

Rise and Fall of Caries Prevalence in Eastern Europe - Reasons and Consequences^{*)}

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Summary

The global pattern of caries prevalence is changing. In Europe the number of countries showing a caries decline has increased over the last two decades. While up until 1990 only 12 countries were known to have a DMFT for 12-year-olds below 3.0, this number increased to more than 25 from 1991 to 1997. The current caries prevalence is spread over a range, with a significant East-West gradient from 7.7 DMFT in Latvia down to 0.9 in The Netherlands. With the exception of Slovenia (1.7), East Germany (2.6) and the Czech Republic (2.7) all DMFT indices in Eastern European countries were within the range from 4.0 to more than 6.0. There are also signs in Bulgaria and Romania for the beginning of caries increase. In most of these countries implementation (or re-implementation) of oral health promotion and prevention at community level is needed.

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Introduction

From an oral-epidemiological point of view the 20th century has presented two diametrically opposite trends. There was initially a continuous increase from the beginning of the century till the mid-seventies. Since then there has been a general decrease of caries prevalence in the highly industrialized countries of the „Western hemisphere“; referred to - in scientific literature - as the „caries decline“. In some of the Northern and Western European countries with traditionally high caries prevalence the DMFT has dropped since the mid-seventies from 6.0 - 10.0 to 3.0 - 5.0 (Glass 1982) (1).

At the ORCA-Satellite-Symposium 1990 in Ljubljana the first overlook on the actual caries status in Europe was calculated out (Marthaler 1990) (2). During the years from 1983 to 1989 only 7 European countries showed a very low caries prevalence at age 12: Denmark, Finland, Malta, The Netherlands, Scotland, Sweden and Switzerland. At the same time there were 19 countries with moderate (2.7 to 4.4 DMFT) and five with high or very high caries prevalence (Figure 1).

In contrast to the apparent change of caries pattern in the North and West of Europe, no caries decline could be proven unequivocally in Central and Eastern Europe until the end of the eighties (3). The radical changes in the political and economic situation that have taken place in these countries have

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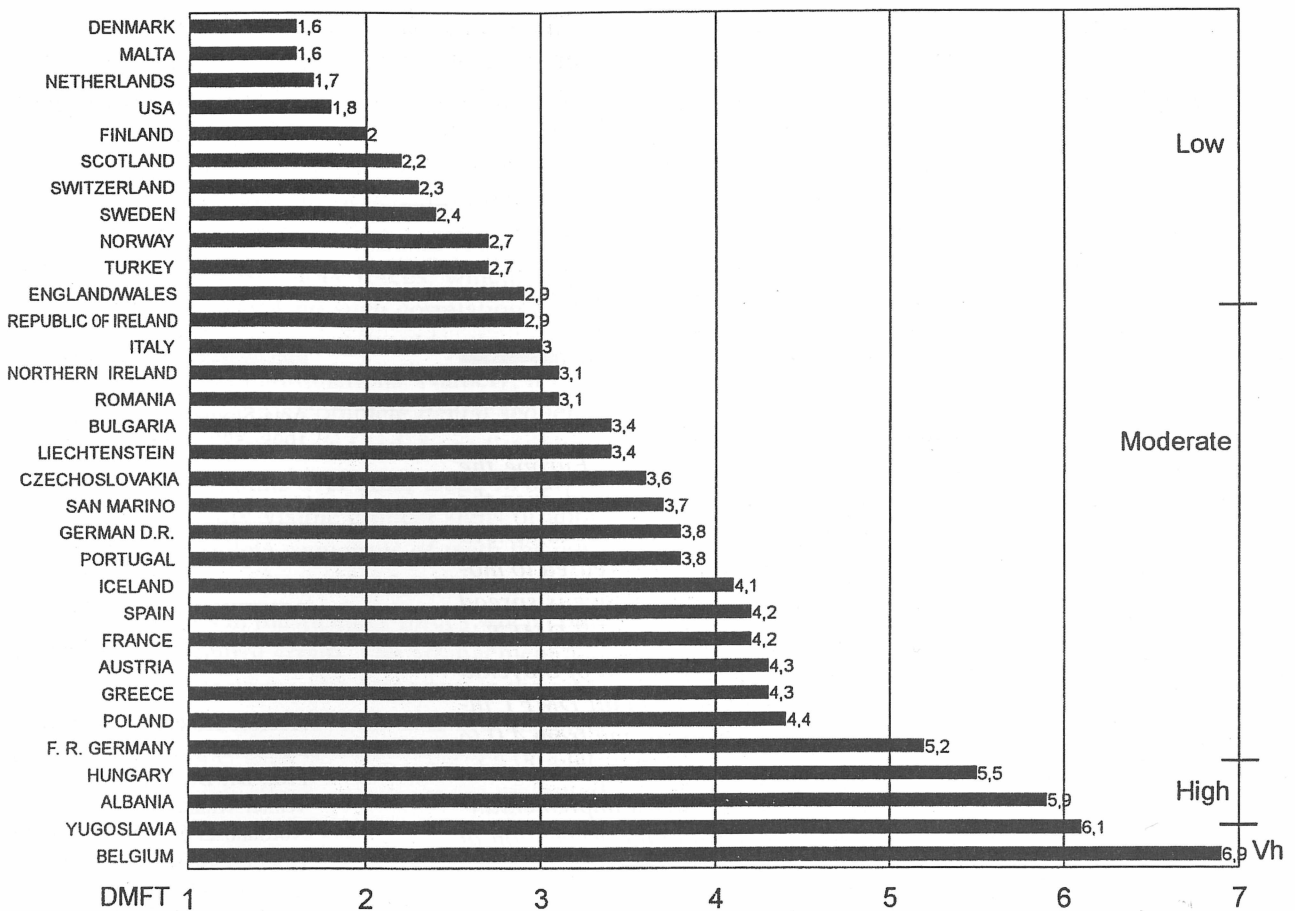


Figure 1. Caries prevalence at age 12 during the period 1983 to 1989

Slika 1. Prevalencija karijesa u dobi od 12 godina u razdoblju 1983. do 1989.

imposed a number of financial and infrastructural constraints, which may be followed by a „Disaster of caries prevention”. An increase of caries prevalence was expected in all of the former Eastern European countries.

Situation analysis

According to the latest information in *Bulgaria* caries prevalence increased during the years from 1993 to 1996 from 3.1 to 4.3 DMFT. A comparable trend occurred in the neighboring country *Romania*, with an increase from 3.1 to 4.0 DMFT (1986 to 1992) (Petersen et al. 1994) (4).

In *Poland* the current situation is rather unclear. According to the results of two pathfinder surveys in 1987 and 1990 (Szatko and Boczkowski 1992)

there is an increasing trend of caries prevalence (5). The decline from 1982 to 1987 changed to an increase of DMFT values until 1990. However, the DMFT data are not in correspondence with the results published by Lisiecka (1996) (6). Nevertheless, caries levels in Poland are still high and Szatko (1992) describes the Polish situation as disastrous; the life style of children and teenagers changed to a „Western cariogenic model” (7).

