	ftm6	ftm9	FT9	etm9
0	36/33	35/30	42/43	26/28	35/37	34/39	24/22	37/35	32/34
1	2/1	6/3	0/1	4/6	0/5	6/1	10/2	2/6	5/3
2	0/2	1/5	0/0	4/4	4/1	1/2	3/11	0/1	3/1
3	0/0	0/4	0/0	3/3	0/0	0/1	1/4	0/1	0/3
4	0/1	0/0	0/0	1/2	1/0	1/0	1/0	1/0	0/1
5	0/0	0/0	0/0	1/0	0/0	0/0	0/1	0/0	0/0
6	0/0	0/1	0/0	1/0	0/0	0/1	0/2	0/0	0/1
7	0/1	0/1	0/0	0/0	0/0	0/0	1/1	0/0	0/0
MR	7/7	3/1	3/1	5/2	5/2	3/1	5/2	5/2	5/2

Salivary examination
Stimulated saliva, with secretion values lower than 1 ml/min, was significantly more often found in the extremely preterm children compared with the controls (Table 2). There were no differences found in pH between the groups.

Extremely preterm children had significantly more S. mutans (Table 2) than the controls (p=0.032).

Twins
The oral health and risk indicators for each sibling in the four twin pairs did not differ from the rest of the children (Table 5). However, one twin pair had asthma, several teeth with hypominerlization (6/7) and severe hypomineralization (2/2).

Dropouts
Five of the eleven dropouts that participated in the retrospective study showed no differences from the study group concerning caries or enamel hypomineralization according to the dental records.

Dental records at 3, 6 and 9 years of age
Caries
At 3 and 9 years of age, no statistically significant differences between the extremely preterm children and the control children were found concerning dt_m/DT, et_m/MT and ft_m/FT (Table 6). At 6 years of age, the control children had significantly more caries in the primary dentition compared with the extremely preterm group (Mann-W=749.5; p=0.045).

Mineralization disturbances in primary dentition
In the dental records, mineralization disturbances in the primary dentition were noted in five extremely preterm children (11%) at 6 years of age, compared with none among the control children (p=0.024). One of the extremely preterm children had a disturbance affecting all teeth. According to dental records at 9 years of age, seven extremely preterm children (16%) had mineralization disturbances in the primary dentition, compared with none in the control group (p=0.004). In both groups, four children were noted to have local mineralization disturbances in the permanent teeth at 9 years of age.

Findings related to morbidity
No specific medical diagnose or postnatal treatment was associated with severe mineralization disturbances.

Periodontal and caries findings and salivation were not related to morbidity or dysfunctions in the adolescents.

Discussion
This explorative and retrospective study has shown that children born before week 29 GA, as adolescents, had more risk indicators for future oral health impairments. They had more plaque and BoP, less stimulated saliva and more S. mutans than healthy children born at term

Further, enamel hypomineralization with severe loss of enamel was more frequent in the permanent dentition of extremely preterm children and may cause an increased need of invasive treatments in the future.

The findings showed no statistically significant association with single postnatal medical diagnose or treatment nor with any medical diagnose or functional impairments in the adolescents.

By matching the extremely preterm children with the control children attending the same Public Dental Service clinic, a reasonable match of the children's social background was made, since 95% of the children in Sweden are reached by the Public Dental Service in their catchment area.
Among the dropouts, there were children with a neurological sequel which may have affected the outcome of caries and oral hygiene according to literature (11).

Four sets of twins were found among the preterm adolescents. The social-behavioral effect on the result may exist associated with plaque, BI and dental caries. However as the number of twins is limited, no conclusions will be drawn.

It has been shown that poor oral hygiene, reduced salivary secretion and S. mutans may enhance caries activity (29). In an earlier study, the extremely preterm children in this study showed a large variability in the children's Performance Intelligence Quotient (PIQ) and a relation between PIQ, low BW and postnatal morbidity was found (14). An insufficient ability to perform a certain task may affect the tooth brushing technique and explain the poor oral hygiene among the preterm children, resulting in more gingivitis.

The difference in saliva secretion between the two groups may be attributed to anxiety, fear, stress and asthma among the preterm children. Many of the preterm children have experienced medical treatment during their childhood and repeated painful operations may cause fear and anxiety. It has been shown that preterm children react physiologically to stress (22). Preterm children have been shown to have more behavioral problems causing stress in the dental treatment situation compared with the con-

trols (6), which subsequently may cause a lower salivary flow. The preterm children had more S. mutans which might be a result of more plaque. It is not possible to draw any conclusions on the impact of the results on an individual basis, but it has been shown that in a group level, a higher rate of S. mutans is associated with higher caries frequency (34).

The number of children with caries and the DMFT did not differ between the groups. There was a tendency toward more initial caries buccally and lingually in the teeth from the preterm children compared with the control group. Therefore, the result may indicate an increased caries activity during adolescence and is associated with the earlier discussed problems with oral hygiene among the extremely preterm children.

Morbidity, such as asthma and cerebral palsy, has been shown to affect oral health (11, 33). Children with ADHD, at 13 years, of age have been shown to have oral risk behavior (5). In this study, there was no association between morbidity and neuropsychiatric disturbances at adolescence and risk indicators.

The results from dental records must be regarded with care as the accuracy of this information is difficult to confirm. However, in the retrospective study at 6 years of age, the preterm children showed less caries which is in consistency with recent publications (10, 15) but in contrast with a recent Swedish study (6). In a review article (8), no uniform agreement concerning preterm children and caries risk was found. The fact that the caries prevalence in Sweden is low (20, 32) may affect the results of this study. In countries where caries prevalence is higher, the impact of the extremely preterm children's diagnoses and functional disturbances may be more important for the oral outcome. This study has not been able to prove that preterm children have more caries than healthy children born at term.

The frequency of enamel hypomineralizations in the permanent dentition in extremely preterm children did not differ from what was found among the control children, however, the severity of the enamel disturbances was more pronounced. In the primary dentition, the results of mineralization disturbances in this study were in agreement with other studies (2, 30). The higher frequency of hypomineralization found among 9 year olds compared to 6 year olds, confirms the difficulties in diagnosing hypomineralization in the primary dentition as well as the possibility of incomplete notations in dental records. Several studies have shown mineralization disturbances in the primary and permanent dentition associated with systemic insults the first year of life (3, 25). However this study could not confirm any association between GA at birth, BW, BWsds or specific medical diagnose and mineralization disturbances in the primary or permanent dentition among the extremely preterm children.

In conclusion, this study indicates that the oral health of adolescents born extremely preterm is not related to specific postnatal diagnoses, treatments or morbidity. The preterm adolescents had poor oral hygiene, more gingivitis, lower stimulated saliva and more S. mutans. The frequency of mineralization disturbances in enamel did not differ between the groups; however, the extremely preterm children had more severe mineralization disturbances compared with the healthy full term controls. These risk indicators constitute an increased vulnerability for a poor adult oral outcome among extremely preterm children. Considering the results of this study, individual recommendations for preventive treatment and support should be given to extremely preterm adolescents.

Acknowledgements

This study was supported by grants from The Research & Development Council in the Region of Västra Götaland, Sweden; The Research & Development Council in Södra Älvsborg County, Sweden; The Dental Society of Gothenburg; The Foundation of Sigge Persson and Alice Nyberg for Research in Odontology and from the Swedish Society of Paediatric Dentistry.

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Corresponding author:
Dr Marianne Rythén
Specialist Clinic for Pediatric Dentistry
and Hospital Dental Care
SU/Mölndal
SE-431 80 Mölndal
Sweden
E-mail: marianne.rythen@vgregion.se

Routines for interocclusal appliance therapy among general dental practitioners in a Swedish county

MAJA GNAUCK[1], MARTTI HELKIMO[1], TOMAS MAGNUSSON[2]

Abstract

◎ The aims of this study were to investigate what kind of interocclusal appliances that were chosen among Swedish dentists when treating temporomandibular disorders (TMD), the clinical rationale for the treatment, the diagnoses that warranted the appliance treatment, the use of adjunct TMD treatments and prognostic considerations, and possible differences in these respects between children/adolescents and adults with TMD, and, finally, possible differences between private practitioners and general practitioners in the public dental service.

During the 12-months-period April 2009 – March 2010 all general dental practitioners in the county of Jönköping, Sweden, were asked to fill in a questionnaire when performing a TMD treatment with an interocclusal appliance. A total of 394 questionnaires were filled in and returned, 216 (55%) from dentists in public dental service and 178 (45%) from private practitioners.

It was found that in 40% of the cases, no pre-treatment recording of the functional status in the masticatory system had been made. The commonest reasons for the treatment were bruxism, headache, and replacement of a previous appliance.

Less than half of the appliances made were hard acrylic appliances. Some kind of adjunct therapy had been made in 22% of the cases treated in public dental service. The corresponding figure for those treated by private practitioners was 25%. Therapeutic jaw exercises was the commonest adjunct therapy followed by selective occlusal adjustment. In the vast majority of cases, the dentists judged the prognosis of the treatment to be good.

It is concluded that a large number of appliances made to treat TMD were soft appliances, especially in public dental service. This reflects a possible overuse of soft appliances at the expense of hard acrylic appliances. Furthermore, in a large number of cases, the treatment was performed without any pre-treatment registrations, and adjunct therapies were rarely used. In all these respects, there is an improvement potential for the treatment of TMD in general dental practice.

Key words

TMD, treatment, splints, dentistry, indications

[1] Department of Stomatognathic Physiology, The Institute for Postgraduate Dental Education, Jönköping, Sweden.
[2] School of Health Sciences, Jönköping University, Jönköping, Sweden.

Rutiner för bettskenebehandling hos allmäntandläkare i ett svenskt landsting

MAJA GNAUCK, MARTTI HELKIMO, TOMAS MAGNUSSON

Sammanfattning

◉ Målet med studien var att undersöka vilka typer av bettskenor som svenska allmäntandläkare väljer när de behandlar patienter med funktionsstörningar i käksystemet, vilka kliniska registreringar som föregår behandlingen, vilka diagnoser som föranleder behandling, huruvida bettskenebehandlingen kombineras med andra interventioner, hur prognosen för insatt behandling bedöms samt att analysera om det i dessa avseenden förelåg skillnader mellan barn-/ungdomspatienter och vuxna patienter samt mellan tandläkare i folktandvården respektive privattandläkare.

Alla allmäntandläkare i Jönköpings län ombads att fylla i ett frågeformulär när de under 12-månadersperioden april 2009 - mars 2010 utförde behandling med bettskena. Totalt inkom 394 formulär, 216 (55%) från tandläkare verksamma inom folktandvården och 178 (45%) från privattandläkare. Andelen barn/ungdomar som erhållit bettskena var 38% respektive 7%.

I 40 % av fallen hade det inte upprättats något bettfysiologiskt status före behandlingens start. De vanligaste indikationerna för behandling med bettskena var bruxism, huvudvärk samt ersättning av en tidigare bettskena. Trettio procent av resiliensskenorna sattes in i diagnostiskt syfte.

Mindre än hälften av de rapporterade bettskenorna var hårdplastskenor, varav stabiliseringsskenan var den helt dominerande typen. Resiliensskena valdes i större utsträckning av folktandvårdstandläkare, medan privattandläkare oftare valde hårdplastskena. I 22% av fallen som behandlats av folktandvårdstandläkare kombinerades bettskenan med någon annan typ av behandling. Motsvarande siffra för privattandläkarna var 25%. Rörelseträning för käkmuskulaturen var den vanligaste behandlingskombinationen följt av selektiv bettslipning. I mer än 80% av fallen bedömde tandläkarna prognosen för den insatta behandlingen som god.

Slutsatsen av studien är att resiliensskenan utgjorde ett vanligt val vid behandling av funktionsstörningar i käksystemet, speciellt inom folktandvården. Detta återspeglar en möjlig överanvändning av denna skentyp. Dessutom kan konstateras att ett stort antal av patienterna behandlades utan att något funktionellt status upprättades före behandlingen och möjligheten till kombinationsbehandling utnyttjades sällan. I dessa avseenden torde det finnas en potential att inom allmäntandvården förbättra behandlingen och omhändertagandet av patienter med funktionsstörningar i käksystemet.

Introduction

There are many publications about general dental practitioners' knowledge, beliefs, routines and experiences concerning etiology, diagnostics, treatment and prognosis of temporomandibular disorders (TMD) (14, 20-22, 31, 33, 34). However, little is known about Swedish dentists' attitudes in respect of indications and routines for treatment with interocclusal appliances.

TMD are characterized by pain in the face and/or jaws at rest or during jaw movements, headache, limited range of mandibular mobility, temporomandibular joint (TMJ) sounds and tiredness or fatigue in the masticatory muscles (7). Signs and symptoms of TMD are common in non-patient populations (5). However, TMD signs and symptoms cannot be transformed into treatment need (5, 9). The perceived severity of symptoms seems to be the determining factor (9). The treatment need of TMD has been estimated to be 3-25 % in different populations and in different age groups (9, 26).

A treatment plan for TMD should not be determined only by the disorder per se but also, and more important, by the patient´s needs (15). Today it is widely accepted that the vast majority of TMD patients can be successfully managed by general practitioners using often simple and conservative and mostly reversible treatment methods e.g. counselling, reassurance, different kinds of interocclusal appliances, therapeutic jaw exercises and selective occlusal adjustment.

"Occlusal splint therapy may be the first treatment a dentist thinks of when dealing with a patient with a TMD" (16). A number of different types of interocclusal appliances with different indications and functions have been described in the literature (2, 7, 16). It has been suggested that not the design of the appliance, but an accurate diagnosis, a dentist who is familiar with the appliance in question, and the patient´s comfort are the most important factors for the treatment outcome (7).

In the 1970s and 1980s an increasing number of interocclusal appliances were made in Sweden (17, 25) and Helkimo predicted that this trend would continue. In the 1990s, it was estimated that approximately 30 000 – 40 000 appliances were made each year in Sweden (24). The yearly incidence has been estimated to be 0.3% to 0.4% of the Swedish population (23) or 0.42% to 0.57% in adults (21, 22). According to statistics from the Swedish Insurance Office, the exact number of appliances made for adults (>19 years of age) due to TMD during the 12-month-period April 2009 – March 2010 was 48 307. Out of these, 37 464 (78%) were hard acrylic appliances and 10 843 (22%) were soft/resilient appliances (henceforth called soft appliances). In December 31, 2009 the adult Swedish population was 7 152 707 (Statistics Sweden, www.scb.se). Thus, the yearly incidence of treatment with hard and soft appliances was 0.52% and 0.15%, respectively, making a total incidence of 0.67%.

Many different types of hard acrylic appliances have been described in the literature but in Sweden (21), as well as in other countries (30), the by far most commonly used is the stabilisation appliance (Figure 1). This type has been recommended for treatment of TMD related muscle and joint pain by providing a "temporary and removable ideal occlusion" (2). It has also been recommended for treatment of TMD patients with myofascial pain (8, 11), as well as patients with TMD of arthrogenous origin (8, 13) and tension-type headache in patients with TMD of myogenous origin (12).

