Dental health in 14- to 17-year-old Estonian schoolchildren in Tartu and Tallinn

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The dental health of 392 Estonian schoolchildren aged 14–17 years (197 in Tartu and 195 in Tallinn) was studied. In Tartu only 1 child had lost teeth because of caries, as against 30 in Tallinn. Clinically caries-free dentitions were found in 15% of the children in Tartu and in 3% in Tallinn. The mean DMFT value was 3.7 in Tartu and 7.0 in Tallinn, being higher among girls in both cities. The mean DT value was 1.0 in Tartu and 2.6 in Tallinn. All subjects examined had a gingival bleeding index (GBI) higher than zero. The mean GBI was 20% in Tartu and 18% in Tallinn. □ *Dental caries; periodontal disease*

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Very little information on the dental and oral health of Estonian people was available in Western countries before the 1990s. Most of the investigations conducted in Estonia have been published in Estonian or Russian in local scientific journals, which are not widely known outside the Baltic countries.

The only information available in the Western literature is from the recent investigation by Bjerner et al. (1) concerning the occurrence of caries among 12-year-old children in the county of Viljandi, Estonia. According to this investigation, caries is as common today in Estonia as it was in the fifties in Scandinavia. The mean number of DMF teeth in 12-year-olds in Viljandi was 4.6. However, the variation in DMFT indices in different parts of Viljandi was fairly great, ranging from 3.3 to 5.7 in the five schools studied.

A recent Estonian study concerning the occurrence of caries among 12-year-old children in the western islands and coastal regions of Estonia showed quite low DMFT values, varying from 1.3 to 2.4 in the coastal regions and from 2.1 to 3.2 in the islands. The mean DMFT values for children aged 15–18 years ranged from 3.3 to 4.9 in the coastal regions and from 4.5 to 8.6 in the islands (2). Correspondingly, the mean DMFT values among 12-year-old children at the end of the seventies in Tartu varied from 3.5 to 5.1, being highest in those districts of the city where the fluoride content of the drinking water was lowest. The fluoride content of the city's drinking water varied from 0.1 to 2.8 mg/l (3).

Epidemiologic studies have shown marked improvements in oral and dental health during the past few decades in most Western countries (4–12). For example, in Finland the average DMFT value among 15-year-olds decreased from 12.2 to 3.1 between 1974 and 1991 (10). No regular follow-up studies of the progress of oral health in Estonia as a whole have so far been carried out.

Although the high prevalence of dental diseases seems to be a major problem in Estonia, little is known about the dental conditions and diseases of the jawbones in Estonian schoolchildren. To rectify the situation, the Department of Dental Radiology of the University of Helsinki contacted the Estonian authorities with a view to arranging a detailed investigation in conjunction with Estonian dentists in Tartu and Tallinn.

Materials and methods

The series consisted of 392 Estonian children, 197 in Tartu and 195 in Tallinn (Table 1). The examinations were carried out in May 1993 at the Dental Clinic of the University of Tartu and at the Tallinn Dental Clinic. The sample was obtained from 6 schools in Tartu and 20 schools in Tallinn. The schools and the children were selected randomly by the local authorities from different districts of the two cities. In Tartu 200 schoolchildren (whole classes) were invited to the examination, and all participated. Three of the children were excluded from the examination because they did not fulfill the age criteria of the present investigation. In Tallinn 245 schoolchildren were invited for examination, but 45 children (18%) did not arrive, and 5 of the participants were either too old or too young and were therefore excluded. The final sample consisted of 88% of the 445 children originally invited to participate in the study. The final sample represented 2.6% of all 14- to 17-year-old boys (2870) and 4.3% of all 14- to 17-year-old girls (2844) in Tartu. The corresponding

Table 1. Numbers of subjects by age and sex in Tartu and Tallinn

Age (years)	Tartu			Tallinn			Total		
	Boys	Girls	Total	Boys	Girls	Total	Boys	Girls	Total
14	20	26	46	21	34	55	41	60	101
15	21	32	53	8	35	43	29	67	96
16	17	31	48	9	38	47	26	69	95
17	17	33	50	15	35	50	32	68	100
Total	75	122	197	53	142	195	128	264	392

figures in Tallinn were 0.4% of the boys (12,141) and 1.2% of the girls (11,607).