The documented national averages provide, however, only an incomplete picture of caries prevalence in these countries, as very significant regional differences can be found. Regional variations in caries prevalence are typical for *Hungary* (Czukur 1994) (8). They include differences between urban and rural areas. Children from rural areas usually have higher DMFT values (2.7 to 7.4). These data are an indication of the existence of children with high

caries risk and they are also typical for *Romania* and other countries, where the distribution of caries also varies greatly.

Countries of the former Soviet Union

Kuzmina (1993) and Leous (1994) reported caries prevalence in 14 states of the former USSR (9,10). According to multinational studies the DMFT values vary from 1.2 in Tadjikistan to 7.7 in Latvia. Given the size of these countries it is not surprising that the caries prevalence of 12-year-olds differs greatly from one country to the next.

Structural conditions and the corresponding determinants of caries also vary widely. The level of caries prevalence differs generally between the cold Northern and the warm Southern regions of the former USSR. In *Russia*, the European region with 3.7 differs from the Sibirian with 4.0 (Khabarovsk) and 4.6 DMFT in Omsk. However, there are great variations in caries levels between different regions in the European part of the country and also in dependence from natural content of fluoride in drinking water, as published for the Moscow region (Kuzmina et al. 1994) (11). A comparable relation is known from *Estonia* (Russak 1997) (12).

Alarmingly high are the DMFT indices in the Baltic states, especially the DMFT around 7 in *Latvia* and 6 in *Lithuania*. The exceptionally high caries prevalence in these two Baltic states is confirmed by newly published results of additional epidemiological studies (Balciuniene 1997, Care et al. 1997, Machiulskiene et al. 1998) (13,14,15).

Eastern Germany

The reunification of the two German states in 1990 has introduced a dramatic social transformation in *Eastern Germany*, resulting in a complete change of political, economic, commercial and social structures, including those of medical and dental care. The previous state-run health system has been restructured along the lines of private medical and dental practice. The previous legally established concepts of care and prevention, which provided regular dental care for children and juveniles from 1979 has also radically altered.

There was also a minimisation or cessation of communal or *group-related preventive programs*, involving supervised oral hygiene and local application of fluoride. In addition *water fluoridation* of 35 towns, encompassing about 18 % of the population, came to a halt during the years 1990 - 1993. The *provision of fluoride tablets* to about half a million pregnant women and children in many urban and rural areas was also discontinued. Other oral health problems resulted from the greatly increased availability of refined products and sugar-rich beverages, together with changed patterns of food consumption, associated with a sudden influx of fast food and other new products.

Considering the multifactorial nature of dental caries, it was anticipated that these transformations would have an adverse effect on the oral health of children and juveniles. The following *hypotheses* were therefore put forward to serve as a basis for epidemiological research:

- Significant increase in caries prevalence (primary and secondary caries) in both dentitions of the juvenile population;
- Marked caries waves in towns following the cessation of water fluoridation;
- Conditions favouring caries progression in single teeth (including approximal caries) as well as early tooth loss, as a consequence of reducing school dental services.

Retrospective comparison of caries prevalence: Between 1959 and the end of the eighties the DMFT values for 12-year-old children in towns without water fluoridation would be at the upper limit of the

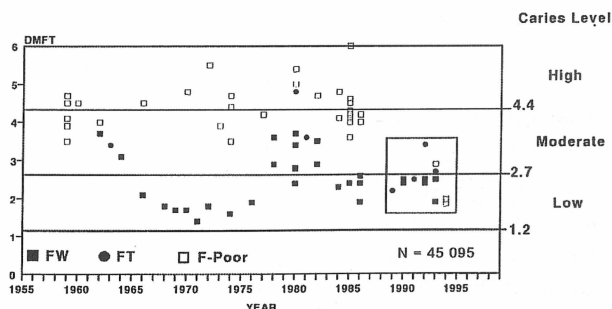


Figure 2. *Development of caries prevalence of 12-year-old children in Eastern Germany during the years 1959 to 1995*

Slika 2. *Razvoj prevalencije karijesa u 12-godišnjaka u Istočnoj Njemačkoj od 1959. do 1995.*

moderate, or in the high-caries, range. Regional geographical differences were clearly marked and the caries prevalence fell in a DMFT range between 1.5 and 6.0 (Figure 2). There were notable differences in caries prevalence between towns with and without water fluoridation.

In the years 1991 - 1995 caries prevalence for 12-year-old children was completely different (1.8 - 3.0 DMFT). In the period from the eighties to 1993-95, the DMFT mean computed for 12-year-old children was seen to have decreased by 34.2 %; from 3.8 in the eighties down to 2.5 (Künzel 1997) (16). In contrast to the period before 1991, all regional differences were significantly reduced and the difference between towns without water fluoridation and towns which had abandoned water fluoridation had become less clearly marked (2.8 : 2.0 DMFT). In this context it is of interest to look at the situation in former cities with *F-enriched drinking water*.

The high caries preventive effectiveness of water fluoridation has been proven worldwide since the early fifties. Up to 80 % reduction was reported after 10 - 20 years of water fluoridation, which was

documented in own studies (Chemnitz, former Karl-Marx-Stadt) as well. At the same time it was shown that long-lasting interruptions or cessations of water fluoridation usually resulted in a caries increase (Künzel 1980) (17). According by there was no doubt that the general cessation of water fluoridation in East Germany would be followed by an increase of caries prevalence. However, what happened during the last three periods of observation (Figure 3).

In 1959 caries prevalence was with some exceptions slightly higher in *Chemnitz* than in *Plauen*. In spite of increasing sugar consumption from 27.4 up to 35.2 kg/pCY, caries prevalence decreased after implementation of water fluoridation in all age groups.

Two opposite caries preventive events marked this period in both towns. In *Chemnitz* technical reasons caused an interruption of water fluoridation for 22 months around 1971 (0.18 ppm F). In *Plauen* water fluoridation was implemented in 1972 for about 55 % of the inhabitants. An additional 20 % received mixed water (0.4-0.7 ppm F). The trend of caries prevalence was different in both towns in the period 1971-1983, when compared with the first period. In *Chemnitz* caries prevalence increased significantly after the interruption of water fluoridation till 1979. A caries increase could not be prevented, in spite of a sufficient amount of aminfluorides (fluids, gels) and sodium fluoride varnishes, available and „massively” used in kindergartens and schools as a „substitute” for water fluoridation. There was a completely different caries trend in *Plauen*. Caries prevalence increased in the period from 1959 and 1971. After implementation of water fluoridation the caries trend changed to a decrease and in 1983 the starting level of 3.5 DMFT was reached again with an ongoing reduction of caries till 1987.