The soft appliance (Figure 2) is also frequently used in Sweden (22) and has been advocated when interocclusal appliance treatment is needed in young children and adolescents with primary or mixed

Figure 1. Hard acrylic stabilization appliance

Figure 2. Soft appliance

dentition, as a temporary treatment in acute situations, in complete denture wearers and in patients who have fixed dental prosthesis (FDPs) supported by implants, as well as in patients who need to wear their appliances during the day time (7).

Many authors have stressed that the majority of patients with signs and symptoms of TMD can be managed by an interested, knowledgeable, and adequately trained general practitioner, using simple treatment modalities (6, 7, 18, 33). There is, however, also a need for TMD specialists to handle non-responding patients (19, 33). A vision can be that specialist centres deal with more intractable cases and cases with diagnostic difficulties (33). Even if the treatment of these more difficult patients can be referred to a TMD specialist, it is still the general practitioners who meet the patient the first time and have the important task to identify and diagnose these kinds of patients (7).

The aims of this study were to investigate what type of appliances that were chosen among Swedish dentists, the clinical rationale for the treatment, the diagnoses that warranted the appliance treatment, the use of adjunct TMD treatments, prognostic considerations, and possible differences in these respects between children/adolescents and adults with TMD, and, finally, possible differences between private practitioners (PPs) and general practitioners in the public dental service (PDS).

Material and methods

A postal letter was sent to all PPs (n=69) and general practitioners in PDS (n=128) in the county of Jönköping, Sweden, in the end of March 2009 with information of the aims of the study and a request to fill in a questionnaire upon delivery of an interocclusal appliance to a patient during the 12-months-period April 2009 – March 2010. All dentists also received a reminder by email four times during the study period.

The questionnaire comprised questions concerning the patients' age and gender, the examination made to diagnose TMD, the indication for the appliance treatment, the kind of interocclusal appliance made, the reasons for choosing a soft appliance (when applicable), the estimation of the prognosis, and whether the treatment with interocclusal appliance had been combined with other TMD treatment modalities. All questions were multiple choice. The results are presented as frequencies and mean values. For the statistical analyses of differences between variables and groups, χ^2-test has been used. A p-value <0.05 has been considered as a statistically significant difference.

Results

During the study period a total of 394 questionnaires were filled in and returned, 216 (55%) from PDS and 178 (45%) from PPs. The male/female proportion was 36/64 both among those treated in PDS and among those treated by PPs. There were statistically significantly more children/adolescents among those treated in PDS compared to PPs (37% and 8%, respectively, $p<0.001$). The mean age for children/adolescents was 16 and 17 years, respectively (range: 8-19 years). The adults treated in PDS were somewhat younger compared to those treated by PPs (43 years and 51 years, respectively, range: 20-85 years).

Some kind of pre-treatment recording of the functional status in the masticatory system was reported to have been made in 59% of the cases from PDS and in 64% of the cases from PPs. When recordings had been made, palpation of jaw muscles was the most common one (94% and 86%, respectively), followed by palpation of the temporomandibular joints (79% and 72%), registration of joint sounds (50% and 52%), and registration of jaw opening capacity (32% and 28%).

The main indications for the appliance treatment are presented in Table 1. The commonest reasons for the treatment were bruxism, headache, and replacement of a previous appliance. The only statistically significant difference found between PDS and PPs was that headache was a more common indication for treatment in children/adolescents treated in PDS ($p<0.05$).

The types of appliances made are presented in Table 2. Out of the hard acrylic appliances, 97% were stabilisation appliances. The remaining were single Shore-plates and mandibular positioning appliances. When treating adult patients, PPs used hard acrylic appliances statistically significantly more often than dentists working in PDS ($p<0.01$). Seventy-five per cent of the soft appliances were placed in the upper jaw. The corresponding figure for hard appliances was 94%.

The reasons to choose a soft appliance are presented in Table 3. For adult patients, dentists working in PDS more frequently used the soft appliance as a diagnostic measure compared to PPs ($p<0.01$), while the reversed was found for the indication "to protect a prosthetic construction/bruxism" ($p<0.01$).

Apart from the appliance treatment, some kind of adjunct therapy was reported to have been made in

Table 1. Main indication/-s for appliance treatment (%). In some cases, more than one indication was listed.

Indication	Public dental service		Private practice		Total
	Children/adolescents n=78	Adults n=135	Children/adolescents n=13	Adults n=158	n=384††
Bruxism	35	23	69	31	30
Headache	30*	22	8*	17	21
Replacement	8	28	23	22	21
Jaw muscle pain	12	14	8	13	13
Fractures of fillings and teeth	1	9	0	17	10
Tender teeth	17	12	8	6	10
TMJ pain	12	7	8	11	9
TMJ locking	12	2	0	0	3
TMJ sounds	0	4	0	1	2
Other†	4	2	0	5	4

* Statistically significant difference between PDS and PP ($p<0.05$)
† e.g. tongue thrust, reduced jaws opening, malocclusion
†† Information about age was missing in 10 cases

Table 2. Type of interocclusal appliance made (%).

Type of appliance	Public dental service		Private practice		Total
	Children/adolescents n=78	Adults n=135	Children/adolescents n=13	Adults n=158	n=384†
Hard acrylic	32	39**	54	58**	46
Soft	68	61	46	42	54

** Statistically significant difference between PDS and PP ($p<0.01$)
† Information about age was missing in 10 cases

Table 3. Main reason to chose a soft appliance (%).

Indication	Public dental service		Private practice		Total
	Children/adolescents n=53	Adults n=81†††	Children/adolescents n=6	Adults n=67	n=207†††
Diagnostic treatment	34	39**	17	16**	30
Acute treatment	32	16	0	24	22
Protect FDP's†/bruxism	8	16**	33	40**	22
Economic reasons	8	17	0	6	11
Mixed dentition	11	-	33	-	4
Other††	8	11	17	13	11

** Statistically significant difference between PDS and PP ($p<0.01$)
† Fixed dental prosthesis
††e.g. tender teeth, patient's preference, daytime clenching, tongue thrust
††† Information about the main reason to chose a soft appliance was missing in 1 case

Table 4. Adjunct TMD therapies used (%). In some cases, more than one intervention has been listed.

Intervention	Public dental service n=213†	Private practice n=171††	Total n=384
Some kind of intervention	22	25	23
- therapeutic jaw exercises	89**	62**	76
- occlusal adjustment	15*	36*	25
- drugs (analgesics and/or NSAIDs)	2	12	7

Statistically significant differences between PDS and PP *$p<0.05$, **$p<0.01$
† Information about age was missing in 3 cases
†† Information about age was missing in 7 cases

22% of the cases treated in PDS. The corresponding figure for those treated by PPs was 25% (Table 4). PPs more frequently performed selective occlusal adjustment as an adjunct therapy ($p<0.05$), while dentists in PDS more frequently used therapeutic jaw exercises ($p<0.01$).

The prognosis of the treatment was judged to be good in 84% and 88% of the cases, respectively. In all the other cases, the prognosis was judged to be uncertain, and not in one single case was it judged to be poor.

Discussion

One drawback with the present study is that we have no information about the size of the drop-out since no reliable figures are available for how many interocclusal appliances that were actually made in the county of Jönköping during the time period under study. Two-hundred-ninety-three questionnaires concerning adults were returned from PPs and dentists in PDS. During the actual time, the TMD specialist clinic in the county made 192 hard acrylic and 62 soft appliances for adult patients, making a total of 547 "known" appliance treatments in adults. The adult population in the county was 253 933 subjects. The incidence of appliance treatment in adults is thus 0.21%. Even if there might be regional differences concerning this treatment modality, this figure is much lower than the incidence figure for Sweden as a whole; 0.67%. It can be assumed that many treatments have not been reported and this must be considered when the results are interpreted.

The proportion of children/adolescents who had received appliances was much higher in PDS compared to PPs. This is logical since in Sweden the PDS has the responsibility for the dental care up to the age of 19 years, and the vast majority in these age groups also receives their treatment in PDS.

In a previous study it was found that some kind of functional status was recorded in only one-fourth of cases where appliance treatment had been performed by general practitioners, while this was a routine in specialist settings (22). In the present study, some kind of pre-treatment clinical recording had been made in approximately 60% of the cases.

In cases where a clinical recording was made, the commonest measure was palpation of jaw muscles. The least common one was registration of maximal jaw opening capacity despite the fact that the latter registration has been suggested to be the most valid and reproducible clinical TMD variable (1, 32).

In the present study, the number of cases where a clinical registration had been made is considerably higher compared to the figures presented by Lindfors et al (22), but still, in 40% no such registrations were made. This is surprising since the clinical status and the case history are the bases for the diagnosis. Furthermore, a pre-treatment clinical registration is a prerequisite to evaluate the treatment result. There is an obvious improvement potential in this respect when handling TMD patients in general dental practice.

Bruxism was the commonest indication for appliance treatment both in children/adolescents and adults. This has been reported earlier (21, 22) and it has been suggested that bruxism is an overtreated condition in general dentistry (22) since it is well known that tooth wear, with few exceptions, is a normal and slow process (7). In PDS headache was a more common indication for appliance treatment in children/adolescents compared to PP. One possible explanation might be that dentists in PDS treat many more young patients and, as a result, are more observant on headache possibly related to TMD.

As stated in the introduction, 22% of all appliances made for adults in Sweden in 2009/2010 were soft ones. In the present sample, much higher figures were found, 61% and 42% in PDS and PP, respectively. At the specialist clinic in the county, 24% of the appliances made were soft ones, a figure much more comparable with the national figures. It is known that differences exist both between counties and between clinics within the same county. For the choice of appliance, in one county 63% of all appliances made were soft ones, while the corresponding figure in a neighboring county was 20% (22). Furthermore, 78% of all appliances made in one clinic were soft ones, while, in another clinic in the same county, only 5% of the appliances made were of this type (22). In the present study, differences were also found between dentists in PDS and PPs, where the PPs more frequently choose hard acrylic appliances. It is obvious that there are differences in traditions, cultures and strategies when it comes to the choice of appliance in treating TMD.

In line with recommendations in textbooks (7, 24, 25) the majority of hard acrylic appliances, 94%, were placed in the upper jaw. Three out of four soft appliances were also placed in the upper jaw. This is notable since it has been recommended to place soft appliances in the lower jaw for comfort reasons (7, 24, 25).

The scientific support for both the efficacy and effectiveness of hard acrylic appliances is much bet-

ter than that for soft appliances (10, 27). Moreover, a disadvantage with soft appliances is that they can only be recommended for short term use since they deteriorate fairly quickly (7). Furthermore, a recently published thesis questions the benefit of soft appliances when treating adult patients suffering from chronic TMD pain (28). It was concluded that treatment of TMD in children and adolescents with mixed dentition and short-term treatment of acute TMD in adults may be possible indications for soft appliances (28).

The most common reason to choose a soft appliance was to use it as a diagnostic tool, and this reason was more common in PDS compared to PP. This can be questioned since hard and soft appliances probably have different modes of action. It has, for instance, been shown that patients who had a reduced EMG activity when using a hard acrylic appliance turned to an increased EMG activity when it was replaced with a soft one (3, 29). A non-response to a soft appliance treatment does not necessarily mean a non-response to a treatment with a hard acrylic appliance and vice versa.

Another common reason to choose soft appliances was to protect FPDs/bruxism, and this was a more common reason among PPs. Considering the fact that this indication implies long-term use of an appliance that quickly deteriorates, this indication can be seriously questioned.

Hard acrylic appliances were a more common choice among PPs compared to dentists in PDS. In agreement with previous studies (21, 22), the hard appliances made by general practitioners in Sweden were, with rare exceptions, stabilisation appliances. TMD specialists use a variety of hard appliances (21, 22) and it has been stated that "it is likely that the treatment of TMD cases in general dental practice could be improved if general practitioners were familiar with more types of appliances and their specific indications" (22).

In only 22% - 25% of the cases had some kind of adjunct therapy been used. An equal figure of adjunct therapies (23%) has been reported previously (22). Much higher figures (73%) have been reported from specialist settings (22) and according to one previous study presenting data from 2594 patients treated at a specialist clinic, the patients received on the average 1.9 treatment modalities (4). One important reason to use a combination of different therapies is to maximise any complementary effects (15). It is likely that the outcome of TMD treatment would improve if general practitioners to a greater extent used combinations of TMD treatments.

In the present study, therapeutic jaw exercises was the commonest adjunct therapy, and it was more commonly introduced by dentists in PDS compared to PPs, while selective occlusal adjustment was more commonly used by PPs. Drugs were rarely used and probably reflect an overall restrictive approach in Swedish dentistry to prescribe analgesics and NSAIDs. In a comparable previous study (22), the use of occlusal adjustment as a combined treatment was equally common as in the present study, while therapeutic jaw exercises was used much more rarely. The differences found in this respect are probably due to differences in treatment traditions and treatment approaches in different parts of Sweden as well as differences in patient materials between PDS and PP.

In the vast majority of the cases treated both in PDS and PP the prognosis was considered to be good. This is probably a reflection of a positive experience from previous treatments made with interocclusal appliances.

To conclude, this study shows that a large number of appliances used in the county of Jönköping to treat TMD were soft appliances, especially in PDS. This reflects a possible overuse of soft appliances at the expense of hard acrylic appliances. Furthermore, in a large number of cases, the treatment was performed without any pre-treatment registrations, and adjunct therapies were rarely used. In all these respects, there is an obvious improvement potential for the treatment of TMD in general dental practice.

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Corresponding author:
Dr Maja Gnauck
Department of Stomatognathic Physiology
The Institute for Postgraduate Dental Education
P.O. Box 1030
SE-551 11 Jönköping, Sweden
E-mail: maja.gnauck@lj.se

Adolescents' experiences of participating in a school-based fluoride varnish programme in Sweden

EVA-KARIN BERGSTRÖM[1,2], ULLA MOBERG SKÖLD[1], DOWEN BIRKHED[1], MARGRET LEPP[3]

Abstract

◉ Population-based health promotion with school-based fluoride varnish programmes is becoming more frequent, as these programmes have been implemented in many parts of Sweden during the last five years. The caries-prevention effect is well studied, but as yet there is no study aimed at adolescents' experiences of these programmes. The aim of this study was therefore to describe how a school-based fluoride varnish programme is experienced by participating adolescents. The study was performed as a qualitative study by conducting four focus-groups interviews. In all, 26 adolescents participated, all aged 15. All the participants had several years' experiences of a fluoride varnish programme at school. The participants were asked to describe their experience of participating in the programme. The analysis of the data from the interviews was carried out according to the principles of phenomenography. The three themes that emerged were "Conceptions in relation to the individual", "Conceptions in relation to the school dental nurse" and "Conceptions in relation to the group and school". The result showed that the adolescents experienced that it was positive to take part in a fluoride varnish programme at school and they regarded the school as an important health promotion arena. In spite of this, there were perceptions that were worth reflecting on for school dental nurses, such as feelings of exposure, peer pressure and a perceived lack of information. To further improve these programmes, and thereby increase population-based dental health promotion, it is important to highlight the role of dental personnel, as they are largely responsible for creating the atmosphere.

