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Dental health, received care, and treatment needs in 11- to 13-year-old children with immigrant background in Heidelberg, Germany

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Objectives. The purpose of the survey was to evaluate the caries experience, the provided care, and the unmet treatment need in 11- to 13-year-old schoolchildren with immigration background compared to children without migration experience.

Methods. A cross-sectional study of 502 schoolchildren, 48% of which have immigration background, was conducted. Schools in areas of disadvantaged socio-economic status were chosen for this study. DMFT scores, fissure sealants, and the occurrence of orthodontic treatments were recorded.

Results. The mean DMFT score of the immigrant children was significantly higher than that of the nonmigrants: 1.5 vs. 0.8. The SiC Index was also significantly different in both groups: 3.7 vs. 2.4, respectively. The Unmet Restorative Treatment Need Index was twofold higher in the immigrants compared to the nonmigrants. Only 45.6% of the immigrants had sound permanent teeth compared to 65.5% of the nonmigrants. The average number of sealants per child was 1.9 vs. 2.8, respectively. In addition, only 31.5% of the immigrants were provided with an orthodontic treatment compared to 48.3% of the nonmigrants.

Conclusion. Children with immigration background demonstrated more caries and received less dental care when compared to children without migration experience. The community prevention programmes, addressed similarly to all children, could not close the gap in oral health between immigrant and non-immigrant children.

Introduction

Over the last two decades, worldwide migration has become a key global issue. The related health issue is taking more importance, and is being increasingly investigated. In 2004, the Federal Republic of Germany counted about 7.3 million inhabitants without German citizenship; these persons represented 8.9% of the total population and made Germany the European country that hosts the largest number of foreigners[1]. An additional 8.1 million residents (data from 2005) in Germany with migration experience have German citizenship, bringing the proportion of residents with migration experience close to one-fifth of the total population[1]. This proportion is even higher in children[1].

However, previous studies showed that, since the 1980s, caries prevalence in children in Germany is decreasing continuously[2]. Nevertheless, there are a few reports on oral health in children with migration experience in Germany showing inequalities[3–5].

There is a discrepancy between the large number of immigrants and the sparse scientific data on migrants' oral health in Germany, the lacking number of German reports dealing with the dental health of the immigrant children, and the dissimilarity in the origins of these immigrants compared to the other regions. Therefore, we decided to conduct this survey. This study is presenting data on caries prevalence, rates of existing dental interventions comprising restorative, preventive and orthodontic care, and unmet dental treatment need of the immigrant children.

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Materials and methods

Population sample

The study was conducted in May and June 2004 in Heidelberg, a city in south-west Germany with a population of 140 000, 14% of which are foreigners. With the help of the Heidelberg Regional Health Authority, the secondary schools that appeared to have high proportions of enrolled children with an immigrant background were selected; five schools were thus identified. All of them were located in underprivileged areas of the city. The 5th, 6th, and 7th grades were chosen since these grades comprise, at the time the study was conducted (end of the school year), generally most of the 11- to 13-year-old children. The children without migration experience attending the same selected schools, and living usually in the same socially disadvantaged areas of the city, were included as control group. Migration experience was determined using a questionnaire. Prior to the dental examination, a letter of consent was sent to the parents of all the children in the selected classes. The parents were also asked to complete an included questionnaire specifying the country of birth of both parents and of their child. They were also asked to answer these questions even if they were not approving the dental examination of their child. Only those children who returned these papers approved, completed, and signed by a parent were included in this study.

This study is presenting an analysis of the data of 502 children. The original sample comprised 865 pupils, age 11–13 years. Twenty-seven children were missing school on the day of the examination and could not therefore be included in the study. In addition, 336 children were excluded from the study due to the non-agreement of the parents or of the child, or because the questionnaire had not been returned, not properly filled out, or not signed. Proportions of excluded children varied from class to class, i.e. in three classes all children were examined, and in one class no child returned the questionnaire.

Among the 502 children who were included in the study, 48% had an immigration background, and 52% were nonmigrants. Each group was divided in three subgroups according to the age of the child (Table 1).

Table 1. Study population distributed according to background and age.

Age/*n*	Immigrants (M)	Nonmigrants (N)	Total
11	75	76	151
12	88	99	187
13	78	86	164
All ages	241	261	502
Proportion	48%	52%	100%

Concerning ethnicity, 34.4% of the immigrant children originated from Eastern Europe, 22.4% from Turkey, 15% from the Middle East, 14.1% from other Western counties, and the rest from South-East Asia (9.5%), Sub-Saharan Africa (2.1%), and Latin America (2.5%).

The average age of all 502 studied children was 12.0 years. Considering each group alone, the average age was 12.0 for migrants, and 12.0 for nonmigrants. The boy to girl ratio was 47.3% vs. 52.7%, and 50.6% vs. 49.4% in both groups, respectively.

Data collection

The clinical examination was performed in the schools by a dentist (A.B.) who had been calibrated by another dentist with extensive experience in oral epidemiology (A.S.). The caries diagnosis was based on visual examination using a plane mouth mirror, a blunt dental probe, and a halogen lamp. Probes were only used for removing oral debris obscuring tooth surfaces or for confirming suspicious lesions. No radiographs were taken. The World Health Organization (WHO) method and criteria were followed for collecting and recording data[6]. Carious, missing, and filled permanent teeth and those presenting a fissure sealant were recorded. Only teeth with dentine caries lesions were considered carious. Missing and filled teeth were only considered if it was a result of dental caries. Fissure sealants were recorded regardless of whether they were complete or not. In addition, current or previous orthodontic treatments were recorded regardless of being removable or fixed appliances.