Clinical examination and diagnostic criteria

In the clinical examination the following findings were recorded: decayed, filled, and missing teeth, dental fluorosis, and gingival status. All clinical examinations were performed by one investigator (J. Peltola).

In the calculation of DMFT indices the wisdom teeth were excluded. The examination was performed in a dental chair with a mirror and an explorer and with the help of fiberoptics transillumination. Clinical caries was recorded as present only when needing treatment: when a lesion in a pit or fissure or on the smooth surface had a detectably softened floor, undermined enamel, or softened wall. Enamel caries was excluded.

The consistency of the assessments was determined beforehand. A weighted kappa value (13) was calculated for 20 dental students examined twice with a 6-week interval to determine the intra-observer agreement for the DMFT assessments.

Dental fluorosis was recorded using Dean's index criteria (14).

Gingival status was examined using the gingival bleeding index (GBI) (15). The GBI was determined by gentle probing of the gingival pockets on six surfaces of every permanent tooth except the wisdom teeth. After a waiting period of 10–15 sec the number of bleeding gingival units was recorded. The index is the number of bleeding pockets expressed as a percentage of the units examined. On the basis of the GBI values, gingival condition was placed in one of four categories (16): 1) relatively healthy gingiva (0–5%), 2) moderate gingivitis (6–15%), 3) relatively severe gingivitis (16–25%), and 4) severe gingivitis (>25%). To standardize the probing force (20 *g*) in the determination of GBI, probing was practiced beforehand, using a Hunter probe.

Statistical analyses

The chi-squared test and Fisher's exact test were used to analyze the statistical significance of differences. In statistical analyses of the differences between the sexes, age groups, and cities, multivariate analysis was used.

The present study has been approved by the ethical committees of the universities of both Tartu and Helsinki. Informed consent was obtained from each child and their parents.

Results

Reliability tests

An almost perfect kappa index of 0.96 was obtained for the intra-observer agreement in the assessment of clinical caries (17).

Decayed, missing, and filled teeth

In the clinical examination caries-free dentitions were found in 30 children (15%) in Tartu and in 5 children (3%) in Tallinn. The mean DMFT value was 3.7 in Tartu and 7.0 in Tallinn ($p < 0.001$) (Table 2). Girls had higher DMFT values than boys ($p < 0.001$), and the values increased with age ($p < 0.001$).

Table 2. Mean and 95% confidence intervals (in parentheses) of DMFT index in 14-, 15-, 16-, and 17-year-old Estonian schoolchildren in Tartu and Tallinn

Age (years)	Tartu			Tallinn		
	Boys	Girls	Total	Boys	Girls	Total
14	2.2 (0–5.9)	3.4 (0–8.0)	2.8 (0–7.5)	5.1 (0–12.9)	5.7 (0–15.9)	(0–13.4)
15	3.7 (0–11.5)	3.3 (0–8.4)	3.4 (0–9.7)	5.5 (0.8–10.2)	7.1 (0–16.1)	6.8 (0–15.2)
16	2.1 (0–5.5)	4.8 (0–10.1)	3.9 (0–9.4)	5.3 (0–11.8)	7.6 (0–17.6)	7.1 (0–16.7)
17	3.5 (0–9.2)	5.2 (0–11.7)	4.6 (0–11.1)	7.4 (1.5–13.3)	9.5 (1.7–17.3)	8.9 (1.5–16.3)
Total	2.9 (0–8.6)	4.2 (0–10.0)	3.7 (0–9.6)	5.8 (0–12.7)	7.5 (0–16.7)	7.0 (0–15.6)

Statistical significance of differences: Tartu/Tallinn ($p < 0.001$); boys/girls ($p < 0.001$); and age groups ($p < 0.001$).