Key words

Adolescents, fluoride varnish, focus-group interviews, phenomenography, school-based

[1] Department of Cariology, Sahlgrenska Academy at Gothenburg University, Göteborg, Sweden

[2] Department of Preventive and Community Dentistry, Public Dental Health Service Västra Götaland Region, Sweden

[3] Institute of Health and Caring Sciences, Sahlgrenska Academy at Gothenburg University, Göteborg, Sweden

Ungdomars erfarenheter av skolbaserade fluorlackningsprogram i Sverige

EVA-KARIN BERGSTRÖM, ULLA MOBERG SKÖLD, DOWEN BIRKHED, MARGRET LEPP

Sammanfattning

◎ Skolbaserade populationsinriktade fluorlackningsprogram har blivit allt vanligare och genomförts på många håll i Sverige under de senaste fem åren. Den kariesförebyggande effekten av dessa program är väl utvärderad men studier på hur ungdomar upplever dessa program är få eller saknas. Syftet med denna studie var därför att beskriva hur ett skolbaserat fluorlackningsprogram upplevs av de deltagande ungdomarna. Studien genomfördes som en kvalitativ intervjustudie med fyra fokusgrupper. Sammanlagt deltog 26 ungdomar, samtliga 15 år. Alla deltagare hade erfarenheter från ett fluorlackningsprogram i skolan. Intervjuerna ägde rum direkt efter en fluorlackning och deltagarna ombads att beskriva sina erfarenheter av fluorlackningsprogrammet. Analysen av data från intervjuerna genomfördes i enlighet med principerna för den fenomenografiska ansatsen. Tre teman; ”Uppfattningar i förhållande till individen”, ”Uppfattningar i förhållande till tandsköterskan” och ”Uppfattningar i förhållande till gruppen och skolan” med tillhörande kategorier framkom. Majoriteten av ungdomarna upplevde att det var positivt att delta i fluorlackningsprogram i skolan och såg skolan som en viktig hälsofrämjande arena. Emellertid fanns det uppfattningar som särskilt bör beaktas av folktandvårdens personal som arbetar i skolan. Det handlade om känslor av utsatthet, grupptryck och en upplevd brist på information. För att ytterligare förbättra och utveckla dessa fluorlackningsprogram är det därför viktigt att belysa tandvårdspersonalen som arbetar i skolan, då det är de som till största delen avgör hur ett fluorlackningsprogram kan upplevas.

Figure 1. Fluoride varnish programme in school (FVP): Information and instruction in group, flossing and application of fluoride varnish.

Introduction

In Sweden, all children and adolescents up to the age of 20 are entitled to receive tax-subsidised dental care. This means that all children and adolescents are the focus for caries-prevention programmes and regular check-ups at dental clinics. Internationally, this is something unique. The Public Dental Health Service started in Sweden as early as 1938 and, together with independent dental research, this probably provided the basis for good oral health among children and adolescents in Sweden (3).

Furthermore, there is a long tradition of caries prevention programmes at schools for all children and adolescents in Sweden. Back in 1965, *Torell &Ericsson* (26) showed that fluoride mouth rinsing every second week at school contributed to a 20-30% caries reduction among children and adolescents. After that, Swedish children and adolescents had the opportunity to take part in population-based fluoride mouth rinse programmes at school during a period of 25 years. However, in the mid-1980s the fluoride programme ceased at most schools. At that time, there was a change in prevention policy aiming at a high-risk strategy at dental clinics rather than a population-based strategy at school.

Dental health has improved substantially among children and adolescents during the last 40 years in almost all the industrialised countries including Sweden (18). There is, however, an under-reporting of caries prevalence among children and adolescents in the official caries data, as they only report dentine lesions and fillings (6, 15, 17, 20, 25). Enamel lesions on the approximal surfaces constitute more than 80% of the total caries lesions among Swedish 16-year-olds, independently of a high or low caries prevalence in the population (2, 15, 23). The underestimation of the true caries prevalence in combination with the modern lifestyle and people neglecting the optimal use of fluoride toothpaste were the reasons for once again aiming at using the school as a health promotion arena. In 2005, Moberg Sköld et al. (16) reported in a 3-year school-based fluoride varnish study in different caries risk areas that the fluoride varnish Duraphat had a significant effect in reducing new caries lesions and progressing caries lesions among 13- to 16-year-olds. The result of that study was one of the reasons for the re-implementation school-based fluoride varnish programme (FVP) in the south-western part of Sweden in 2008 (Figure 1).

The caries-prevention effect of FVP is well documented, but knowledge of how children (age 6-12 years) and adolescents (13-18 years) experience the programme is lacking (13, 19, 21). Taking part in FVP

at school is probably experienced differently from person to person. Experience of the treatments may play an important role in the outcome of the programmes. A better knowledge of the participating children's and adolescents' experiences of participating in an FVP could possibly improve the intervention, by enhancing the motivation to participate and thereby improving dental health.
The aim of the present study is to describe how a school-based fluoride varnish programme is experienced by participating adolescents.

Materials and methods

Study design and approach

The study was performed with a phenomenographic approach. The aim of the phenomenographic approach is to describe the qualitatively different way a group of people make sense of, experience and understand phenomena in the world around them (14). Interviews are common as a means of data collection within phenomenography (7, 8). In this study, the phenomenon was experience of participating in a FVP.

Data collection

Four focus-group interviews were chosen with 4-9 participants in each group which is in agreement with the advices compiled by *Gibson* (5). The interviews took place directly after an FVP had been performed, in school. As *Gibson* stated, the school is an ideal location as the participants are 'insiders' and thereby anxiety for the interview-situation could be reduced. The interviews started with renewed information about the aim of the study, followed by the main open interview question. The participants were asked to describe their experience of participating in FVP. They were also asked about their expectations, thoughts and emotions in relation to FVP. One of the authors (E-KB) carried out the interviews, together with one of the other authors (ML) as an observer and co-interviewer. The interviews were recorded digitally and lasted for an average of 20 minutes (range 16-26 minutes). The interviews were then transcribed verbatim by E-KB.

Participants

The 26 participants in this study were recruited from one secondary school in a medium-sized municipality in the south-western part of Sweden. The headmaster of the school was contacted and agreed to let the adolescents participate in the study. The parents of the adolescents in four classes were informed by letter about the study. They received a written consent form to fill in and return if they agreed to allow their adolescents to participate in the study. In all, 26 adolescents participated; 22 girls and 4 boys, all aged 15. All the participants had several years' experience of FVP, since it had been standard at this school for 7-8 years.

Data analysis

The analysis was performed according to the phenomenographic approach (22, 27). The data analysis was inspired by *Alexandersson's* four steps (1). In the first step, all the interviews were read thoroughly several times after they had been transcribed verbatim, in order to obtain an overall impression of the material. The second step was devoted to noting similarities and differences in the material. In the third step, the statements were sorted into descriptive categories of conceptions. In the fourth and final step, the categories were reflected upon and the themes emerged, all describing the participants' experience of participating in a FVP.

Trustworthiness

As in the case of qualitative research in general, it should be possible to follow the researchers' thinking throughout the study. The research results should present an inner logic. To obtain a high level of trustworthiness, the categories must be sound and represent the participants' perceptions. The categories should not simply be a construction of the researcher (4, 9). The quotes given in this study are intended to facilitate the readers' evaluation of the trustworthiness of the analysis. To ensure correct data analysis, a co-examiner tested the results. These categories were presented to the co-examiner, who assigned the quotations to the "correct category". Agreement was almost unanimous between the author and the co-examiner. To further test the trustworthiness of the categories, a group of PhD students and researchers working in the field of phenomenography discussed the preliminary results with associated quotations.

Ethics

The participants received both written and verbal information about the study. The parents received written information and both adolescents and their parents signed consent forms prior to the interviews. Permission to perform the study was obtained from the Ethics Committee at the University of Gothenburg, Sweden (Dnr: 384-09).

Gibson (5) stated that there are two important ethical considerations that should be taken into account when using focus groups. The first is that disclosures by participants are shared not only with the researcher but also with the group members. The second is that intense group discussions may give rise to stress or distress in individuals. Furthermore, *Smith* (24) considers the potential for overdisclosure by the participants as the major risk. In this study the research topics were of a less sensitive kind, but efforts were still made to ensure no participant would feel exposed or stressed.

Results

Three themes "Conceptions in relation to the individual", "Conceptions in relation to the school dental nurse", and "Conceptions in relation to the group and school" with their attendant categories, representing different conceptions of having participated in the FVP, emerged in the analysis of the interviews with the adolescents. (Table 1)

Theme: Conceptions in relation to the individual

The first theme, "Conceptions in relation to the individual", contains conceptions that deal with the individuals' perspective of participating in the programme. The theme consists of four categories; "the first contact – a cool and scary event", "further on an ordinary event – no big deal", "overall an exposed situation", and "varnish that tastes good or bad".

Category: The first contact – a cool and scary event

The first category contains conceptions related to the participants' experiences of their first contact with the FVP. The statements showed that the initial treatment could be a long awaited stage in life. They felt grown up.

"You feel really grown up. I'd seen it on TV… and I had been waiting for it for so long – so it was fun."

Being in the programme and receiving fluoride varnish for the first time at school was a new sensation and the participants described how they felt awesome and cool. On the other hand, the experience could also be associated with negative feelings such as fear and tension. The "syringe" was a specific fear. When they came to the room and saw the setting with syringes, it was frightening. Some participants stated that not knowing what was going to happen added to the feeling of tension.

"I remember that I was really nervous. I didn't know what was involved and, when I saw all the syringes, I thought 'What's that?'. When I came out, I kept my mouth open all the time, because it didn't taste nice at all."

Category: Further on an ordinary event – no big deal

The second category covers conceptions about how small the intervention is in everyday life. According to the statements, participating in an FVP is not a big deal once you get used to it. It is seen as an ordinary procedure, an ordinary event in which one participates almost automatically. The participants said that they soon got used to taking part and learned to handle the situation. According to the statement, participating in the programme is not regarded as particularly enjoyable. However, as the treatment period is very short, there is no need to look for alternative ways.

"It isn't much fun participating, but what else can you do? You can't sit at McDonald's and do it, can you? You can't do it in a playroom! It can't really be made more enjoyable either. After all, it takes such a short time that it doesn't really matter."

Even if participating in an FVP is short and not so much fun, some participants said that the moment of treatment could still be a moment of relaxation.

"It didn't hurt, but you felt really relaxed when they did this (shows) and you had to sit and hold your mouth…"

Category: Overall an exposed situation

The third category covers the participants' experiences of vulnerability during FVP. The situation in itself was regarded as special. One of the reasons

Table 1. Themes and categories that emerged in the analysis

1.Theme	Conceptions in relation to the individual
1.1. Category:	The first contact – a cool and scary event
1.2. Category:	Further on an ordinary event – no big deal
1.3. Category:	Overall an exposed situation
1.4. Category:	Varnish that tastes good or bad
2.Theme	Conceptions in relation to the school dental nurse
2.1. Category:	More knowledge is wanted
2.2. Category:	The approach of the school dental nurse important for confidence
3.Theme	Conceptions in relation to the group and school
3.1. Category:	Small groups for feeling safe
3.2. Category	The school is a smooth and convenient arena

given was the expectation of having to open their mouth to strangers. This could create a feeling of exposure. In addition, the strangers are supposed to put their fingers in the mouth and perform a treatment.

"No, I don't like it when strangers stick their hands in my mouth..."

In addition to opening their mouths to strangers, they sometimes also had to open their mouths in front of their schoolmates. The participants had experienced that FVP had sometimes been performed too publicly, creating an exposed situation.

"It would have been a good thing if it had been a little more private. It can sometimes feel a little… as they do it very openly and everyone stands watching and some people are probably a little sensitive when it comes to standing and opening their mouths in front of everyone when people are poking around in their mouths. So some people may very well feel uncomfortable."

Being exposed to the public leads to an uncomfortable feeling, according to the statement above.

Category: Varnish that tastes good or bad
The fourth category covers conceptions relating to the taste of the varnishes. All the statements highlighted the taste. Some participants said that the taste was quite nice.

"But I have always thought that it tasted quite nice…"

On the other hand, other participants said that the taste was disgusting.

"But it tastes really disgusting."

The majority of the participants suggested a new flavour for the varnish and the most wanted flavours were mint, strawberry and chocolate.

Theme: Conceptions in relation to the school dental nurse

The second theme consists of two categories, "more knowledge is wanted" and "the approach of the school dental nurse important for confidence". The conceptions in the theme cover statements, all of which are related to the role of the school dental nurse in FVP.

Category: More knowledge is wanted
In the first category, statements about personal knowledge and perceived information are covered. Even though they said that they had been poorly informed, most of the participants claimed that they had a general knowledge of fluoride varnish. The statements highlighted the fact that fluoride could prevent caries and strengthen the enamel. Other participants had only vague perceptions of the reasons for fluoride varnish. They said that it felt good, but they were uncertain of its actual effects.

"No, but I think it feels good… but I don't know what effect it has."

The participants said that they had not been informed about the reasons for FVP. The statements pointed to a perceived lack of information.

"I remember that we weren't told why we needed this varnish or what the varnish contains, some kind of introduction."

Consequently, the participants expressed a wish for more information about FVP, the aim, and effect.

Category: The approach of the school dental nurse important for confidence
This category covers conceptions of the school dental nurses' approach, attitude and behaviour. In general, the participants had confidence in the school dental nurses and believed that they would not expose them to anything dangerous.

"*I don't believe they would inject anything stupid in my mouth. I have quite a lot of confidence in them.*"

The trust also led to greater confidence, according to the statements, which affected the motivation to follow given recommendations about oral health. A meeting with a school dental nurse who created confidence could motivate behavioural change. There was a clear conception of how school dental personnel should behave to gain confidence and trust. According to the statements, the school dental nurse should see the participants, treat them carefully, give information about the programme and not work too fast. However, there were also conceptions of what distinguished an inferior school dental nurse. The participants described this as being treated too quickly and insensitively.

"For some of them are like this. They aren't exactly heavy-handed, but they can have a 'Right, let's get on with it' attitude."

Some participants had met school dental nurses with an unfriendly attitude.

"She just comes in and is unfriendly and just says 'Open your mouth!'."

Theme: Conceptions in relation to the group and school

The third theme consists of two categories which cover statements related to being treated in groups in school. The categories are "small groups for feeling safe " and "the school is a smooth and convenient arena".