Interruption in Water Fluoridation and Caries Prevalence in 12-Year Old Children

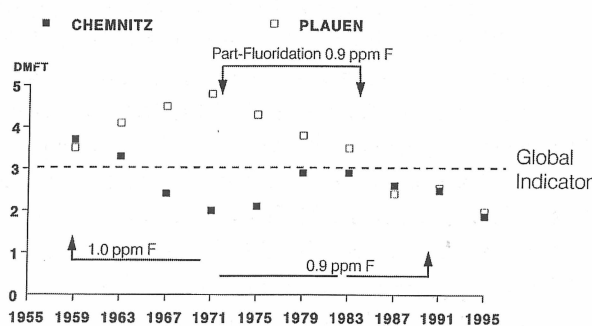


Figure 3. Effect of long-lasting interruptions or cessation of water fluoridation in Chemnitz (former Karl-Marx-Stadt) and Plauen between 1959 and 1995. While a caries increase followed interruptions of water fluoridation (22 month around 1971), DMFT indices decreased further after cessation of water fluoridation 1984 in Plauen and 1990 in Chemnitz

Slika 3. Učinak dugotrajnog prekida fluoridacije vode u Chemnitzu (bivši Karl-Marx-Stadt) i Plauen u između 1959. i 1995. i 1995. Dok je povećanje karijesa pratilo prekid fluoridacije vode (22 mjeseca oko 1974.), DMFT indeksi su bili sniženi nakon prekida fluoridacije 1984. u Plauen u 1990. u Chemnitzu

Once more completely different caries preventive conditions distinguished this period compared with the first two periods. New laws after the reunification of Germany caused the definitive cessation of water fluoridation in Chemnitz in 1990. Thus only F-poor drinking water was available in both towns. In both juvenile populations a significant reduction of caries was found after the cessation of water fluoridation. This is *not in agreement with the predicted caries increase* until 1995. For the 12-year-olds in Chemnitz caries prevalence reduced

by 26.8 % and in Plauen by 25.5 %. The DMFTs of 1.87 and 1.98, respectively, were the lowest ever during the whole observation time (Künzel and Fischer 1997) (18).

In this context the comparison with the post-socialistic development of oral health related conditions in the adjoining *Czech Republic* is very interesting. The economic and socio-political conditions as well as the standard of living were very similar to those in Eastern Germany until 1990-91. This includes the established dental care system with its concentration on caries prevention as well as the time of the social transformation in 1990 and their structural effects. Just as in Eastern Germany, a *caries decline* occurred in the years between 1987 and 1993. Caries prevalence for 12-year-olds decreased significantly by about 20 % in this time from 3.3 to 2.7 DMFT (Krejsa and Mrklas 1995) (19). During this period water fluoridation in Prague the capital city - initiated in 1975 - ceased. In 1988 caries prevalence of the young population was 44 % lower in the city than the national average (Lekesová et al. 1996) (20). Although water fluoridation ceased in the same year, caries prevalence for 12- and 14-year-old schoolchildren did not change between 1988 and 1995 (1.84 to 1.83 and 2.85 to 2.80 DMFT res.). In 1995 the DMFT of 1.8 for 12-year-olds in Prague was remarkably under the national average of 2.7 DMFT. Even so caries prevalence did not decrease after cessation of water fluoridation like, as Eastern Germany. One has to assume - concerning the caries decline in the Czech Republic - that there were circumstances, that minimized the caries risk.

In addition to these observations should be mentioned that there is a third country with a substantial decline in caries prevalence after social transformation, i.e. *Slovenia*. During a eleven-year - period from 1987 the mean DMFT value for 12-year-olds dropped in this country from 5.1 about 2.6 to 1.7 in 1998 (Vrbič 1998) (21). This caries trend is attributed to a growing programme of preventive measures (fluoride treatment including dentifrices, oral health education and fissure sealings) that encompass increasing numbers of the young population. In opposite to the prognosed increase of caries prevalence - more or less for all Eastern European countries - there are three countries - maybe more - with a substantial caries decline in the young population.

Reasons for caries trends

This raises the question of why there are such differences in caries trends among the former Eastern European countries after the *transition*. On one side „*Fall*” and on the other side „*Rise*” or stable high level of caries prevalence. Is it the lack of:

- comprehensive preventive programs for oral health,
- qualified health care education for the population,
- broader availability of fluorides in the human environment,

or are there other reasons for such a high caries prevalence, e. g. sparse and poorly equipped oral health care services (Bjanarson et al. 1995, Aleksejuniene et al. 1996, Künzel 1996) (22,23,24). In this context it is of great interest to look at the pattern of caries prevalence for 12-year-olds in Europe, especially at the fascinating epidemiological changes between the eighties and nineties. As was demonstrated (Figure 1) a *caries decline* occurred during the eighties (1983 to 1989) - with the exception of The Netherlands and Switzerland - in the North of Europe, including Britain and Ireland. In nineties (1991 to 1997) caries decline moved later on from West to East. The borderline between countries with lower and higher caries levels (more than 3 DMFT) was postponed to East and separates now - like a „*Roman limes*” - the majority of the former Eastern European countries from the rest of the European region. More or less all countries on the left side of this „*Limes*” reached DMFT averages below 3.0 and seven of them below 2.0 DMFT. On the other side of the borderline caries prevalence of 12-year-olds is still high or very high (12 countries), sometimes linked with an increasing caries trend.

These remarkable differences in oral health are in accordance with the deep and widening gap in general health between the Eastern and Western halves of the European region, because the transformation of Europe's political, economic and social landscape have had a major impact on health (WHO 1996) (25). As national and personal incomes declined, *health inequalities deepened*. The major pan-European issue is therefore the *growing divide* between health status of East and West, especially in

the case of communicable disease, e.g. the increasing incidence of diphtheria, poliomyelitis, tuberculosis, hepatitis B and other transmitted diseases. A comparable development was also demonstrated for *noncommunicable diseases*, especially cardiovascular and respiratory conditions, external causes of death and cancer. The gap in life expectancy between Western and Eastern European countries is about six years, more than 75 % of which is due to premature mortality before the age of 65 years (WHO 1996). But what does this WHO report say about oral health status after years of change in dental care in the Eastern European countries? The fluctuating and growing problems are mentioned only in two sentences:

- Oral health care standards are low in a number of countries, and
- in most of these, oral health promotion and preventive care have not been implemented systematically or on a community-wide basis.

This all that refers to oral health problems in this report. What does this really mean if we look at the actual pattern of caries prevalence behind the „*Roman limes*”? We need answers on how to solve the rising problems, what is necessary to improve oral health status.

Under the leadership of FDI an international group of experts published in 1985 (Renson et al. 1985) (26) a position paper with the main reasons responsible for declining caries:

1. The wide availability of fluorides, both topically and systemically used.
2. Enhanced oral health behaviour of the population.
3. Reduction in the frequency of sugar consumption in its total intake.
4. Greater utilization of dental care services.
5. The adoption of an preventive approach by dental practitioners.
6. The widespread use of antibiotics and their effects on the oral microflora.