Table 3. Mean number and 95% confidence intervals (in parentheses) of decayed (DT) and filled teeth (FT) in 14- to 17-year-old Estonian schoolchildren in Tartu and Tallinn

	Age (years)	Tartu			Tallinn		
		Boys	Girls	Total	Boys	Girls	Total
DT	14	0.5 (0–2.1)	0.8 (0–3.3)	0.6 (0–2.8)	2.0 (0–6.7)	2.7 (0–7.4)	2.4 (0–7.1)
	15	1.0 (0–4.3)	0.8 (0–3.0)	0.9 (0–3.6)	2.3 (0–7.0)	2.2 (0–6.7)	2.2 (0–6.7)
	16	0.6 (0–2.4)	1.3 (0–4.4)	1.1 (0–3.8)	1.8 (0–7.7)	2.8 (0–7.5)	2.6 (0–7.7)
	17	1.4 (0–4.1)	1.2 (0–3.6)	1.3 (0–3.7)	3.5 (0–7.6)	3.1 (0–7.8)	3.2 (0–7.7)
	Total	0.9 (0–3.4)	1.0 (0–3.5)	1.0 (0–3.5)	2.4 (0–7.3)	2.7 (0–7.4)	2.6 (0–7.3)
FT	14	1.8 (0–5.5)	2.9 (0–7.6)	2.4 (0–6.7)	4.0 (0–9.9)	3.9 (0–10.2)	3.9 (0–10.0)
	15	3.0 (0–9.1)	2.8 (0–7.1)	2.8 (0–7.9)	4.3 (0–9.3)	5.6 (0–13.6)	5.4 (0–12.8)
	16	1.7 (0–5.0)	3.7 (0–8.6)	3.0 (0–7.7)	4.2 (0–9.3)	5.9 (0–14.7)	5.6 (0–13.8)
	17	2.6 (0–7.9)	4.4 (0–10.1)	3.8 (0–9.7)	5.4 (0–12.5)	7.6 (0–15.0)	6.9 (0–14.3)
	Total	2.3 (0–7.0)	3.5 (0–8.6)	3.0 (0–8.9)	4.5 (0–10.4)	5.8 (0–13.8)	5.4 (0–13.0)

All variables were statistically significantly higher in Tallinn than in Tartu ($p < 0.001$); FT values were statistically significantly higher in girls than in boys ($p < 0.01$); FT ($p < 0.01$) and DT ($p < 0.05$) values increased statistically significantly with age.

There were 93 subjects with no decayed teeth needing treatment in Tartu (47%) and 38 in Tallinn (19%). The mean number of carious teeth was 1.0 in Tartu and 2.6 in Tallinn ($p < 0.001$) at the clinical examination (Table 3). The number of teeth with actual caries increased slightly with age ($p < 0.05$), but no clear differences were seen between boys and girls. The mean number of filled teeth was also noticeably higher in Tallinn (5.4) than in Tartu (3.0) ($p < 0.001$). The number of filled teeth increased with age ($p < 0.001$) and was higher in girls than in boys ($p < 0.01$) (Table 3). In Tartu only 1 subject had lost teeth, as against 30 in Tallinn ($p < 0.001$)

None of the subjects in the present series was edentulous or wore removable dentures.

Dental fluorosis

The mean fluorosis index was 0.12 in Tartu (0.09 in boys and 0.13 in girls) and 0.01 in Tallinn (0.00 in boys and 0.01 in girls). The difference between Tartu and Tallinn is statistically significant ($p < 0.01$).

Periodontal status

All subjects in both Tartu and Tallinn had a GBI higher than zero (range, 3–54% in Tartu and 1–59% in Tallinn). The mean GBI was 20% in Tartu (21% in boys and 19% in girls) and 18% in Tallinn (18% in both sexes). A distribution of subjects into different categories on the basis of the GBI value is shown in Fig. 1. Slight or probable alveolar resorption was detected radiographically in about 3% of the subjects (in 0.2% of all teeth in Tartu and in 0.6% in Tallinn). In no cases were changes indicating juvenile periodontitis found. There were no statistically significant differences between the two cities, sexes, or age groups in figures representing periodontal status.