Category: Small groups for feeling safe
Being treated in small groups was regarded as a positive experience, according to the participants' statements, as the group could provide a feeling of security.

"Yes, I think it's really good to be treated in groups… because then, if you have a bad attack or a gagging reflex or something like that, your friend is next to you and then it feels easier…"

Nevertheless, the participants stressed the importance of really small groups. Even a group of six persons could be regarded as too large. The reason for small groups was primarily to reduce the number of spectators.

"I think it's good if there are only a few at a time, so that not everyone is standing there. Five at a time is pretty good. Some people are bound to think that it's embarrassing if everyone is standing there watching."

Large groups could also increase peer pressure. The participants stated that they had been affected by their schoolmates and had been in situations where they had acted as the group expected and not as they felt.

"Well, I had to pretend, as everyone thought it was disgusting, so I had to spit it out, even though I quite liked it."

Category: The school is a smooth and convenient arena
Participating in FVP at school was appreciated by the participants, according to the statements. They saw several reasons for this. One was the accessibility to a large number of the targeted group and the opportunity for dental personnel to keep track of everyone.

"Because most of them are at school and so it's easier to keep track."

The participants also reflected on possible alternatives to being treated in school. One alternative mentioned was the opportunity to visit the clinic for flouride varnish treatment instead. The participants thought this would be more complicated, according to the statements. Consequently, they regarded the school as a better arena for dental health promotion. The efficiency of the current method was also mentioned.

"It's a good time and you can treat many students in one day instead of booking a large number of dental appointments and so on… So perhaps it's easier."

Some participants considered it unlikely that the programme would reach as many adolescents if they had to visit a dental clinic instead to receive the fluoride varnish. The participants stated that they participated in the programme because they knew it was good for them and, even if they knew it was voluntary, they saw it as something obligatory.

"Well, it isn't very popular, but you do it because you know it's good for you, not because you want to."

The participants reflected on the opportunity to take part in health promotion programmes at school that everyone is offered. They appreciated the fact that FVP is free of charge. They also emphasised the advantage of everyone being given access to the programme.

"It's good that it's free. Yes – and that everyone has access to it."

Discussion

To our knowledge, this is the first study that describes adolescents' experiences of participating in a school-based fluoride varnish programme. The study showed that they related the conceptions of the programme to themselves as individuals, to the school dental nurse and to the group and school. As a wide range of experiences were collected, the phenomenographic approach was ideal (12). The use of focus groups had the advantage of interaction between the participants, which probably resulted in more extensive material than individual interviews would have provided (5, 7, 8). Far more girls participated and this could indicate that they are often more willing to discuss and express their feelings and experiences at this age, compared with boys. Also *Lepp & Bagshaw* (11) found that girls generally were more verbal, for example they wrote more in their journals than the boys. Only one school was chosen for this study, but there is no reason to assume that adolescents attending this school are very different

from adolescents from other schools in the municipality. The trustworthiness could be argued about, due to the small sample, but, based on the level at which the interviews were held, there is no reason to question the trustworthiness. The experiences from these participants could be used as a map of possible ways adolescents can perceive participating in FVP.

When it came to the individual-related theme, the most important finding was probably the conceptions of feeling exposed during the programme. The participants suggested several solutions to this – for example, that the ideal setting would be to turn their back to the group, thereby preventing a direct view into someone's mouth. Another suggested solution was smaller groups or a more shielded setting. The very first time of participation in the programme was also considered special in both a positive and a negative way. According to the statements, this event could make the adolescents feel grown up and also excited about doing something they had seen older schoolmates do. On the other hand, seeing a tray full of fluoride applicator-injectors with possible sharp syringes was somewhat terrifying for some participants, as well as not knowing how they would be used. These findings are important as school dental nurses may be able to use this knowledge in their interaction with the adolescents. After the first session, the FVP was considered a lot less dramatic. It was then seen as an ordinary, minor event which most adolescents take part in almost automatically. In addition, some participants had experienced the FVP as a relaxing moment of pampering. The positive experiences, such as relaxation and the satisfaction of receiving oral health, are important findings, as they could be keys to increasing or maintaining a high level of participation. There were many statements regarding the taste of the varnish. Obviously, the taste is experienced differently from person to person and the statements showed this very clearly.

The conceptions of the programme in relation to the school dental nurse included statements about having some knowledge about the reasons for fluoride varnish, but also about having been poorly informed. It is only possible to speculate about the origin of their knowledge, but various sources probably contribute, such as the dental clinic, commercials, family and friends and the school dental nurse. They expressed a wish for more information. As the routine for FVP is that the participants should be given written information about the programme before the first treatment every time they enter a higher level at school, there is no reason to doubt that the participants in this study were given information prior to the FVP. Nevertheless, this information is clearly not enough. This supports the findings in a study by *Östberg* (28) showing that there was a limited understanding of given information and that many adolescents wanted to learn more about their oral health care. Information and the distribution of knowledge about FVP should definitely be an extensive part of the intervention and this finding indicates a real opportunity to improve both the distribution and possibly also the form of information and knowledge. More emphasis could be placed on involving the adolescents in the learning process instead of just handing out written information. The approach of the dental personnel was shown to create the atmosphere during treatment. In spite of this, a school dental nurse appeared automatically to be trusted due to her profession. The participants expected correct, safe treatment. In addition, some participants had real confidence in the school dental nurse and said that she had given recommendations which they had been careful to follow. This confidence and trust could be reinforced by a positive, calm attitude towards the adolescents, but it could be weakened by a negative, hasty attitude. Also this is in conclusion with the study of *Östberg* (28) showing that the credibility of the dental personnel, delivering a health message, is essential as well as their ability to create confidence. The conclusion in that study was that when credibility and confidence is perceived oral health education is more likely to be successful among adolescents.

In relation to the group and school, one important conception was that school-based group prevention is both a smooth and a practical opportunity to obtain access to health promotion. This is in agreement with the conclusions of *Kwan et al.*(10) stating that the school is an important arena for promoting health. Small groups were preferable, as they provided security and support in a potentially unpleasant situation. The negative aspect of group treatment was the potential for peer pressure, something to which special attention should be paid and, if possible, it should be directed in a less negative direction. Peer pressure can never be disregarded when dealing with groups, but it could possibly be turned into a good force that encourages everyone to participate instead of the opposite.

To conclude, the adolescents experienced the school-based fluoride varnish programme as a positive everyday event and they regarded the school as an important health promotion arena. To improve

this programme still further, it is important to highlight the role of the dental personnel, as they are largely responsible for creating the atmosphere.

Acknowledgement

This study was supported by grants from the Council for Research and Development in the Västra Götaland Region.

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Corresponding author:
Dr Dowen Birkhed
Department of Cariology, Institute of Odontology
P.O. Box 450, SE-405 30 Göteborg
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E-mail: birkhed@odontologi.gu.se

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How much information is remembered by the patients? A selective study related to health education on a Swedish public health survey

GUNNAR EKBÄCK[1], CARINA PERSSON[2], SVEN ORDELL [3,4]

Abstract

◉ The purpose of this study was to investigate the degree to which patients have perceived that they got questions or advice about eating habits and smoking habits at their last visit at the dental clinic and if this information was differently distributed between different age groups. A further aim was to study whether there were differences in the proportions of questions and advice given to individuals who perceived problems regarding caries and gum bleeding compared to those that did not feel they had problems.

The results are based on a postal questionnaire survey, "Life and Health 2008". The study was conducted in a population of women and men aged 18–84 years in 5 counties in Sweden. A total of 68,710 questionnaires were sent out and the response rate was 59.2%.

Substantial differences in proportions existed between age groups regarding who received questions and advice related to dental caries and periodontal disease. The differences between age groups regarding information were statistically significant since it was less common that older people got questions and advice than younger. These differences also exist, but less pronounced, between those with disease related problems and those without. Three factors were statistically significantly associated with information. Age, education level and problems with caries or bleeding gums had statistical effect on the prevalence of questions and advice related to eating habits or smoking habits respectively.

In conclusion, it is an urgent need of education in methods for dental staff if they want to contribute to changes in life style behaviors for their patients since most patients today don't perceive that they got important disease relevant information at the last dental visit.

Key words

Health education, information, caries, periodontitis

[1] Department of Dentistry, Örebro County Council, Örebro, Sweden

[2] Department of Community Medicine and Public Health, Örebro County Council, Örebro, Sweden

[3] Dental Commissioning Unit, Östergötland County Council, Sweden

[4] Department of Oral Public Health, Malmö University, Malmö, Sweden.

Hälsorelaterad information – vad kommer patienten ihåg?

GUNNAR EKBÄCK, CARINA PERSSON, SVEN ORDELL

Sammanfattning

◉ Syftet med denna studie var att undersöka i vilken grad patienterna uppfattade att de fått frågor eller råd om kost eller rökvanor vid det senaste besöket vid tandkliniken och om denna information var olika vanligt förekommande mellan olika åldersgrupper. Ett ytterligare syfte var att se om det fanns skillnader i andelen frågor och råd till personer med upplevda problem med karies och blödande tandkött jämfört med dem som inte upplevde problem

Undersökningen bygger på en stor enkätstudie, Liv & hälsa 2008, som genomfördes i en population av kvinnor och män i åldrarna 18–84 år i fem län i Sverige. Totalt skickades 68,710 enkäter ut och svarsfrekvensen var 59.2%.

Betydande skillnader i proportioner fanns mellan åldersgrupperna som hade fått frågor och råd relaterade till karies och tandlossning. Det fanns statistiskt signifikanta skillnader mellan olika åldersgrupper då det var mindre vanligt att äldre fick frågor och råd än yngre. Dessa skillnader återfanns också, men i mindre utsträckning, mellan dem som hade sjukdomsrelaterade problem och dem utan. Tre faktorer var statistiskt signifikant associerade med information. Ålder, utbildningsnivå och problem med karies respektive blödande tandkött hade statistiskt signifikanta samband med förekomst av frågor och råd relaterade till matvanor respektive rökvanor.

Det finns ett akut behov av utbildning i pedagogiska metoder för personal inom tandvården om de vill bidra till förändringar i livsstil för sina patienter eftersom de flesta patienter idag inte upplever att de fått viktig sjukdomsrelevant information vid det senaste tandvårdsbesöket.

Introduction

Treatment of diseases like caries as well as periodontitis involves more than just repairing the damage. There is a strong awareness that these are lifestyle-related diseases in which a lifestyle change often is necessary for patients (8-9). The national board of health and welfare in Sweden (NBHW) has recently, in May 2011, presented national guidelines for adult dental care (10). It is the first time in Sweden that guidelines for adult's dental care have been developed and the new guidelines includes recommendations about how the diseases of the mouth should be prevented and treated. The NBHW finds that the patient's own participation is extremely important and that dentistry's role is very much to work with effective methods of helping and supporting patients to improve their oral health behaviour. One purpose of the guidelines has been to highlight effective methods with the best possible scientific basis (evidence) nation-wide to offer adults good dental care. Research shows the need for something more than information about oral health prevention, which has been a key action in dentistry for a long time, to get changes in behaviour (12).

The ability to influence the individual's dietary and smoking habits increases with a theory-based behavioural-medical treatment strategy (4). Some common theories and models of health related decision making are Health Belief model, Theory of Reasoned Action or Theory of Planned Behaviour (12). As *Thones & Tiford* stated 2001 "if we understand the existing relationships between, for example knowledge, beliefs, skills, attitudes, social pressures…we would have some insight into the likely effects of a given educational program". Behaviour influenced approaches of various kinds have been discussed without researchers being able to positively identify one method as superior to other methods (10).

Whatever the model, knowledge is one important ingredient in promotive work. In dentistry, models for caries treatment are often a combination of information of caries and the underlying causes. The effect of this information e.g. the dietary information provided by dental personnel, are not evaluated in scientific studies. There is also a lack of studies within the field of oral health sciences from other countries evaluating the effect of dietary information in relation to knowledge about caries (9-10).
One way to evaluate the effect of information is to ask patients if they remember having received any information at all, thereby controlling how much information is given in such a way that patients will remember it. To the authors' knowledge, there are no studies based on a large material in Sweden that have examined the proportion of patients who remember that they received information and advice from the dental staff related to caries and/or periodontitis or analyzed different factors underlying the decision to give this information. Therefore, the purpose of this study was to investigate the degree to which patients have perceived that they had got questions or advice about eating habits and smoking habits at the last visit to the dental clinic and if this information was different between different age groups. A further aim was to see whether there were differences in the proportions of questions and advice to individuals with perceived problems regarding caries and gum bleeding compared to those that did not feel they had problems. It was hypothesised that younger individuals and those with selfperceived problems with caries and gum bleeding should have received more disease relevant information about eating habits and smoking habits.

Material and methods

Population and Response Rate

The results are based on a postal questionnaire survey, "Life and Health 2008". The study was conducted in a population of women and men aged 18–84 years in 5 counties in Sweden, and were stratified by gender, age, and geographic area. Data were collected from March to May, using a postal questionnaire, and the collection was completed after two postal reminders. The respondents agreed to linking official data records to the data in the questionnaire by informed consent. Apart from adjustment for various selection sizes in the different strata, the register data was used for calibration of non-response bias for various groups of individuals. The calibration weightings were constructed by use of population level information on a set of auxiliary variables to adjust the design weightings (5, 11). The register data used to produce the calibration weightings were sex, age, geographic area, education level, employment status, occupational category, country of birth and year of immigration. Statistics Sweden, the statistical administrative authority in Sweden, added registered data and returned files with anonymous data to the counties. This was done under the jurisdiction of the Swedish law and the Declaration of Helsinki. An approval from the ethics committee was not applicable because the data are anonymous. Total 68,710 questionnaires were sent out and the response rate was 59.2%. Nonresponse analysis and the characte-

ristics of the study participants are described earlier (4).

Measures

The first part (Table 1) is descriptive. From "Life and Health 2008" six questions were chosen: Do you have: (1) Problems with dental caries? (2) Problems with bleeding gums?; At your last visit in a dental clinic: (3) were you asked any questions about your diet? (4) where you asked any questions about your smoking habits? (5) Did you receive any advice to change your eating habits? (6) Did you get any advice to change your smoking habits? Information was given to answer questions 3-6 only if the visit to the dentist was recent (within the past three months). Response options were no and yes.

The second part (table 2-3) examines the statistical effect of four independent variables, sex age, education and problems with oral health on the dependent variables asked/advised about eating/smoking habits. The predictor variables and their categories are given in table 2 and 3. Those variables were chosen among variables possible to find in the survey, variables deemed important for the hypothesis and also one important socio-economic (SES) variable, educational level, available for all respondents.

Statistical methods

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, Release version 17). Bivariate analyses were conducted by cross tabulation. Multivariate analyses were conducted using binary multiple logistic regression with categorical data (Forced Entry method).

Results

Substantial differences in proportions existed between age groups who had perceived that they got questions and advice related to dental caries and periodontal disease. The older (65-84 years) had perceived that they got significantly fewer questions and advice than younger (18-24 years). These differences also exist, but much less pronounced, between those with disease related problems and those without (Table 2, 3).