Ten years later we are more experienced and so it was very important to ask once more „What do the experts believe?” today about the reasons for the caries decline. Bratthall et al. (1996) (27) collected the views of more than 50 international experts confronted with the question: What were the main rea-

sons why 20-25-year-olds have less caries nowadays, compared to the situation 30 years ago? For the majority of the proposed factors, the experts, answers ranged from a low impact rating (effect or minor effect) to a significant impact (important or very important). The main results of the interviews are as follows (27):

1. Regarding the question of the single most important factor, majority of experts (40 out of the 52) considered „*fluoride*” to be the most important (some added in combination with „oral health education”).
2. The factor most experts agreed upon was a very important factor, explaining more than 40 % of total caries reduction, the use of *fluoride toothpaste*.
3. Regarding diet, including possible changes in total sugar consumption, frequency of sugar consumption or sugar substitutes, the answers pointed towards a less important or minor role.
4. Similar results were also found for most measures carried out by oral health personnel, including fissure sealants.

Summarising, the importance of fluoride is irrefutable. However, on the other hand there is also disagreement on the impact of different factors on oral health. Consequently, the influence of other factors on „the final event of caries decline” should not be overlooked, and they should be deeply and critically analyzed. In this context it is of interest to look at the background situation in *Eastern Germany*, where caries decline took place during a ten-year period from the mid-eighties till 1995. This period covers the change from a mainly systemic to a mainly topical availability of fluorides, a change in the supply of food and luxury articles, a complete restructuring of the dental care system and changes in many other environmental factors. There are two large components in this scenario (Figure 4); improvement in oral health behaviour and changes in the environment, over which the individual has little influence. It is not yet possible to decide which of these two components are of prior importance in the causal structure of the epidemiological observed caries pattern. One ought possibly to assume that the changes in the environment, which would exert a „passive” effect in minimising the risk of oral in-

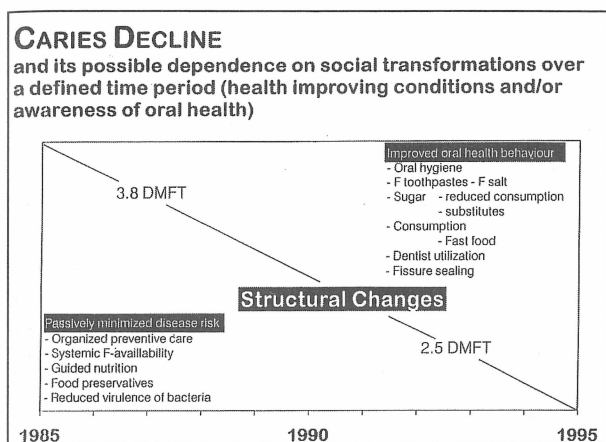


Figure 4. Causes of the caries decline in Eastern Germany (Model situation „East”) and its possible dependence on social transformation (after the reunification in 1990) over the period from 1985 to 1995 (health improving conditions and/or better awareness of oral health?)

Slika 4. Uzorci smanjivanja karijesa u Istočnoj Europi i njegova moguća ovisnost o socijalnim promjenama (poslije ujedinjenja 1990.) u razdoblju od 1985. do 1995. (unaprjeđenje zdravstvenih uvjeta i/ili bolja briga za oralno zdravlje?)

fection, would be the dominant factor during the period of observation.

There could of course have been a decrease in the virulence of the cariogenic bacteria. Only in Germany had the use of antibiotica doubled, from 137.5 to 264.0 million Defined Daily Doses (DDD) during the past ten years and this does not include the 199.2 million DDD of antibiotics in expectorants, antimykotics, dermatics, ophthalmiatrics and otologics. The antibiotics prescribed under private health insurance in hospitals (10 % of total), or used in veterinary medicine, or in the production of animal food are also excluded. In contrast to the zero-base level of usage at the end of the forties, 2160601 t antibiotics were used in 1993 in pharmaceuticals, in animal food production and in other areas which is on average equivalent to 0.027 kg antibiotics per person per year. A possible connection between this and the caries decline cannot completely ruled out. Undoubtedly there were factors influencing the caries decline that were present both before and after the structural changes. The following factors are documented by data (Künzel 1997) (16):

- Greater utilisation of dental services = large number of subjects who visited the dentist on-

ce a year (90.7 %) or at least once every six months. (50 %); high F component (90 %); high proportion of children with orthodontic treatment (47.9 %);

- Adoption of preventive approach by dental practitioners = fissure sealing for 40.3 % of subjects with 3.6 molars/head, combined with F-topical and oral health instructions/remotivations;
- Increase of F toothpastes from 10 - 15 % up until 1990, to 88 % in 1993. Toothpaste consumption in 1993 - 95: 4 to 5 tubes containing 75 ml/pCY = 270 - 330 g/subject;
- F salt available since 1992; market share in 1993 - 1995 < 15 %;
- 90 % of all children received during their first year vitamin D₃ combined with NaF (0.25 mg F/die) = 222 Mio DDD (= Defined Daily Dose) for rickets prevention;
- No positive correlation between annual sugar consumption and level of caries prevalence anymore. The sugar consumption in 1993 was as low as 1980 - 1989 (35.1 to 40 kg/pCY) and the availability of products with sugar substitutes increased (1993: 7795 tons).

These developments coincided with other changes in the consumption of food and in the pattern of food consumption in the population, and these must also be taken into consideration. The availability of fruit and vegetables, and the supply of food and luxury products had increased, for instance, in both quantity and quality. The introduction of fast food chains, have had a direct impact on the eating patterns of children and juveniles. A parallel shift towards the consumption of beverages and ice cream may also have been of some importance. Both contain high percentages of food preservatives (especially benzoic and sorbic acids) which, in a low pH environment, may act as antibacterial agents.

Conclusion

The aim of this contribution was to demonstrate, on examples from Eastern Europe, that caries prevalence in the young population is dependent on oral health promoting conditions. It is acknowledged that the primary anti-caries agent is fluoride. Nothing or very little caries prevention could have been achieved

ved without it. Fluoride is the dominant component even in the most complex preventive programs. The concluding message is that caries decline may also be expected in Eastern European countries, depending on the implementation of national or communal caries preventive programs (including oral health education) and the broad local and/or systemic availability of fluorides.

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Usponi i padovi čestote karijesa u Istočnoj Europi - razlozi i posljedice

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Sažetak

Globalna se slika čestote karijesa stalno mijenja. U Europi se u posljednja dva desetljeća povećala množina država u kojima čestota karijesa opada. Dok je do godine 1990. samo 12 zemalja imalo DMFT za 12-godišnju dob manji od 3,0, njihov je broj između 1991. i 1997. porastao na 25. Sadašnja se čestota karijesa - uz znatne razlike između Istoka i Zapada - kreće u rasponu od 7,7 DMFT u Letoniji do 0,9 u Nizozemskoj. Osim u Sloveniji (1,7), Istočnoj Njemačkoj (2,6) i Češkoj Republici (2,7), vrijednost DMFT se za sve ostale zemlje Istočne Europe kretala u rasponu od 4,0 do više od 6,0. Ima i znakova porasta čestote karijesa u Bugarskoj i u Rumunjskoj. U većini tih zemalja nužna je provedba (ili ponovna provedba) promidžbenih i preventivskih mjera na razini cijele zajednice.