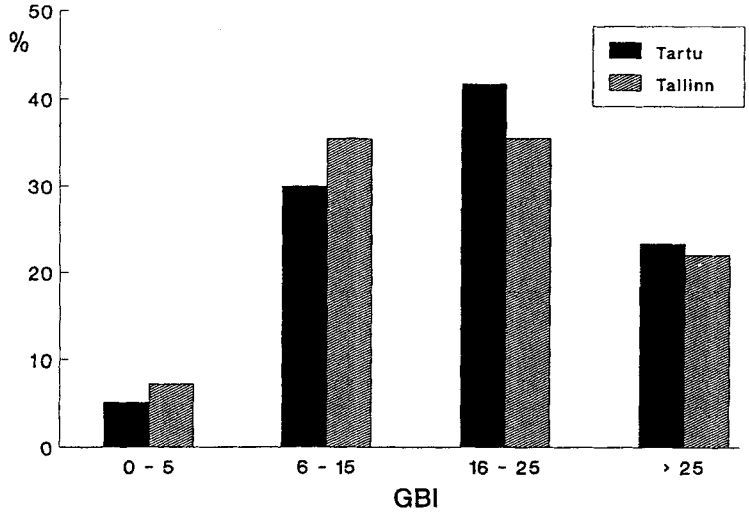

Fig. 1. Frequency of four categories of gingival bleeding index (GBI) values among 14- to 17-year-old schoolchildren in Tartu and Tallinn.

Discussion

In the present series the girls were overrepresented compared with the boys both in Tartu and in Tallinn, and we therefore considered it important to give the main results separately for boys and girls in the two cities.

The exceptionally high kappa value for the intra-examiner agreement in the previous clinical caries assessment is probably partly due to the small number of DMF teeth among the dental students in Helsinki used in the test. The intra-examiner test may not be totally valid, because the final target group was schoolchildren. Nevertheless, it was considered important to practice the examination and to get some idea of the reproducibility of the method.

The earlier findings in Viljandi, Estonia, from the study by Bjerner et al. (1) gave the impression that DMFT values in young Estonians are high. It was therefore surprising to find that the DMFT values obtained in Tartu did not differ markedly from those in Finland. Both in Helsinki and in Finland as a whole the mean DMFT values vary from 2.4 to 4.5 among 14- to 17-year-olds, being only slightly lower than those in Tartu (10, 18).

It is interesting that girls had higher DMFT values than boys in the present study. Similar results have been found earlier in Estonia (2). A corresponding trend is seen in Finland among teenagers and adults but not in children below the age of 15 years (11, 19, 20). The difference between the sexes was mainly due to the greater number of filled teeth in girls, as the MT and DT values did not differ markedly. One reason for the differences between the sexes may be that the boys with teeth in poor condition were those who did not attend the study in Tallinn.

The mean numbers of teeth with actual caries (DT) among 14- to 17-year-olds in Helsinki ranged from 0.7 to 1.2 (mean, 0.9). These figures are close to the values found in the clinical examination in Tartu (mean, 1.0) but lower than those in Tallinn (mean, 2.6). Secondary caries was a common finding in both Tartu and Tallinn. A similar finding was reported by Bjerner et al. (1) among 12-year-olds in Viljandi.

The gingival status of the schoolchildren was similar in the two cities studied and close to that of teenagers in Jönköping, Sweden, studied by a comparable method in 1983 (21). No sex differences were seen in Estonian schoolchildren, which differs from the opinion presented in other investigations that girls and adult women are better aware of the importance of preventive and self-dental care and have better periodontal health than males (19, 22). Although calculus was not recorded in the present study, it was a common finding during the probing of gingival pockets.

In conclusion, the differences in dental health between Tartu and Tallinn schoolchildren show that there are substantial regional differences in dental health in Estonia. These differences can be explained at least partly by differences in the fluoride content of the drinking water. Our finding that dental fluorosis was commoner in Tartu than in Tallinn is an indication of the presence of such local factors. Whereas it is obvious that there is still much work to do to improve the dental health of young Estonians, it was highly gratifying to find that there are regions in which the condition of the teeth of schoolchildren is fairly good.

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