As indicated in Table 2 and 3, three factors were statistically significantly associated with information. Table 2 show that "age" and "problems with caries" have statistically significant Odds Ratios (OR) in relation to questions about "eating habits" and for the outcome measure "advice about eating habits" "education" also had statistically significant OR. In Table 3 "age", "education" and "problems with bleeding gums" had significant OR in relation to the dependent factors "asked or advised about smoking habits". For both Tables "age" had the highest OR.

Discussion and conclusion

This study has two main purposes. The first objective was to determine the degree to which patients perceived that they had got questions or advice about eating habits and smoking habits at the last dental visit and if the information was different between different age groups. A further aim was to see whether there were differences in questions and advice to individuals with perceived problems regarding caries and gum bleeding compared to those that did not report any problems. The main finding was that especially in the older group, it was a very small percentage who felt they had received any information.

Swedish legislation on licensing has encouraged dental hygienists to take an active role in dentistry in order to stimulate a promotive approach in dentistry. However, there is always a risk that the promotive approach only becomes a paper-product as there are few ways to evaluate how many of these efforts that are registered only as a tariff actions but not carried out in real life. It is also difficult to evaluate if the information has been given in such a way that the patients remember it. The results of this study suggest that Swedish dentistry has given up on the older age group where almost no information is provided regardless of whether the patient is experiencing problems or not. While this information to the younger groups is on a low level there is still something more tangible. The information also seems provided routinely without considering whether the patient is experiencing problems with these diseases or not. It also raises the question if the treatment providers at all ask the patient about their experience and views on problems related to oral health. The usage of a single question on oral health, and document the answer, has been advocated earlier (1-2, 7).

The role of information in the final decision making in the process of adopting new behaviours is small, but necessary. McGuire (1981) has discussed the various steps and associated pitfalls in this process (6). He divided the process in five parts; level of awareness, level of understanding, adopting positive belief and attitudes, skills acquisition and finally, adopt preventive behaviour. Following a group through these stages, only 3% of the original group

Table 1. Proportion (calibrated column %) of persons, by age groups who got questions and/or advice and total number of respondents (n)

Age		Problems with dental caries			
		No	(n)	Yes	(n)
65-84	Asked about eating habits	3.4%	(4378)	6.2%	(942)
	Got advice about eating habits	1.9%	(4167)	4.7%	(908)
40-64	Asked about eating habits	8.0%	(4655)	12.7%	(1384)
	Got advice about eating habits	2.5%	(4570)	6.4%	(1376)
24-39	Asked about eating habits	19.9%	(1095)	23.0%	(651)
	Got advice about eating habits	6.8%	(1088)	13.4%	(647)
18-24	Asked about eating habits	27.9%	(585)	34.1%	(238)
	Got advice about eating habits	12.3%	(579)	21.8%	(237)
Age		Problems with bleeding gums			
		No	(n)	Yes	(n)
65–84	Asked about smoking habits	7.8%	(4625)	8.9%	(499)
	Got advice about smoking habits	3.0%	(4397)	3.4%	(477)
40–64	Asked about smoking habits	19.4%	(5046)	23.6%	(980)
	Got advice about smoking habits	5.8%	(4952)	8.8%	(974)
25–39	Asked about smoking habits	37.7%	(1294)	37.6%	(427)
	Got advice about smoking habits	5.2%	(1277)	11.4%	(426)
18–24	Asked about smoking habits	42.4%	(633)	46.3%	(181)
	Got advice about smoking habits	6.4%	(625)	14.0%	(181)

Table 2. Binary Multivariate logistic regression models (Forced Entry method): Odds ratios (OR) for being asked or advised about eating habits, with p-value (p) and 95% confidence intervals (95% CI).

		Asked about eating habits			Advised about eating habits		
		OR	p	95% CI	OR	p	95% CI
Sex	Men (ref)						
	Women	1.0	0,626	(0.86–1.09)	0.9	0,162	(0.74–1.05)
Age	65–84 (ref)						
	40–64	2.3	0,000	(1.93–2.74)	1.5	0,001	(1.20–1.97)
	25–39	5.9	0,000	(4.87–7.18)	4.0	0,000	(3.04–5.26)
	18–24	10.1	0,000	(8.16–12.40)	7.3	0,000	(5.55–9.61)
Education	Low (ref)						
	Medium	1.1	0,270	(0.93–1.28)	0.8	0,022	(0.63–0.97)
	High	1.1	0,218	(0.94–1.32)	0.7	0,001	(0.51–0.84)
Problems with dental caries	No problems (ref)						
	Problems	1.4	0,000	(1.21–1.56)	2.3	0,000	(1.95–2.76)

Asked about eating habits; n=13 588; nagelkerke=0.109. Advised about eating habits; n=13 261; nagelkerke=0.095

Table 3. Binary Multivariate logistic regression models (Forced Entry method): Odds ratios (OR) for being asked or advised about smoking habits, with p-value (p) and 95% confidence intervals (95% CI).

		Asked about smoking habits			Advised about smoking habits		
		OR	p	95% CI	OR	p	95% CI
Sex	Men (ref)						
	Women	1.0	0,712	(0.90–1.08)	0.9	0,075	(0.74–1.01)
Age	65–84 (ref)						
	40–64	2.6	0,000	(2.32–2.98)	2.2	0,000	(1.76–2.67)
	25–39	6.3	0,000	(5.43–7.32)	2.2	0,000	(1.65–2.87)
	18–24	8.9	0,000	(7.48–10.59)	2.4	0,000	(1.75–3.28)
Education	Low (ref)						
	Medium	1.1	0,041	(1.01–1.27)	1.0	0,727	(0.80–1.17)
	High	1.0	0,931	(0.88–1.15)	0.5	0,000	(0.36–0.60)
Problems with bleeding gums	No problems (ref)						
	Problems	1.2	0,003	(1.06–1.34)	1.5	0,000	(1.28–1.87)

Asked about smoking habits; n=13 367; nagelkerke=0.121. Advised about smoking habits; n=13 014; nagelkerke=0.034

reached the final stage. This reasoning is partly the ground for choosing other outcome variables than clinical epidemiological data on disease when evaluating health promotion interventions (3). Tones and Tilford concluded that "if a link has in fact been demonstrated, there is no need to use epidemiological indicators to access success"(13). Following this reasoning it can be very appropriate to measure given information from a patient centred view to evaluate promotive initiatives in dentistry.

Finally, some effect of educational level is found. The fact that those with higher education perceive that they received less information could be due to an increased awareness of healthcare providers duty to inform. It could also be because health care providers believe that those with high education already have such knowledge.

A strength of this study is that the results are from a well known study and with a very large number of respondents, but less used in dental research. It also handles a very actual discussion about the role of dental staff in health promotion by giving patients a better understanding of self-care and is in this way improving the fit between research and practice. It could also be used as part of a periodic review about how well the new national guidelines on oral health promotion are implemented in Swedish dental care by repeating the study in a few years.

There are also some limitations in this study. Firstly, the cross sectional nature of data used in this analysis did not allow the investigation of cohort and other time effects. Secondly, the independent variables chosen for the logistic regression utilized here were based on logical reasoning as well as statistical associations. Nevertheless, a limited number of variables were compared indicating that some discrepancies might have influenced the results. Finally, since the present data rely on self-reporting, the indicators recorded might have been biased by under- or over-reporting due to socially desirable responses and poor recall effect. The hypotheses that the younger patients would get more information than the older groups and that those with perceived problems did get more information than those without problems, were corroborated even if, especially among the elder groups, there were very few who got any information. To summarise, the present study has shown that it is an urgent need of education in effective methods for dental staff if they want to contribute to changes in life style behaviours for their patients.

Acknowledgements

This study was supported by the Department of Dentistry and the Department of Community Medicine and Public Health, Örebro County. The County Councils in Sörmland, Uppsala, Värmland, Västmanland and Örebro, Sweden funded the population survey.

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Corresponding author:
Dr Gunnar Ekbäck
Dental Department
Örebro County Council
P.O. Box 1613 ,
SE-70116 Örebro
Sweden
E-mail: gunnar.ekback@orebroll.se

Facing a moral dilemma – introducing a dental care insurance within the Public Dental Service

LILLEMOR R-M HALLBERG[1], MAGNUS HAKEBERG[2], ULRIKA HALLBERG[3]

Abstract

◉ Through the reform entitled "Dental care insurance – dental care at a fixed price", patients are offered a dental insurance, a capitation plan, that ensures that they can visit the dentist regularly during a period of three years at a fixed price per month (Frisktandvård). This insurance may be offered to all patients. The aim of this study was to generate a theory explaining the main concern for the staff at the public dental service when they have to introduce and advocate dental care insurance to patients. Interview data from 17 persons, representing different professions within the public dental service, were collected and analyzed simultaneously in line with guidelines for grounded theory. The results indicated that dentists/dental hygienists experienced several difficult standpoints concerning the implementation of the dental insurance, somewhat of a moral dilemma. The staff generally had a "cautiously positive attitude" to the forthcoming dental care insurance, but had perceptions how and when the patients should be offered the insurance and what that may mean to the clinic. The respondents reflected about the economic aspects for the clinic and how the oral health may be affected over time for the patients.

Key words

Dental care insurance, qualitative method

[1]School of Social and Health Science, Halmstad University, Sweden,
[2]Department of Behavioral and Community Dentistry, Institute of Odontology, The Sahlgrenska Academy, University of Gothenburg, Göteborg, Sweden,
[3]Nordic School of Public Health, Göteborg, Sweden

Ett moraliskt dilemma – introduktion av en ny tandvårdsförsäkring

LILLEMOR R-M HALLBERG, MAGNUS HAKEBERG, ULRIKA HALLBERG

Sammanfattning

◎ Abonnemangstandvård, vilket innebär att en patient kan välja ett nytt betalningssytem inom tandvården har införts inom Folktandvården i alla landsting i Sverige under de senaste åren (Frisktandvård). Patienten har således ett val att göra, medan behandlaren, dvs tandläkare och tandhygienist erbjuder patienten antingen taxebaserad vård eller abonnemangstandvård. En månatlig premium förslås till patienten baserad på en riskbedömning genomförd av behandlaren. Tandläkares/tandhygienisters inställning till och tankar om abonnemangstandvård saknas i vetenskaplig litteratur varför syftet med denna studie var att med en kvalitativ metod, grounded theory, intervjua tandläkare och tandhygienister. En grupp om 17 tandläkare och tandhygienister tillfrågades och intervjuades av två erfarna forskare. Resultaten visar att behandlare upplevde ett flertal svåra ställningstagande kring införandet av abonnemangstandvård, något av ett moraliskt dilemma. Personalen var dock försiktigt positiv till försäkringen men hade tankar kring hur och när patienter ska erbjudas försäkringen och vad det kan innebära för kliniken. Framförallt funderade de intervjuade kring den ekonomiska utvecklingen vid kliniken och hur den orala hälsan hos patienterna påverkas på sikt.

Introduction

The Swedish Public Dental Care Service (PDS) has decided to change the payment system by introducing a new dental insurance for individual consumers – a capitation plan. The traditional fee-for-service system will be optional as a parallel system. So, after receiving information about the systems, adult patients may decide which dental plan they believe would be optimal for them. This large-scale change in the payment system has the objective of obtaining the maximum societal benefit from the resources individuals and society choose to invest in dental care. Is capitation such a system? Few scientific publications can be found in this area of research (5,8).

This new insurance system has already been introduced by all county councils or regions in Sweden. This offers a unique possibility scientifically to study the effects of this alternative dental financing system and to compare it with the traditional fee-for-service system at individual and PDS clinic level, as well as county council or regional level. The capitation system means that the adult individual (> 19 years of age) agrees to a 3-year contract with a dentist and dental hygienist at a PDS clinic (5). The dentist or dental hygienist makes a risk classification, which then results in a suggestion for a premium category. The patient then has to decide whether or not to accept this fixed monthly payment. The patient will receive any dental treatment that may be needed, regardless of the cost. Specialized dental care is not included, however. The three-year contract can be continued after a renewed risk assessment (and potentially a new premium) (5). The choice is always the individual's, whether it is the decision to join the plan the first time or the decision to renew or withdraw from the contract after the first three years. The capitation system is presently being implemented with the same regulations and risk-classification system by all county councils and regions in Sweden, including all PDS clinics.

There is a lack of knowledge and research in dentistry with regard to analyses and evaluations of caregivers' views of large-scale changes in their work and the importance of this objective in relation to patient needs and the financial and technical structure of the clinics. So, when implementing a new financing model for dental care, a new dental insurance model, it is imperative that we investigate the employees, i.e. chief dental officers of PDS clinics, dentists and dental hygienists, views of crucial changes affecting their daily work.

The aim of this grounded theory study was to generate a substantive theory explaining the main concern for dentists/dental hygienists at Public Dental Service clinics, when introducing a new dental insurance model, and their pattern of perceptions to handle this.

Method

Grounded theory

Our aim was to generate a substantive theory that explains the collected data and a theory-generating method was therefore felt to be suitable. Grounded theory, originally developed by *Glaser & Strauss* (3), offers systematic inductive guidelines for collecting and analyzing data. The method has since been reformulated by *Strauss & Corbin* (7) and by *Charmaz* (1). In this study, we planned to use the original version of the method, now called "classic grounded theory". It has been assumed that the ontological and epistemological position of classic grounded theory comes close to traditional positivism (1,4). *Glaser* (2) implicitly assumes a "real reality" and says that data can be discovered and recorded. Constant comparisons of data, theoretical sampling and memo writing are fundamental features of the analysis in grounded theory. According to *Glaser & Strauss* (3), the quality criteria of a grounded theory are that the categories and emerging theory must explain the data on which they are based (i.e. fit), provide a useful explanation of the studied phenomena (i.e. work), provide explanations of actual problems in the studied area (i.e. relevance) and can be modified by changing conditions or additional data (i.e. modifiability).

Participants and Procedure

The study sample comprised 17 participants, 3 men and 14 women, of varying age (mean=43.8 years, standard deviation=10.5) and professional experience, i.e. dentists (heads of clinics, n=4), dentists (n = 7) and dental hygienists (n = 6), all employed at the Public Dental Service. They were informed about the purpose of the study and were asked to participate in a taped interview about their reflections and thoughts on the forthcoming introduction of the dental care insurance. The taped interviews, lasting between 45 and 60 minutes, were conducted in a quiet room at the relevant PDS administrative office. A few interviews were conducted over the phone for practical reasons (e.g. geographical distance). The majority of interviews were conducted by the third author (UH, who is a sociologist and doctor

of public health), but the first author (LH, who is a psychologist and professor of health science) also conducted some interviews. All the interviews were transcribed verbatim by an external secretary. Initially, an open sampling was made to obtain a heterogeneous group and to optimize variations in data. The interviews involved open questions, followed by probing and follow-up questions. In the analysis of the initial interviews, some interesting concepts emerged, such as "another queue", "the coin has two sides", "identifying potential patients" and "stressing the advantages", which guided discussions with participants in further data collection (i.e. theoretical sampling). Interviews were conducted until redundancy was reached, i.e. new interviews did not add new information, which is also called saturation.