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Uvod

Kad je riječ o usnoj šupljini, s epidemiološkog se stajališta u 20. stoljeću opažaju dva dijametralno oprečna kretanja. U prvome redu, od početka stoljeća pa do sredine sedamdesetih godina postojao je stalan trend porasta čestote karijesa. Od tada se u visoko industrijaliziranim zemljama tzv. Zapadne hemisfere čestota karijesa općenito smanjuje; taj se trend u stručnoj literaturi i spominje kao "smanjenje karijesa". U nekim zemljama sjeverne i zapadne Europe s tradicionalno visokom čestotom karijesa, DMFT se od sredine sedamdesetih godina smanjio s 6,0 - 10,0 na 3,0 - 5,0 (Glass 1982.) (1).

Na satelitskom simpoziju ORCA održanom 1990. u Ljubljani, napravljen je prvi pregled stanja karijesa u Europi (Marthaler 1990.) (2). U razdoblju

od godine 1983. do 1989. samo je u 7 europskih država postojala vrlo mala čestota karijesa u djece u dobi od 12 godina: u Danskoj, Finskoj, Nizozemskoj, Škotskoj, Švedskoj, Švicarskoj i na Malti. U isto je doba čestota bila umjereno visoka u 19 zemalja (2,7 do 4,4 DMFT), a visoka u 5 zemalja (Slika 1).

Nasuprot očitij promjeni čestote pojave karijesa u sjevernoj i zapadnoj Europi, u srednjoj i istočnoj Europi nije se moglo uvjerljivije pokazati nikakvo opadanje čestote karijesa sve do kraja osamdesetih (3). Radikalne političke i gospodarske promjene u tim zemljama, stvorile su mnoge financijske i infrastrukturne poteškoće koje su se očitovale i u obliku "katastrofe u prevenciji karijesa". Porast čestote karijesa očekivao se u svim zemljama bivše Istočne Europe.

Raščlamba stanja

Prema podacima iz Bugarske, čestoća karijesa u toj zemlji porasla je u razdoblju od 1993. do 1996. s 3,1 na 4,3 DMFT. Sličan je trend bio i u Rumunjskoj, gdje je utvrđen porast s 3,1 na 4,0 DMFT (1986. do 1992. godine) (Petersen i sur., 1994.) (4).

U Poljskoj je postojeće stanje donekle nejasno. Prema rezultatima dvaju istraživanja iz 1987. i 1990. godine (Szatko & Boczkowski, 1992.), opaža se uzlazni trend čestoće karijesa (5). Silazni trend između 1982. i 1987. zamijenjen je porastom vrijednosti DMFT do 1990. godine. No, podatci o DMFT nisu u skladu s rezultatima koje je objavila Lisiecka (1996.) (6). Bilo kako bilo, čestoća karijesa u Poljskoj još je uvijek velika, te Szatko (1992.) stanje u Poljskoj naziva katastrofalnim; životni stil djece i mladeži promjenio se u "zapadni kariogeni model" (7).

Dokumentirani podaci o stanju na nacionalnoj razini daju, međutim, nepotpunu sliku čestoće karijesa u tim zemljama, jer se mogu naći znatne regionalne razlike. Regionalna kolebanja čestoće karijesa tipična su za Mađarsku (Czukur 1994.) (8). Ona uključuju razlike između gradskih i seoskih područja. Djeca iz seoskih područja obično imaju više vrijednosti DMFT (2,7 do 7,4). Ti podatci pokazuju da postoje djeca s visokim rizikom nastanka karijesa, što je tipično i za Rumunjsku i za ostale zemlje u kojima čestoća karijesa također pokazuje velika regionalna kolebanja.

Zemlje bivšega Sovjetskog Saveza

Kuzmina (1993.) i Leous (1994.) objavili su podatke o čestoći karijesa u 14 država bivšega SSSR-a (9,10). Prema tim multinacionalnim istraživanjima vrijednosti DMFT se kreću od 1,2 u Tadžikistanu do 7,7 u Letoniji. Uzimajući u obzir veličinu tih zemalja, ne iznenađuje da je čestoća karijesa u 12-godišnjaka toliko različita od jedne do druge zemlje.

Strukturne okolnosti i odgovarajuće odrednice karijesa također vrlo kolebaju. Čestoća karijesa na hladnome sjeveru jako se razlikuje od one u toplim južnim područjima bivšega Sovjetskog Saveza. U Rusiji se pak europsko područje s DMFT 3,7 razlikuje od sibirskog s DMFT 4,0 (Harbarovsk) i 4,6 koliko iznosi u Omsku. No postoje velike razlike u

čestoći karijesa i među raznim područjima europskoga dijela zemlje, a ovisi i o prirodnom sadržaju fluorida u vodi za piće, kao što je objavljeno za moskovsko područje (Kuzmina i sur., 1994.) (11). Slični su odnosi i u Estoniji (Russak 1997.) (12).

Alarmanтно su visoke vrijednosti DMFT u baltičkim zemljama, napose u Letoniji gdje je DMFT oko 6 i u Litvi gdje je oko 7. Vjerodostojnost doista visoke čestoće karijesa u tim dvjema baltičkim zemljama potvrdila su i najnovija, dodatna epidemiološka istraživanja (Balciuniene 1997; Care i sur. 1997; Machiulskiene i sur. 1998.) (13,14,15).

Istočna Njemačka

Ujedinjenje dviju njemačkih država godine 1990. donijelo je dramatične društvene promjene Istočnoj Njemačkoj jer se potpuno promijenila politička, gospodarska i društvena struktura, pa tako i one strukture koje se odnose na medicinsko i stomatološko zbrinjavanje. Prijašnji sustav državnoga vođenja restrukturiran je usporednim uvođenjem privatne medicinske i stomatološke prakse. Dotadašnja legalno uspostavljena koncepcija zbrinjavanja i prevencije, koja je od 1979. godine osiguravala redovitu stomatološku skrb za djecu i mladež, također se je radikalno promijenila.

Smanjeni su ili ukinuti grupni programi prevencije, koji su obuhvaćali i nadzirano održavanje higijene usne šupljine i lokalnu uporabu fluorida. Uz to, u razdoblju od 1990. do 1993. godine obustavljena je fluoridacija vode u 35 gradova, a u njima živi 18% stanovništva. Prekinulo se davati fluorid u tabletama velikoj skupini od oko pola milijuna trudnica u mnogim gradskim i seoskim područjima. Ostali problemi u vezi s održavanjem zdravlja usne šupljine posljedica su veće mogućnosti uporabe rafiniranih proizvoda i napitaka bogatih šećerom, što je posljedica promijenjena načina prehrane i iznenadna obilja brzo pripravljene hrane (*fast food*) i ostalih novih proizvoda.