Analysis of data

The data were collected and analyzed simultaneously (by LH and UH) in line with the guidelines for grounded theory. Substantive codes, illuminating actions, events and meaning were identified in the data line by line, using an initial open coding process. These codes were labeled concretely and codes with similar meaning were grouped into summarizing categories that were labeled in a more abstract and comprehensive manner. The categories were constantly compared with one another to secure differences between and similarities within each category. Memos, i.e. reflections, ideas and assumptions based on actual data, were written during the entire analysis process. Moreover, the saturation of each category was sought. Saturation means that new data fit into categories already devised and that new data do not add new information. However, saturation can be seen as a somewhat "elastic" concept or as a subjective decision. In the next step of the analysis, called focused coding, only promising categories and codes were used and the coding was more conceptual than line by line. Every category must earn its way into the analysis (2). Filling in any category that remained underdeveloped required theoretical sampling, i.e. the emerging results guided questions and focused on further data collection. Theoretical sampling was also done by re-reading interviews with a specific focus to fill gaps and shed more light on the emerging categories. This included the opportunity to identify dimensions, context, conditions and consequences of the categories. A core category, central to the data, was then identified and labeled "facing a moral dilemma". This meant that the emerging result was delimited, as only categories related to the core category were included in the final results. All categories were then integrated through theoretical coding into a theoretical model explaining the main concern (core category) and the way the dental staff handled it (categories). According to Glaser (2), data should be summarized in as few categories as possible, without losing too many of the nuances within the data.

Ethical considerations

The research design was approved by the Regional Ethical Review Board and requirements relating to informed consent and confidentiality were met.

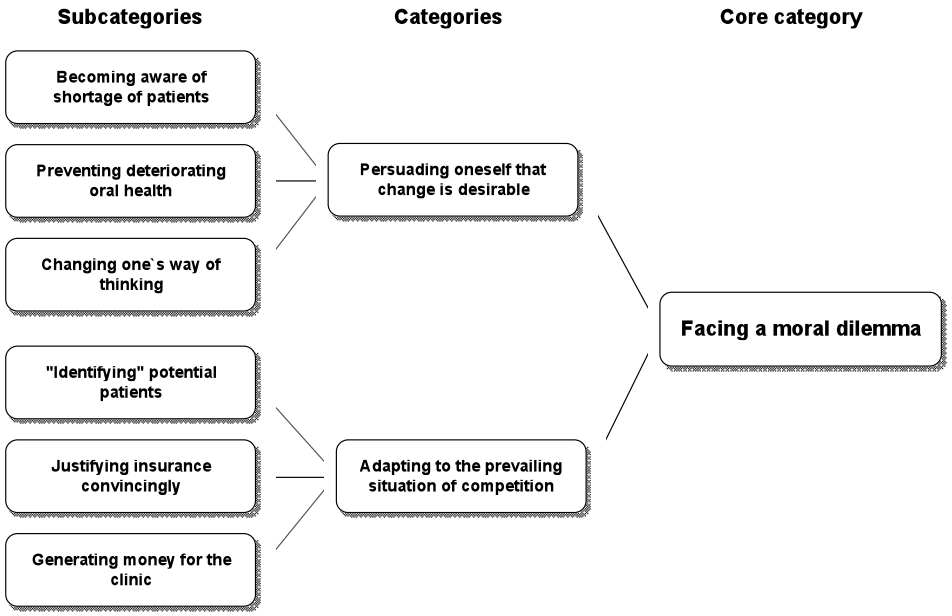
Results

A substantive theory, or theoretical model, was generated (Figure 1). A core category, facing a moral dilemma, was identified and explained the main concern for dental staff having to introduce and contract subscriptions to the dental care insurance within the PDS. The dental staff handled this moral dilemma by using two interrelated management patterns, i.e. persuading oneself that change is desirable and adapting to the prevailing situation of competition that concerned their employment and working conditions within the PDS. Both management patterns include specific strategies (subcategories). The core category, categories and subcategories included in the substantive theory are further described and illustrated with quotations from the interviews below.

Facing a moral dilemma

Generally, the staff had a "cautiously positive attitude" to the dental care insurance which was in the process of being introduced at their clinics. Despite this somewhat wait-and-see approach, they were facing a moral dilemma (core category) related to the meaning and the expected consequences of the dental care insurance for the clinic. They were aware that "the coin has two sides" and, in their narratives, this was demonstrated by several contradictory perceptions related to subscriptions to the dental care insurance. Among other things, these contradictions were related to economy and profitability versus professional role and oral health promotion. They meant that, on the one hand, the forthcoming dental care insurance might secure the need for a sufficient number of patients at the clinic, but, on the other, the aim of the reform was actually to secure good oral health, especially in young adults. This involves a dilemma between, on the one hand, competition,

Figure 1. Overview of subcategories, categories and core category included in the substantive theory.



economy and the survival of the clinic and, on the other, their professional attitude towards patients as independent, responsible human beings who can take care of their oral health without being directed by a system of insurance. The professional roles of the staff as oral health care experts were affected by similar contradictions related to becoming advocates of dental care insurance instead of using their professional knowledge to promote patients' oral health and encourage them to take the responsibility themselves for preserving their oral health.

The following quotation is designed to illustrate the perceived "moral dilemma":

> "*You find yourself in a role in which you are both a salesperson and a provider of care at the same time. You have to sell something to the patients, in other words… an insurance… and that's difficult… you feel doubtful about doing it. You are going to sell something that will be more expensive for some and perhaps less expensive for others. That's how insurance works. But we are involved with health care not sales.*
>
> "*… it will be a kind of 'another queue' – the patients who become part of this healthy dentistry concept and… they will always be summoned (to the dentist). Perhaps they are the 'best' people (with healthy teeth), perhaps they are the people who already come here (at the clinic without having insurance)".*

The two interrelated management patterns (categories), persuading oneself that change is desirable and adapting to the prevailing situation of competition, which were adopted in order to handle the moral dilemma are described in more detail below.

Persuading oneself that change is desirable

One way to handle the moral dilemma was persuading oneself that change is desirable. The staff were aware that it was now too late to discuss whether or not the dental care insurance should be introduced at the clinic. They knew that the political decision had already been made, so their task was instead to discuss the practical procedures related to information about the dental insurance and to implement the reform at their clinic. In many ways, the staff were realistic and understood that the reform was designed not only to be related to the clinic, but that it would also adopt a health-promoting perspective in terms of oral health. The practical focus would be to facilitate greater involvement in patients' oral self-care, combined with continued regular visits to the clinic to maintain their oral health. The staff could see the good idea behind the reform. They were also aware that, if the patients followed the advice of the dental care staff, they could be placed in a low-premium group with limited costs. Three specific strategies (subcategories) were included in this management pattern, i.e. becoming aware of the shortage of patients, preventing deteriorating oral health and changing one's way of thinking.

Becoming aware of possible shortage of patients: The dental staff were aware of the existing shortage of patients at the dental clinic. This shortage related in particular to young adults aged 20 and above who were no longer able to utilize free dental care. Many young adults were in the process of leaving their homes for a long journey or to work abroad or they were studying far away from their homes. Other groups which risked staying away from dental care were immigrants and older persons with a limited economy. The staff expected that the drop-out of patients would increase if measures were not taken. The awareness of the shortage of patients was expressed in the following way by the informants.

"In the same way, it was really important to try to keep the 19-year-olds we have lost so that they come for their annual check-ups, even when they leave the free dental care service… so it's obviously a good thing… because then you get… you get more patients, at least you hope so… it's difficult to fill the appointment book, many people call and cancel at the last minute… or just don't turn up… so we can hope that this new reform… will result in more patients.

"It goes in waves, but right now the appointment books are pretty empty on certain days… there are a lot of immigrants here... and so… even if it isn't…you can't say that…they call and cancel… more, but…there are also other… residential areas around… there's… a lot… that characterizes the clinic… it does… it would be true to say that… in many ways."

Preventing deteriorating oral health: The staff talked about their overriding task as giving patients individualized information and supervision in terms of oral health promotion. The aim was to teach the patients how to maintain and sustain good oral health. Good oral health means being symptom free and satisfied with your teeth, e.g. oral function (eating, chewing and swallowing), communication (speech), social life (maintaining social roles) and well-being. In line with this, the patients were expected to do the daily preventive actions related to the teeth and mouth. Free dental care ceases when young adults reach 20 years of age and, at that time, most young people have good oral health and oral care habits. The staff were aware that, after leaving free dental care, young people do not prioritize charged visits to the dentist. After some years, their oral health often deteriorates considerably, with caries, toothache and the need of dental treatment. This was seen as a tragedy by the dental staff.

"Avoiding all this… first and foremost pain and cavities. Maintaining the good health status they have… which we have in fact helped them with in the public dental service… when they leave us. That's a real shame… because after four to six years when they haven't been to the dentist… we have had to extract teeth and do root canal work. That's a tragedy! It's important to find them before that happens, motivate them… They are financially vulnerable and they haven't established stability with routines in their lives, if you could put it that way."

Changing one's way of thinking: They appeared to be motivated to do what they had to do in order to maintain oral health in young adults and, at the same time, to do what they could to secure their professional roles as dental staff at the PDS. Earlier thoughts about young adults' internal motivation to visit the PDS regularly and voluntarily were increasingly questioned by the staff, primarily for economic reasons but also because they prioritize other commitments. The staff's readiness for a change for the better was obvious, although a touch of resistance towards the dental care insurance could also be present.

"No, of course, I have to… after all, I believe in it… but it's, you know… you have to do it… we are going to have it and it's going to be introduced, so you have to believe in it, you know, because you can't go around thinking I don't like this and… how are we going to do this and I will never be able to… advocate dental care and then… you have to believe in it. Otherwise it won't work…"

Adapting to the prevailing situation of competition

In general, the dental care staff had "cautiously positive attitudes" towards change and were persuading themselves that a change was desirable and positive for them. This attitude facilitated their way of adapting to the prevailing situation of competition and was seen as crucial for their future opportunities to continue their professional work. The approach towards their present patients and potential subscribers to dental care insurance was influenced by this attitude and included the strategies (subcategories): "identifying" potential patients, justifying in a convincing way and generating resources for the clinic.

"Identifying" potential patients: One advantage with the dental care insurance is that young adults in particular may stay within the public dental care system. Most young adults lack the financial wherewithal to prioritize their oral health and many of them therefore have to give up professional dental

care after free dental care ceases. Young adults can be offered continued dental care at a reasonable cost because their oral health is very good and this results in a low-premium group with a subsequent low monthly cost. According to the staff, the young adults must be asked and offered the dental care insurance in order to "keep" them in the "system" and thereby preserve their oral health. This was regarded by most professionals as doing a good turn for young people, whereas some were in two minds about the reasonableness of the offer. There was a suspicion that, after the dental care insurance was introduced, the patients would be less active in their own daily dental care and instead rely on regular visits to the clinic being enough to maintain a good oral health status. It could be that young adults will regard their teeth as "belonging" to the dental clinic, i.e an external locus of control view of health beliefs.

"*We have been given a target, I think it was 350 patients… something like that I think it was… that we need to list in one year (dental care insurance)… we shall have to see, it will be fun… the clinic has a few ideas about ways of having patients… and how we can pass on information and that kind of thing… We are going to offer two evenings at which we are going to give information and the whole clinic will take part and we are going to do something cool… make people feel welcome and we are going to contact companies… or we are already doing that, so that we can offer some toothbrushes and toothpaste and so on… and give them information at the same time.*"

Justifying insurance convincingly: The staff were prepared to provide the right kind of information and to try their best to motivate patients to subscribe to the dental care insurance. The staff planned to provide convincing information about the advantages of the insurance which includes informing patients about how much their monthly cost for dental care will be and that they will be regularly called to visit the dentist. The dental care insurance also includes the opportunity to avoid unforeseen expense and the patients will be offered expedient dental care.

"*And then, when I have more information and have thought things through and feel that this is an excellent opportunity to pass on the message, that you should do this and this at home, we call you for these check-ups. And then, over the next few years, you should have these treatment needs. I also explain that it costs money.*

"*A small monthly cost guarantees that you can get an appointment… and, once you have started to pay, you naturally come for your appointments. I believe that, in any case. So I think that hanging on to the great youngsters… we have wonderful young people today, their mouths are fantastic, helping them to maintain their excellent dental health… is really important.*"

Generating resources for the clinic: The staff were aware that debits have to match credits in the dental care insurance system, otherwise the dental clinic will suffer economically. To maintain this balance, the premium group must be based on careful measurements of oral health status, dental care history, lifestyle and predictions of oral health. If the premium group is too low in relation to the patients' treatment needs during the three-year period, the clinic will lose money and vice versa. They also thought about the consequences of many subscriptions to the insurance by patients who were placed in groups with too low a premium – who would bear the cost in these cases? Their conclusion was that they would have to "gain from the swings what they lose on the roundabouts".

"*We are selling something. At the same time, we are in fact selling dental care every day, it's just a different (system)… we have the insurance system instead of paying for each visit.*

"*Yes, but… it's something we… at the clinics have to offer to the patients, it's a kind of insurance and… the first thing I feel is… that we need to be able to talk and really can… talk about the things that are good and… well… that you know what you are talking about. We can't just say that we have this now… it's a kind of insurance and you will be put in this premium group and… then for the next three years you don't need to… you need to be able to sell it.*

"*I wonder how it will affect us economically – I mean, the clinic. It's a bit like the 'swings and roundabouts'. It's a question of putting people in premium groups 'in the right way', so to speak, so that you don't charge too much but don't get paid too little. We have to survive economically and I regard that as a problem… at least in the beginning.*"

Discussion

This grounded theory study generated a theory that illuminates the fact that the dental care staff were facing a moral dilemma when the forthcoming dental care insurance was introduced in the public dental service. To deal with this dilemma, the staff were persuading themselves that change is desirable and, in a way, a change in their cognitions had begun which was reflected in their focusing on the advanta-

ges of subscribing to the dental care insurance. This "cautiously positive" attitude towards subscribing to the dental care insurance made it easier for them to adapt to the existing situation of competition. This change in thinking was obvious in their struggle to identify potential patients to the dental care insurance. The staff planned to motivate patients in a convincing way, which includes stressing the advantages and adjusting the message to suit the recipient, whereas they were aware at the same time that subscriptions to the dental care insurance would generate resources for the clinic.

All these efforts are in line with the first phase of a change theory, indicating that the dental staff were mentally receptive to a change in attitude and behavior. A theory of change describes phases or steps which are necessary to realize a long-term goal. In a theory of change, *Schein & Lewin* (6) describe three phases, labeled unfreezing, changing and refreezing, representing a process of changes in thinking. These changes in cognition are necessary in order to implement a change. The theory means that previous ways of thinking will be questioned and rejected and changed to something new, i.e. cognitive redefinition. The first phase, unfreezing, means that people become more and more motivated for and receptive to a certain change, e.g. by information and by focusing on the advantages of the potential change. In the second phase, i.e. changing, role models and new concepts are found and this leads to increasing satisfaction and motivation to continue the change. In the last phase, i.e. refreezing, the change in thinking and behavior is confirmed.

The generated theory shows that the staff perceived a moral dilemma related to the dental care insurance. They assume, but do not know the actual outcome, that patients who already have good oral health will mostly subscribe to the dental care insurance while being classified into the lowest or lower premium classes. The staff also discussed the problems with assessment of risk classification. If a patient is classified and offered too low a premium to pay than would be justified from a true disease-predicted risk, then the dental clinic may loose income. On the other hand, a patient offered a higher premium than justified, it would generate a positive income for the dental clinic. However, there seems to be a risk that the dentists and dental hygienists may more frequently get into the former case scenario. Moreover, the patients future dental care behavior with e.g frequency of emergency visits may not be known for the staff, thereby creating a further risk when allocating a premium class to the patients.

Although the introduction of the dental care insurance was perceived as necessary for the dental clinic, it also involves an increased workload for the staff. The dentist and the dental hygienist have to reserve time to make themselves familiar with all the details of the insurance, such as new data programs and new ways of classifying patients' dental status and predicting future dental care needs. The staff have to take the responsibility themselves for acquiring this knowledge and take the time needed to do so. Moreover, risk assessments have to be made for patients during the scheduled time for treatment which may mean an extra workload for the dentists and dental hygienists. Information about the dental care insurance was given to patients during the scheduled time for treatment. The staff stated explicitly that their professional roles as dentists and dental hygienist will also include the role of insurance "agents", for which they were not educated and prepared. This expectation of an extension of their professional role can be seen as a role conflict leading to role uncertainty and dissatisfaction in the professional role.

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Corresponding author:
Dr Magnus Hakeberg
Department of Behavioral and Community Dentistry,
Institute of Odontology, The Sahlgrenska Academy,
University of Gothenburg, Sweden
Box 450
405 30 Göteborg, Sweden
E-mail: hakeberg@gu.se

Orthodontic treatment need, outcome and residual treatment need in 15- and 20-year-olds

KRISTER BJERKLIN[1], RUNE LINDSTEN[1], JANNICKE SAGEVIK TUNGE[2], CHRISTINE SJÖVALL[3]

Abstract

◎ The aim of the study was to investigate orthodontic treatment need and the outcome of orthodontic treatment in 15-, and 20-year-olds in Jönköping, Sweden, with special reference to residual treatment need.

An offer to participate in a clinical investigation was extended to random samples of 130 15-year-olds and 130 20-year-olds. Ninety-six of the 15-year-olds (73.3%; 45 boys and 51 girls) and 82 of the 20-year-olds (62.6%; 47 males and 35 females) accepted and presented for examination The participants filled in a questionnaire and impressions were taken for study models, which were graded according to the ICON index.

In all, 39 (40.6%) of the 15-year-olds and 38 (46.3%) of the 20-year-olds had undergone or were currently undergoing orthodontic treatment. Ninety-one per cent of the 15-year-olds and 84% of the 20-year-olds considered that the orthodontic treatment goals had been fully or almost fully attained.

Two of the 15-year-olds and two of the 20-year-olds currently wanted orthodontic treatment. This indicates a residual treatment demand of about 2%.

Key words

Orthodontic treatment, treatment demand, patient satisfaction

[1]Department of Orthodontics, The Institute for Postgraduate Dental Education, Jönköping, Sweden
[2]Private practice, Sandnes, Norway
[3]Department of Orthodontics, The Hospital section 3, Kalmar, Sweden

Ortodontiskt behandlingsresultat och kvarstående behandlingsbehov hos 15- och 20-åringar

KRISTER BJERKLIN, RUNE LINDSTEN, JANNICKE SAGEVIK TUNGE, CHRISTINE SJÖVALL

Sammanfattning

◎ Syftet med denna studie var att undersöka hur stor del av 15- och 20-åringar i Jönköping som fått ortodontibehandling, vilket behandlingsbehov som finns kvar och vad ungdomarna själva tyckte om sitt bett och om behandlingen.

Ett slumpmässigt urval av 130 15-åringar och 130 20-åringar kallades till Odontologiska Institutionen i Jönköping för att fylla i ett frågeformulär samt att få avtryck för studiemodeller tagna. 96 15-åringar och 82 20-åringar infann sig. Studiemodellerna analyserades enligt ICON index.

Totalt hade 39 (40,6%) av 15-åringarna och 38 (46,3%) av 20-åringarna fått någon form av ortodontibehandling, antingen i allmäntandvården under ledning och kontroll av ortodontispecialist eller på specialistklinik. Behandlingsmålen var helt eller nästan helt uppfyllda ansåg 91% av 15-åringarna och 84% av 20-åringarna. Två av 15-åringarna och två av 20-åringarna ansåg att de hade en bettavvikelse som de ville ha behandling för. När den fria barn- och ungdomstandvården upphörde, vid utgången av det år de fyllde 19 år ansåg endast två att de ville ha behandling. De huvudsakliga skälen till varför en del fortfarande hade ICON-värden lika med eller över 43 var att de inte ville ha någon ortodontibehandling eller koopererade dåligt. De allra flesta barn och ungdomar med ett odontologiskt indicerat behandlingsbehov hade haft möjlighet att få behandling. Denna studie visar, liksom de flesta andra, att ett odontologiskt motiverat behandlingsbehov ligger på mellan 35% och 45% av barnen och ungdomarna.

Introduction

During the last thirty to forty years, several major studies have been undertaken to determine the frequency of malocclusion and orthodontic treatment need in children. *Thilander & Myrberg* (26) estimated deviations from normal occlusion to be about 75%. In 1975, *Helm et al.* (9) reported an orthodontic treatment need of 38% in 293 randomly selected Danish children aged 13–17 yrs.

In an evaluation of dental and aesthetic features according to the index of orthodontic treatment need (IOTN), *Al Yami et al.* (1) reported a definite need for orthodontic treatment in 83% of 920 subjects (mean age 12.2 yrs, s.d. 3.0 yrs). Three Finnish studies reported pronounced variations in treatment need. *Hannuksela* (6) investigated 1,200 9-year-old children: 12% had a very urgent need and 13.3% an urgent need for treatment, while an investigation by *Heikinheimo* (7) of 200 7-year-olds reported an immediate treatment need in 23.5% and a need to monitor occlusal development in 34.5% of the sample. In a longitudinal study, *Heikinheimo et al.* (8) reported findings from a randomly selected group of children, examined at the ages of 7 and 10 years and reported that 19% were in need of orthodontic treatment at age 7 and 43% at age 10.

A study by *Rölling* (24) of 2,301 Danish children aged 9-10 years reported that 37% had malocclusions which required orthodontic treatment.

Wheeler et al. (27) evaluated orthodontic treatment need and demand in 3,696 third and fourth grade children in The United States. While demand for treatment was significantly higher in girls than in boys, the objectively assessed need for treatment had an inverse relationship, 41.8% and 44.2% respectively.

In a Norwegian study, *Stenvik et al.* (25) classified treatment need according to the need for orthodontic treatment index (NOTI) used by the Norwegian Health Insurance System. The material comprised 50 untreated 18-year-olds and 73 35-year-olds. The reported orthodontic treatment need was 54% in the 18-year-olds and 21% in the 35-year-olds.

In another Norwegian study, *Birkeland et al.* (4) reported that of 293 subjects, 44% had completed or were undergoing orthodontic treatment at 15 years of age.

Using a modified version of the Swedish National Board of Health and Welfare Index, *Linder-Aronson et al.* (19) studied a sample of 1,282 children in Stockholm, aged from 8 to 16 years, from five different districts with varying population structures. The prevalence of objective treatment need varied from 23.8% to 28.9%. Subjective treatment need ranged from 21.6% to 30.3%. The highest prevalence was found in areas with large immigrant populations. Objective and subjective treatment needs varied among the five districts studied.

In a recent study, *Perillo et al.* (23) investigated a large sample (n = 703) of 12-year-old children in southern Italy. Two examiners who had been previously trained in the use of occlusal indices screened all the subjects and classified them according to IOTN. The prevalence of grades 4 and 5 was 27.3% and of grade 3 36.7%.

A Swedish study from 1998 (16) of orthodontic treatment outcomes achieved by the Public Dental Health Service in Halmstad investigated the prevalence of malocclusion and residual treatment need. The results showed that 55% of 19-year-old subjects, born in 1975, had received orthodontic treatment: 520 (33%) had undergone treatment by specialists and 340 (22%) had been treated by general practitioners in consultation with specialists. From the same material questionnaire disclosed a significant shift in attitudes to orthodontic treatment. Before treatment, 72% expressed a perceived need for orthodontic treatment, compared to only 10% at follow-up at age 19 years (3). *Al Yami et al.* (2) studied the stability of orthodontic treatment 10 years post- retention. Dental casts from 1,016 patients were evaluated using the PAR index. In all, 564 dental casts were evaluated. In 67% of cases, the achieved treatment result remained stable 10 years post- retention. In 50% of cases of relapse, half of the total relapse had occurred within the first two years post-retention.

The aim of the present study was to investigate the orthodontic treatment need and treatment outcome in 15- and 20-year-olds in Jönköping, Sweden, 2003, with special reference to residual treatment need.

Materials and methods

The original sample for the present study comprised 260 individuals, 130 aged 15 and 130 aged 20, randomly selected from four parishes within Jönköping, Sweden. All were personally invited to participate in the study and were informed about the examination procedures. This study is a part of a major oral health study of individuals aged 3-80 years, conducted in the city of Jönköping, Sweden: an epidemiological study of data collected in 1973, 1978, 1983, 1993 and 2003 (11)

The offer was accepted by 96 of the 15- year-olds (73.3%; 45 boys and 51 girls) and 82 of the 20-year-

olds (62.6%; 47 males and 35 females). At the examination appointment, impressions were taken for study models and the participants filled in a questionnaire, presented in Appendix 1.

Two questions were to be answered by all participants:

1. Have you ever undergone orthodontic treatment?
2. Do you think you have a malocclusion that should be treated?

The remaining questions were to be answered by those who had undergone or were undergoing orthodontic treatment.

The subjects were treated in two different ways:

1. Those who have received their orthodontic treatment in a specialist clinic and
2. Those who have received their orthodontic treatment in a general practice under close supervision of a specialist in orthodontics. The orthodontist checks the ongoing treatment continuously. All treatment decisions were made by the orthodontist.

The study models were analyzed and measured in accordance with the ICON index (5). ICON values ≥ 43 indicate a treatment need. The patients' treatment records were also checked.

The study models were analyzed by a postgraduate dentist (CS), who had been calibrated against two experienced orthodontists on 15 models of each of the two groups. Differences between observers were tested for using Kruskal-Wallis test and correlation was calculated by Spearman correlation coefficients. The analyses showed no significant differences. The correlation coefficients varied between 0.83 and 0.97 for ICON. The questionnaires were analyzed by another postgraduate dentist (JST).

Ethical considerations

The study was approved in 2003 by the Ethics Committee at the University of Linköping, Linköping, Sweden.

Results

The entire material

Ninety-six (73.3%) 15-year-olds participated in the study and sixteen (16.6%) considered that they had a malocclusion that should be treated. Seven of these 16 were currently undergoing orthodontic treatment. One of the previously untreated individuals now wanted orthodontic treatment. Of the eighty-two 20- year-old participants, nine (11%) considered that they had a malocclusion in need of orthodontic treatment. Four of these nine had never undergone orthodontic treatment. One would accept orthodontic treatment now (Table 1).

Treated subjects

In all, 39 (40.6%) of the 15-year-olds and 38 (46.3%) of the 20-year-olds had undergone or were currently undergoing orthodontic treatment.

With respect to the 39 15-year-olds, 28 (29.2%: 14 boys and 14 girls) had been treated in general practice under close supervision by orthodontists and 11 (11.5%; 4 boys and 7 girls) in a specialist clinic (Fig. 1). ICON values ≥43 were recorded in 15 (7 boys and 8 girls) ≤42 in 24 (61.5%). Seven of the 15 with ICON values of ≥43 were undergoing orthodontic treatment. The ICON values of the remaining 8 varied between 44 and 83. All eight had begun orthodontic treatment, two in a specialist clinic and six in general practice but treatment had been discontinued because of poor patient compliance. Four now perceived a need for orthodontic treatment (Table 2), and one subject would like to start treatment.

Among the 20-year-olds, 25 (30.5%; 12 males and 13 females), had undergone orthodontic treatment in general practice under close supervision of an orthodontist and 13 (15.9%; 7 males and 6 females), had been treated in a specialist clinic (Fig. 2). Six of those who had undergone orthodontic treatment in general practice and one in a specialist clinic had ICON values of ≥ 43. All seven had begun orthodontic treatment but had discontinued on the grounds that they were no longer interested..

Of the 20-year-olds who had undergone treatment, 7 had ICON values of ≥43 (range 45-71). One stated that now, at twenty years of age he was interested in undergoing orthodontic treatment (Table 2).

Perceived need for further orthodontic treatment

In response to the question: "Do you think you are in need of further orthodontic treatment?" eleven 15-year-olds and five 20-year-olds answered yes.

Of the eleven 15-year-olds, seven are currently undergoing treatment, two in a specialist clinic and five in general practice. The remaining four have undergone orthodontic treatment in general practice.

Of the five 20-year-olds who perceived a further treatment need, one male and three females had received their earlier treatment in general practice and the other male in a specialist clinic.