Ako se ima na umu multifaktorska narav zubnoga karijesa, nije teško shvatiti da su spomenute promjene nepovoljno djelovale na zdravlje usne šupljine u djece i mladeži. Zato su, kao osnova za epidemiološka istraživanja, iznesene sljedeće hipoteze:

- znatan porast čestoće karijesa (primarnog i sekundarnog) te decidualnih i trajnih zuba u mladoj naraštaja;

- velik val karijesa u gradovima nakon obustave fluoridacije vode;
- uvjeti koji pogoduju napredovanju karijesa pojedinih zuba (uključivši aproksimalni karijes), te suviše ran gubitak zuba kao posljedica redukcije školskih programa zaštite zuba.

Retrospektivna usporedba čestoće karijesa - Između godine 1959. i kraja osamdesetih vrijednost DMFT u 12-godišnje djece u gradovima bila bi, bez fluoridacije vode, na gornjoj granici umjerenih vrijednosti ili čak u području visokih vrijednosti. Jasnno su se opažale regionalne razlike i vrijednost DMFT se je kretala u rasponu između 1,5 i 6,0 (Slika 2). Postojale su i očite razlike u čestoći karijesa stanovništva gradova u kojima se je voda fluoridirala i onih u kojima nije. U razdoblju 1991.-1995. čestoća karijesa u 12-godišnje djece posve se promijenila (DMFT 1,8 - 3,0). U razdoblju od osamdesetih pa do 1993.-95., prosječna se vrijednost DMFT u 12-godišnje djece smanjila za 34,2%, t.j. s 3,8, u osamdesetim godinama, smanjila se na 2,5 (Künzel 1997.) (16). Nasuprot razdoblju prije 1991., sve su se regionalne razlike znatno smanjile, a i razlike između gradova koji su fluoridirali vodu i onih koji to više nisu činili postala je manje jasna (DMFT 2,8 prema 2,0). U tom je kontekstu zanimljivo pogledati kakvo je stvarno stanje u gradovima kojih je voda za piće bogata fluoridom.

U ranim pedesetim godinama jasno je dokazana velika preventivna djelotvornost fluoridacije diljem svijeta. Nakon 10 do 20 godina fluoridacije vode opažen je pad čestoće karijesa i do 80%, što smo opetovano dokumentirali i vlastitim istraživanjima (Chemintz, prije Karl-Marx Stadt).

No, istodobno se je pokazalo da dugotrajni prekidi ili obustava fluoridacije vode obično uzrokuju porast čestoće karijesa (Künzel 1980.) (17). Na osnovi tog iskustva nije bilo nikakve dvojbe da je opća obustava fluoridacije vode u Istočnoj Njemačkoj morala za posljedicu imati porast čestoće karijesa. No što se je dogodilo tijekom tri posljednja razdoblja praćenja (Slika 3).

U 1959. je godini čestoća karijesa, uz neke iznimke, bila neznatno veća u gradu Chemintzu nego u Plauen. Premda se je povećala potrošnja šećera, s 27,4 kg na 35,2 kg/pCY, čestoća karijesa smanjila se je u svih dobnih skupina nakon uvođenja fluoridacije vode.

Dva suprotna zbivanja u svezi s karijesom obilježila su to razdoblje u oba grada. U Chemintzu je, zbog tehničkih razloga, fluoridacija vode bila oko godine 1971. prekinuta 22 mjeseca (0,18 ppm F). U Plauen je tijekom 1972. fluoridiranu vodu moglo piti otprilike 55 % građana. Dodatnih 20 % dobivalo je miješanu vodu (0,4 - 0,7 ppm F). Čestoća karijesa u tim dvama gradovima razlikovala se je u razdoblju od 1971. do 1983. u usporedbi s prijašnjim razdobljem. U Chemintzu je nakon obustave fluoridacije čestoća karijesa znatno porasla do 1979. godine. Taj se porast nije mogao spriječiti unatoč dovoljnoj količini aminofluorida (tekućine, gelovi) i lako s natrijevim fluoridom koje su se uvelike rabile u vrtićima i školama kao nadomjestak za fluoridaciju. Kretanje čestoće karijesa u Plauen bilo je posve drugačije. Čestoća je rasla u razdoblju od 1959. do 1971. Pošto je fluoridacija ponovno uvedena, čestoća se je počela smanjivati te je 1983. dosegla ranija vrijednost od DMFT 3,5, s trendom daljeg pada do godine 1987.

Još su jedanput posve različiti uvjeti prevencije karijesa prouzročili da se to razdoblje razlikovalo od dvaju prijašnjih. Zbog novih zakona nakon ujedinjenja dviju njemačkih država, godine 1990. potpuno je obustavljena fluoridacija vode u Chemintzu. Zato je stanovništvo obaju gradova imalo na raspolaganju samo pitku vodu siromašnu fluoridom. Među mladeži u oba grada uočeno je znatno manje karijesa nakon obustave fluoridacije vode. To nije bilo u skladu s predviđenim porastom čestoće karijesa do 1995. U 12-godišnje djece u Chemintzu čestoća se je karijesa smanjila za 26,8 %, a u Plauen za 25,5 %. Zabilježeni su DMFT u prvome gradu 1,87, a u drugome 1,98, što su najniže vrijednosti ikada opažene (Künzel & Fischer 1997.) (18).

U tom je kontekstu vrlo zanimljiva usporedba s postsocijalističkim razvojem uvjeta u vezi s održavanjem higijene usne šupljine u susjednoj Češkoj Republici. Gospodarski i socioekonomski uvjeti, te životni standard bili su vrlo slični onima u Istočnoj Njemačkoj do 1990.-91. To uključuje postojanje uhodanoga sustava stomatološke skrbi, osobito usmjerenog na prevenciju, zatim razdoblje društvene transformacije koje je nastupilo 1990., te strukturne učinke tih promjena. Kao i u Istočnoj Njemačkoj, između godine 1987. i 1993. čestoća karijesa se je smanjila! U spomenutom se razdoblju čestoća karijesa u 12-godišnje djece smanjila 20 %, t.j. s 3,3

na 2,7 DMFT (Krejsa & Mrklas 1995.) (19). U tome razdoblju obustavljena je fluoridacija vode u glavnome gradu Pragu, uvedena 1975. Godine 1988. čestoća karijesa u mlade populacije bila je u gradu 44 % niža od nacionalnog prosjeka (Lekesova i sur. 1996.) (20). Unatoč tome što je fluoridacija vode ukinuta iste godine, čestoća karijesa u dobnih skupina od 12 i 14 godina nije se promijenila u razdoblju od 1988. do 1995. (s 1,84 na 1,83 u prve dobne skupine i s 2,85 na 2,80 u druge). Godine 1995. DMFT je za djecu od 12 godina u Pragu iznosio 1,8, što je bilo znatno ispod nacionalnog prosjeka od 2,7 DMFT. Budući da se čestoća karijesa nije povećala nakon obustave fluoridacije vode za piće, kao npr. u Istočnoj Njemačkoj, ili se je čak smanjila, kao u Češkoj, valja zaključiti da postoje i druge okolnosti koje smanjuju rizik nastanka karijesa.

Osim tih zapažanja valja napomenuti da postoji još jedna država u kojoj je znatno pala čestoća karijesa nakon društvenih promjena, to je Slovenija. Tijekom 11-godišnjeg razdoblja nakon 1987. prosječna vrijednost DMFT za dob od 12 godina smanjila se je u toj zemlji s 5,1 na oko 2,6 do 1,7 (Vrbič 1998.) (21). Taj se smjer kretanja čestoće karijesa tumači mnogobrojnim programima prevencije (uporaba fluorida, uključivši zubne paste, edukaciju o održavanju higijene usne šupljine, punjenje fisura) koji obuhvaćaju sve veći dio mlade populacije. Nasuprot predviđenoj porastu čestoće karijesa - više ili manje u svim zemljama Istočne Europe - postoje tri zemlje, a možda i više njih, u kojima se čestoća karijesa u mladeži znatno smanjuje.

Razlozi promjena čestoće karijesa

Oni nameću pitanje otkud tolike razlike u kretanju čestoće karijesa među zemljama bivše Istočne Europe koje su sada u tranziciji. S jedne strane PAD, a s druge PORAST ili ustaljeno visoka čestoća karijesa. Razlog tomu je nedostatak:

- sveobuhvatnih programa prevencije, t.j. čuvanja zdravlja usne šupljine,
- kvalificirane zdravstvene edukacije stanovništva,
- šire dostupnosti fluorida u ljudskoj okolini,

ili postoje i drugi razlozi velike čestoće karijesa, npr. nedostatan broj ili slaba opremljenost ambulanta za

stomatološku skrb (Bjanarsom i sur. 1995; Alaksejuniene i sur. 1996; Künzel 1996.) (22,23,24). U tom kontekstu vrlo je važno obratiti pozornost na kretanje čestoće karijesa u djece u dobi od 12 godina u Europi, posebno na fascinantne epidemiološke promjene između osamdesetih i devedesetih godina. Kao što se vidi (Slika 1), čestoća karijesa se smanjila tijekom osamdesetih godina (1983. - 1989.) - s iznimkom Nizozemske i Švicarske - u cijeloj sjevernoj Europi, uključivši Englesku i Island. Devedesetih godina (1991. - 1997.) trend smanjenja čestoće karijesa sa Zapada se premjestio na Istok. Granica između zemalja s niskom i visokom čestoćom karijesa (DMFT veći od 3) pomakla se na istok i sada, poput "Rimske granice", odvaja većinu zemalja bivše Istočne Europe od preostalog dijela zapadnoeuropskog područja. U uglavnom svim zemljama lijevo od "granice" prosječni DMFT smanjio se je na vrijednost ispod 3,0, a u sedam zemalja i ispod 2,0. S druge strane te "granice" čestoća karijesa u 12-godišnjaka ostala je visoka (12 zemalja), katkada se uočava i trend daljega porasta.

Ove izrazite razlike u stanju zdravlja usne šupljine u skladu su s dubokim i sve širim jazom općenito u zdravstvenom stanju između istočne i zapadne polovice europskog prostora, jer transformacija političkih, gospodarskih i društvenih okolnosti snažno utječe i na zdravlje (WHO 1996.) (25). Sa smanjenjem nacionalnog i osobnog prihoda produbljuje se i razlike i nejednakosti u zdravstvu. Zato najveći paneuropski problem danas jesu sve veće razlike u zdravstvenom statusu između Istoka i Zapada, napose kad je riječ o priljepčivim bolestima, npr. sve češćoj difteriji, poliomijelitisu, tuberkulozi, hepatitisu B i ostalih priljepčivih bolesti. Sličan se trend opaža i u neinfektivnim bolestima, napose kardiovaskularnim, te u poremećaju dišnog sustava, vanjskih uzroka smrti i raka. Razlika u dužini životnoga vijeka između zemalja Istočne i Zapadne Europe iznosi oko 6 godina, a više od 75 % te razlike pripisuje se preranoj smrtnosti u dobi prije 65. godine (WHO 1996). No, što ovo izvješće WHO govori o stanju zdravlja usne šupljine nakon godina promjena u održavanju zdravlja usne šupljine u istočnoeuropskim zemljama? Fluktuirajući i sve veći problemi mogu se opisati u samo dvije rečenice:

- standardi održavanja zdravlja usne šupljine u brojnim su zemljama niski, i

- u većini tih zemalja programi promicanja skrbi i preventive ne primjenjuju se sustavno ili se ne primjenjuju na širokoj društvenoj osnovi.

To je sve što se u tom izvješću može naći o problemima održavanja zdravlja usne šupljine. No, što to doista znači ako se uzme u obzir stvarna čestota karijesa iza "Rimske granice"? Potrebni su nam odgovori kako riješiti sve veće probleme, što je potrebno poduzeti kako bi se poboljšalo zdravlje usne šupljine.

Pod pokroviteljstvom FDI međunarodna je skupina stručnjaka godine 1985. objavila (Renson i sur. 1985.) radni dokument s mišljenjem o glavnim čimbenicima nužnima da se smanji čestota karijesa (26). To su:

1. Široka dostupnost fluorida pri topikalnoj i pri sustavnoj uporabi.
2. Svjesniji odnos i ponašanje populacije prema održavanju zdravlja usne šupljine.
3. Smanjenje sveukupne potrošnje, t.j. unosa šećera.
4. Intenzivnije korištenje uslugama službi stomatološke skrbi.
5. Usvajanje preventivskog pristupa u osoblja koje pruža stomatološku skrb.
6. Široka uporaba antibiotika i njihovo djelovanje na mikrofloru usne šupljine.

Deset godina nakon toga raspoložemo s mnogo više iskustva te ponovno moramo upitati što zapravo danas stručnjaci misle o čimbenicima nužnim za smanjenje čestote karijesa. Bratthall i sur. (1996.) (27) prikupili su mišljenja više od 50 međunarodnih stručnjaka kao odgovor na sljedeće pitanje: Koji je glavni razlog što je čestota karijesa u dobi od 20 do 25 godina danas manja nego što je bila prije 30 godina? Za glavninu predloženih razloga odgovori stručnjaka kretali su se od procjene da ti čimbenici nisu imali veću važnost (slab utjecaj), pa do procjene da su znatno utjecali (važni ili vrlo važni). Glavni rezultati ankete (27), mogu se sažeti ovako:

1. Na pitanje o pojedinačnom najvažnijem čimbeniku većina se je stručnjaka (40 od 52) opredijelila za fluorid kao najvažniji (neki su dodali "fluorid u kombinaciji s edukacijom o održavanju zdravlja usne šupljine").