Reasons for undergoing orthodontic treatment

Orthodontic treatment was undertaken mainly to improve aesthetics. Difficulty chewing was also a reason for treatment in 34 percent of the 20-year-olds and 20 percent of the 15-year-olds. Only 3 individu-

Table 1. Orthodontic treatment need, ICON values and treatment demand in 15- and 20-year-olds who have never undergone orthodontic treatment (n = 57 and 44 respectively)

	15-year-olds	20-year-olds
Number of individuals who have not received orthodontic treatment	57 (59.4 %) 27 boys 30 girls	44 (53.7%) 28 males 16 females
ICON mean, value	27	39
ICON value ≥43	10	14
Perceived need for orthodontic treatment	9	4
Would accept orthodontic treatment now	1	1

Figure 1. Flow chart illustrating 15-year-olds

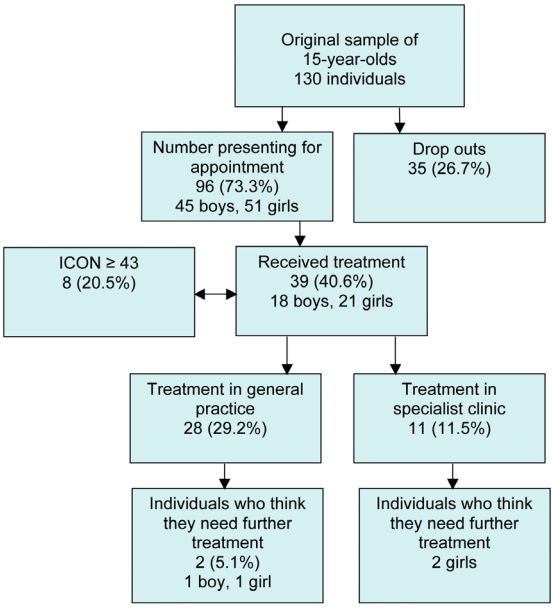

Figure 2. Flow chart illustrating 20-year-olds

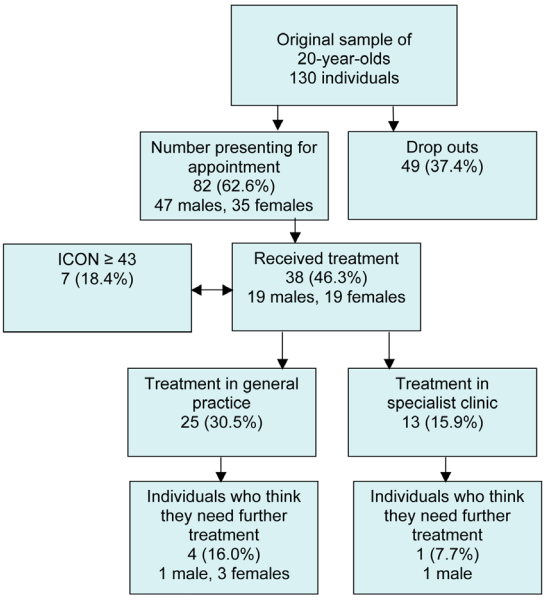

Table 2. Orthodontic treatment history and residual treatment need in 15 and 20-year-olds who have undergone treatment (n=77)

	15-year-olds	20-year-olds
Number of patients under treatment or previously treated	39 (40.6%) 18 boys 21 girls	38 (46.3%) 19 males 19 females
Treatment in general practice	28	25
Treatment in a specialist clinic	11	13
Currently perceive a need for orthodontic treatment	4	5
Would accept orthodontic treatment now	1	1

Table 3. Pretreatment perceptions

	15-year-olds	20-year-olds
In what way did the malocclusion disturb you?		
Poor aesthetics	16 (41%)	21 (55.3%)
Difficulty chewing	8 (20.5%)	13 (34.2%)
Being teased about teeth	1 (2.6%)	2 (5.3%)
Other reasons	22 (56.4%)	14 (36.8%)
∑	47	50
Who initiated the treatment?		
Parents	9 (23.1%)	11 (28.9%)
General practitioner	25 (64.1%)	26 (68.4%)
Specialist/doctor	13 (33.3%)	6 (15.8%)
You	4 (10.3%)	7 (18.4%)
Someone else	1 (2.6%)	
∑	52	50
How much influence did you have on the decision to begin treatment?		
A lot	8 (21.1%)	12 (32.4%)
Some	14 (36.8%)	10 (27.0%)
None	6 (42.1%)	15 (40.5%)
∑	38	37

als cited being teased about their teeth as a reason for treatment (Table 3). In both age groups, general practitioners were cited as the main initiators of treatment, in more than 60% of responses.

Most of the subjects considered that they had very little influence over the decision to undergo treatment (Table 3).

Perception of treatment outcomes

In 39% of the 15-year-olds and 47% of the 20-year-olds, the duration of treatment was as anticipated. The individuals expressed high satisfaction with the treatment results and perceived the results to be stable. Almost all participants considered that the treatment goals had been fully or almost fully attained. The extra effort was well accepted by about 70% of the patients (Table 4).

Comparison of perceptions in relation to treatment setting disclosed that of the 15-year-olds, 46% of those treated in a specialist clinic and 36% of those treated in general practice considered that the treatment goals had been "fully attained", and "almost fully attained" in 55% of those treated in a specialist clinic and in 46% of those treated in general practice. Only one person considered that treatment goals had not been reached at all (Table 5).

Table 4. Treatment evaluation: 15-year-olds, n=39; 20-year-olds, n=38

	15-year-olds	20-year-olds
Duration of treatment		
As expected	14 (38.9%)	17 (47.2%)
Longer	9 (25.0%)	10 (27.8%)
Much longer	4 (11.1%)	1 (2.8%)
Shorter	9 (25.0%)	8 (22.2%)
∑	36	36
Were the treatment goals attained?		
Fully	15 (42.9%)	21 (55.3%)
Almost fully	19 (48.7%)	11 (28.9%)
Not at all	1 (2.9%)	6 (15.8%)
∑	35	38
Are the results stable?		
Yes	24 (68.6%)	25 (67.6%)
Reasonably	10 (28.6%)	10 (27.0%)
Better than pre-treatment	1 (2.9%)	2 (5.4%)
∑	35	37
Was the treatment worth the extra effort?		
Yes, undoubtedly	14 (39.5%)	22 (57.9%)
Yes, well worth it	12 (31.6%)	7 (18.4%)
Yes	8 (21.1%)	3 (7.9%)
Not at all	3 (7.9%)	6 (15.8%)
∑	37	38

Table 5. Relationship between treatment satisfaction and practice setting: general practice or specialist clinic: 15-year-olds, n=39; 20-year-olds, n=38, some did not respond to these particular questions

	15-year-olds						20-year-olds					
	General practice		Specialist clinic		Total		General practice		Specialist clinic		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Were the treatment goals attained?												
Fully	10	36	5	46	15	43	12	48	9	69	21	55
Almost fully	13	46	6	54	19	48	7	28	4	31	11	29
Not at all	1	4	0	0	1	3	6	24	0	0	6	16
∑	24		11		35		25		13		38	
Are the results stable?												
Yes	15	54	9	82	24	69	16	64	9	69	25	68
Reasonably stable	8	29	2	18	10	26	6	24	4	31	10	27
Better than pretreatment	1	4	0	0	1	3	2	8	0	0	2	5
∑	24		11		35		24		13		37	
Was the treatment worth the extra effort?												
Yes, undoubtedly	8	29	6	55	14	40	13	52	9	69	22	58
Yes, well worth it	8	29	4	36	12	32	3	12	4	31	7	18
Yes	7	25	1	9	8	21	3	12	0	0	3	8
Not at all	3	11	0	0	3	8	6	24	0	0	6	16
∑	26		11		37		25		13		38	

Among the 20-year-olds, 69% of those treated in a specialist clinic and 48% treated in general practice considered that the treatment goals had been "fully attained". Of those treated in general practice, six did not consider that treatment goals had been attained.

With respect to stability of outcome, 82% of 15-year-olds treated in a specialist clinic and 54% of those treated in general practice considered the results to be stable. Among the 20-year-olds, 69% treated in a specialist clinic considered the results to be stable and acceptably stable in the remaining 31%. The corresponding results for those treated in general practice were: 64% considered the results to be stable and in the remaining 24%, quite satisfactory (Table 5).

Among the 15-year-olds treated in a specialist clinic, 55% agreed very closely with the statement that the treatment had been well worth the extra effort and 36% partly agreed with this statement. The corresponding figures for those treated in general practice were: 29% in close agreement with the statement and 29% in partial agreement.

The corresponding responses from the 20-year-olds were that 69% treated in a specialist clinic and 52% treated in general practice considered that the extra effort had been well worthwhile.

Negative aspects of treatment

Thirty-one per cent of the 15-year-olds and 34% of the 20-year-olds recalled mainly that the treatment was painful, while for 31% and 26% respectively the main problem associated with treatment was difficulty chewing. Maintaining good oral hygiene was a problem for 21% of the 15-year-olds and 11% of the 20-year-olds. Of the 20-year-olds, 21% considered that the duration of treatment was excessive.

Discussion

Collection of orthodontic data, based on study models and a questionnaire, was first included in 2003 in the oral health study. One hundred and thirty individuals from each of the age groups 15 and 20 years were randomly selected and invited to participate: the aim was to compile a sample of about 100 individuals from each age group.

The 15-year-old group comprised 96 individuals and the 20-year-old group, 82. The poorer acceptance rate among the 20-year-olds was not unexpected, as by the age of 20, many young adults have left home to study or work.

A review of the literature discloses that reports of orthodontic treatment need and demand vary between 24% and 55% of children, many studies indicating 30-45% (4, 7, 8, 9, 24, 27). To date there are few studies analysing treatment outcome. In 1998, Lagerström et al. (16) presented a long-term study of orthodontic treatment in relation to function and dysfunction of the masticatory system. Fifty-five percent of 1, 554 19-year-olds in one community, born in 1975, had received orthodontic treatment: 60% in a specialist clinic and 40% in general practice under the supervision of an orthodontist. No significant correlation was disclosed between TMD signs and symptoms and occlusal contact recordings. There were few cases with severe signs and symptoms of TMD. Analysis of the same material by Berset et al. (3) disclosed that the weighted PAR scores were reduced by 83% from pre-treatment to post-treatment and 69% at follow-up. Only about 10% of participants reported dissatisfaction with their dental appearance and only 2% were interested in further orthodontic treatment (17). These results indicate that most of the malocclusions had been corrected, or that the subjects had been given the opportunity to have them corrected.

Another follow-up study (2) using the PAR index reported that 67% of the achieved orthodontic treatment results persisted ten years after treatment. In 2003 *Lilja-Karlander & Kurol* (18) contacted 223 individuals, all former patients at the same clinic, offering them a clinical examination at the age of 19. One-hundred and sixty-four respondents answered a questionnaire about perceived residual orthodontic treatment need. Forty-eight per cent had received an orthodontic consultation and 36% had undergone orthodontic treatment. Seven per cent in the consultation group and 10% in the no-consultation group perceived a residual treatment need (18).

The present study investigated the uptake of orthodontic treatment in two population samples from Jönköping, subjects aged 15 and 20 years in 2003, and analysed the distribution of treatment between specialist and general practice settings. Given the average interval of five years between treatment of the two groups, it was also of interest to determine whether the rate of uptake of orthodontic treatment had changed over time. The ICON index was used to evaluate residual treatment need in the treated individuals and treatment need in those who had never undergone treatment. In cases with ICON values ≥ 43, it was also necessary to retrieve patient files to determine the reason underlying the value. The ICON threshold value used has been used in other investigations but other threshold values have been

suggested (20). As a value for determining residual treatment need it could be questioned as arbitrarily set.

In the present study we set (the reasonable) quality limit at ICON <43, along with a requirement that the patient did not perceive a need for orthodontic treatment. It is the authors' opinion that the goals for these quality limits cannot and should not be completely fulfilled: while some treatment demands are unrealistic and some people will accept a deviant orthodontic status (13).

The ICON index was validated (15) in two groups of patients 11-14-years of age and 30-40-years of age. The index had a statistical correlation with the patients' opinion of treatment need but the correlation was weak.

The frequency of treated individuals in the present study was somewhat lower than in the study by Lagerström et al. (16): 55%, compared to 41% to 46% in the present study. More cases in the present study had been treated in a general practice setting. Thus the sample population resembles more closely that studied by *Lilja-Karlander & Kurol* (18).In the county in which the present study was undertaken there is a long tradition of orthodontic treatment in general practice in collaboration with orthodontists. All treatment decisions in those cases are made by the orthodontist. This explains the high number of patients treated in general practice: in other districts this would probably be lower (16).

The patient records disclosed specific explanations for the high ICON values in some subjects, the most frequent being the patient's lack of interest in orthodontic treatment or poor compliance.

Although four of the 15-year-olds and five of the 20-year-olds of the treated individuals perceived a current need for orthodontic treatment, very few wanted to start treatment. They were satisfied with their present condition. Similar findings were reported in the study by Lagerström et al. (17). Myrberg & Thilander (22) assessed treatment need in 5,459 schoolchildren, using a 4-point scale. Definite treatment need was found in 10.8%, moderate in 33.6%. However, 21.2% of those objectively assessed as needing treatment were not interested in undergoing treatment. This study was performed almost forty years ago and interest in treatment may have increased today.

On the other hand, in an interview study by *Holmes* (10) of 955 12-year-olds, assessing self-perceived dental attractiveness, objective orthodontic treatment need and subjective treatment demand, the demand for treatment was 85.7%. The response rate might have been lower if the question had been rephrased to ask whether the participant wanted to start orthodontic treatment immediately. In a study of 493 12- and 13-year-olds in Sweden, with special reference to the participants' geographic origin, the frequency of malocclusion, i.e. IOTN grades 4 and 5, was 30-40%, mean 37% (13).

In the present study, although 41% of the 15-year-olds and 46% of the 20-year-olds had undergone orthodontic treatment, 8 and 7 individuals respectively still had ICON values ≥ 43. This finding is difficult to reconcile with studies reporting orthodontic treatment need of less than 25-30% (19, 23). However, Perillo et al. (23) reported a prevalence of 36.7% for IOTN grade 3. Several studies indicate a much higher orthodontic treatment need if the children are to be satisfied with the orthodontic part of children's dental care. Most counties in Sweden offer comprehensive dental care free of charge to children, adolescents and young adults up to the age of twenty. However, in a few counties, only a fixed quota of children, usually 25%, is entitled to orthodontic treatment free of charge.

Even when orthodontic indices are applied, the process of selecting patients to be offered treatment is complicated (21). In this context, when the quota is as low as 25%, it must be difficult to select those eligible for free orthodontic treatment. Järvinen (14) also reported difficulty assessing individual cases using priority indices. However, he noted that despite the obvious shortcomings, treatment need indices are commonly used in Scandinavian countries. In the present study, those who had undergone orthodontic treatment were very satisfied with the results. Around 90% perceived that the treatment goals were fully or almost fully attained and almost 70% perceived the results to be stable. These findings are in accordance with those reported by *Lagerström et al.* (17) and *Lilja-Karlander & Kurol* (18). These studies confirm that very few individuals in these counties leave the free dental service at the age of 20 with residual unmet orthodontic treatment demand.

Conclusions

• In the present study 40.6% of 15-year-olds had undergone or were undergoing orthodontic treatment. At the age of 20, 46.3% have had some form of orthodontic treatment.

• The treatment goals were perceived to be fully or almost fully attained in 76 to 82% of those treated

in general practice and in 100% of those treated in a specialist clinic.

• Two subjects in the 15-year-old group and two in the 20-year-old group stated that they were currently interested in starting orthodontic treatment. This indicates a residual treatment demand of about 2% in the present population.

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Corresponding author:
Dr. Krister Bjerklin
The Institute for Postgraduate dental Education
Department of Orthodontics
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