2. Čimbenik za koji se je većina stručnjaka složila da je vrlo važan, te da se samo njime može objasniti 40 % ukupnoga pada čestote karijesa, jest uporaba fluoridirane zubne paste.
3. Što se tiče prehrane, uključivši moguće promjene u ukupnoj potrošnji šećera, konzumaciji šećera i njegovih nadomjestaka, odgovori su uglavnom iskazali stajalište da je to manje važan ili čak nevažan čimbenik.
4. Slični su rezultati dobiveni i u odnosu prema većini mjera što ih provode stomatolozi, uključivši i sredstva za zatvaranje fisura.

Naposlijetku, može se reći da je važnost uporabe fluorida neupitna. S druge strane, postoje neslaganja oko važnosti ostalih čimbenika u održavanju zdravlja usne šupljine. Sukladno tome ne bi trebalo previdjeti utjecaj tih ostalih čimbenika na "sveukupno smanjenje učestalosti karijesa", te ih treba temeljito i kritički analizirati. S tim u vezi zanimljivo je pogledati kakvo je stanje u Istočnoj Njemačkoj, u kojoj se je čestota karijesa smanjivala tijekom desetogodišnjega razdoblja, od sredine osamdesetih do 1995. To razdoblje obuhvaća promjene od pretežno sustavne uporabe fluorida prema pretežno topikalnoj uporabi, promjene u načinu prehrane i dostupnosti luksuznijih proizvoda, potpunu rekonstrukciju sustava stomatološke skrbi, te promjene mnogih drugih čimbenika okoline. U tom scenariju postoje dvije glavne sastavnice (Slika 4): poboljšano ponašanje u vezi s održavanjem zdravlja usne šupljine, te promjene okoline na koje je pojedinac mogao malo utjecati. Još nije moguće procijeniti koja je od tih dviju sastavnica važnija kao uzročni čimbenik u epidemiološki utvrđenom kretanju čestote karijesa. Moglo bi se pretpostaviti da bi promjene okoline, koje su mogle "pasivno" djelovati smanjujući rizik nastanka oralnih infekcija, mogle biti prevladavajući (dominantni) čimbenik u praćenome razdoblju.

Naravno, mogla se je smanjiti i virulentnost kariogenih bakterija. Samo u Njemačkoj uporaba antibiotika se je u zadnjih deset godina udvostručila, s 137,5 na 264,0 milijuna definiranih dnevnih doza (DDD), a u to nije ubrojeno 199,2 milijuna DDD antibiotika u ekspektoransima, antimikoticima, dermaticima, oftalmicima i otologicima. Nisu ubrojani ni antibiotici propisivani u bolnicama iz sustava privatnoga zdravstvenog osiguranja (10 % od ukupne količine), ni antibiotici uporabljeni u veterinarskoj medicini i u proizvodnji životinjske hrane. Nasuprot

nultoj početnoj vrijednosti potrošnje antibiotika s kraja četrdesetih godina, u 1993. potrošeno je 216.060 tona antibiotika u farmaciji, proizvodnji životinjske hrane i u ostalim područjima, što odgovara potrošnji od 0,026 kg antibiotika po osobi na godinu. Moguća veza između te činjenice i smanjene čestote karijesa ne može se posve isključiti. Nedvojbeno je da su čimbenici koji su utjecali na pad čestote karijesa postojali i prije i nakon strukturnih promjena. Podacima se mogu potkrijepiti sljedeći čimbenici (Künzel 1997.) (16):

- Veće korištenje stomatoloških usluga = velik broj osoba koje su posjetile stomatologa barem jedanput u godini (90,7 %) ili jedanput u pola godine (50 %); velika zastupljenost F (90 %); velik udjel djece s ortodontskim zahvatima (47,9 %).
- Prihvaćanje preventivnog pristupa osoblja u stomatološkoj praksi = zatvaranje fisura u 40,3 % osoba s 3,6 molara po osobi, kombinirano s topikalnom primjenom F, te prihvaćanje uputa o održavanju zdravlja usne šupljine (obnova motiviranosti).
- Porast uporabe zubnih pasta s F s 10 - 15 % (do 1990.) na 88 % u 1993. Potrošnja zubnih pasta u razdoblju 1993.-95.: 4 do 5 tuba s po 75 ml/pCY = 270 - 330 grama po osobi.
- Soli fluora dostupne nakon 1992.; udjel na tržištu u razdoblju 1993.-95. < 15 %.
- 90 % od ukupnog broja djece u prvoj godini života primalo vitamin D₃ u kombinaciji s NaF (0.25 mg F/dan) = 222 Mio DDD (Definirana dnevna doza) redi prevencije riketsioza.
- Nema više pozitivne korelacije između godišnje potrošnje šećera i čestote karijesa. Potrošnja šećera u razdoblju nakon 1993. niža je ne-

goli u razdoblju 1980. - 1989. (35,1 do 40 kg/pCY), a povećao se je izbor proizvoda sa supstitutima šećera (1993. 7795 tona).

Ta su se pozitivna kretanja podudarila s ostalim promjenama u potrošnji živežnih namirnica i u načinu njihova konzumiranja u sveukupne populacije, te i to valja uzeti u obzir. Ponuda voća i povrća se je povećala, a porasla je i ponuda hrane i luksuznih proizvoda na tržištu, i kakvoćom i količinski. Uspostava lanaca za proizvodnju i prodaju brzo spravljene hrane izravno je utjecala na prehrambene navike djece i mladeži. Usporedni pomak prema potrošnji bezalkoholnih pića i sladoleda također bi mogao imati određenu važnost; oba proizvoda sadrže visok postotak konzervansa (pogotovo benzojeve i sorbinske kiseline) koji pri niskom pH mogu djelovati antibakterijski.

Zaključak

Svrha ovoga rada bila je na primjerima iz Istočne Europe pokazati kako čestoća karijesa u mlade populacije ovisi o čimbenicima koji promiču zdravlje usne šupljine. Ponovno se pokazalo da je glavni agens protiv karijesa fluorid. Bez njega može se provesti vrlo slaba prevencija ili ju se uopće ne može provesti. Fluorid je zbog toga dominantna sastavnica čak i najsloženijih programa prevencije. Zaključna bi poruka bila kako se i u zemljama Istočne Europe može očekivati da će se čestoća karijesa smanjiti, no to ovisi o provođenju programa prevencije karijesa na komunalnoj i nacionalnoj razini (uključivši edukaciju o održavanju zdravlja usne šupljine), te o širokoj lojalnoj i /ili sustavnoj dostupnosti fluorida.