In accordance to the information given by the parents, the pupils were classified into two groups: group M or immigrants for children whose parents (one or both) were born outside of Germany, and group N for children whose parents were both born in Germany.

Statistical analysis

From the obtained data, DMFT scores were calculated; mean values, standard deviation, and frequency distribution were computed. The Significant Caries Index[7], which is the mean DMFT of the one-third of the population with the highest DMFT values, was determined through an online developed Microsoft Excel® application (http://www.whocollab.od.mah.se/expl/siccalculation.xls). Proportions of Unmet Dental Treatment Needs were calculated (DT/DFT). Proportions of caries-free children, mean values of fissure sealants, and percentages of children with an orthodontic treatment were also measured. *P*-values used for comparisons of two groups were obtained from the Mann–Whitney *U*-test. For comparison of proportions the χ^2-test was applied. Differences were considered to be significant for $P < 0.05$.

Results

In all age categories, the group of nonmigrant children showed a remarkable higher proportion of individuals with a caries-free permanent dentition (DMFT = 0) than the immigrants (Table 2). Immigrant children had a double amount of teeth with caries experience compared to children without migration experience (Table 2). In fact, the mean DMFT values were significantly different between the two groups for all age categories combined ($P < 0.01$). The mean DMFT values were also much higher in group M compared to group N in each age category. In addition, the mean D-T values calculated for group M were higher than those for group N. This was true for each age category. In group M, 3.3% of the children had one or more missing teeth compared to 1.1% in group N. In each age category the values of the Significant Caries Index were higher in the immigrant children compared to group N (Table 2).

Comparisons of the mean DMFT values within the immigrant children classified by their countries of origin have revealed important differences. Those originated from the states of the former USSR, from Turkey, and from the republics of the former Yugoslavia showed the highest DMFT values. These children represented also more than the half of all immigrant children in our survey (Table 3).

Most of the teeth with caries experience in both groups had been treated. However, children with untreated caries were also found in both groups. The obtained unmet values indicated that restorative treatment needs were significantly higher ($P < 0.001$) among the immigrant children than among the nonmigrants, and this was applicable for each age category. In addition, compared to the nonmigrants, more than twice of the immigrant children

Table 2. Mean and standard deviation (SD) of DT, MT, FT and DMFT scores, the SiC Index, and the proportion of caries-free children in the permanent dentition in children with (M) and without (N) immigration experience.

Groups	Age	11	12	13	All (11–13)
	D-T (SD)	0.20 (0.68)	0.36 (0.92)	0.23 (0.79)	0.27 (0.81)
	M-T (SD)	0.03 (0.16)	0.01 (0.11)	0.14 (0.66)	0.06 (0.39)
Group M	F-T (SD)	1.05 (1.47)	0.90 (1.43)	1.54 (1.91)	1.15 (1.63)
	DMFT (SD)	1.28 (1.70)	1.27 (1.69)	1.94 (2.26)	1.49 (1.92)
	SiC Index	3.28	3.69	4.50	3.72
	% caries-free	48.0	50.0	38.5	45.6
	D-T (SD)	0.08 (0.42)	0.11 (0.43)	0.12 (0.52)	0.10 (0.46)
	M-T (SD)	0.00 (0.00)	0.05 (0.41)	0.01 (0.11)	0.02 (0.26)
Group N	F-T (SD)	0.42 (0.88)	0.71 (1.23)	0.87 (1.86)	0.68 (1.40)
	DMFT (SD)	0.50 (1.00)	0.87 (1.41)	1.00 (1.90)	0.80 (1.51)
	SiC Index	1.50	2.45	2.92	2.38
	% caries-free	73.7	61.6	62.8	65.5

Table 3. Mean DMFT in nonmigrant and immigrant children classified by countries of origin.

Country of origin	DMFT	Mean age	*n*
Latin America	0.17	12.0	6
Sub-Saharan Africa	0.60	12.2	5
Western Europe/USA	0.59	12.0	34
No migration	0.80	12.0	261
Iran	1.00	12.0	9
Romania	0.83	11.8	6
Arab countries	1.19	12.1	27
South-East Asia	1.57	12.0	23
Poland	1.63	12.2	30
Former Yugoslavia	1.56	11.9	18
Turkey	2.02	12.0	54
Former USSR	2.31	11.8	29

Table 4. Distribution of the Unmet Restorative Treatment Need (RTN) Index (proportion of untreated carious teeth among teeth with caries history), and the proportion of children with need of at least one restoration. M denotes children with and N denotes children without migration experience.

Groups	Age	11	12	13	All (11–13)
Group M	% Unmet RTN	6.2	15.2	8.9	10.4
	% Restoration need	13.3	20.5	12.8	15.8
Group N	% Unmet RTN	3.3	5.4	6.0	5.0
	% Restoration need	3.9	8.1	7.0	6.5

Table 5. Mean number of sealed teeth (ST) per child, proportion of children without fissure sealants (ST = 0), and proportion of children with an orthodontic treatment (Ortho). M denotes children with and N denotes children without migration experience.

Groups	Age	11	12	13	All (11–13)
	Mean ST	1.81	1.78	2.17	1.92
Group M	% of ST = 0	40.0	40.9	33.3	38.2
	% Ortho	28.2	23.2	45.1	31.7
	Mean ST	2.57	2.85	2.88	2.78
Group N	% of ST = 0	28.9	27.3	24.4	26.8
	% Ortho	47.9	45.3	51.9	48.3

were in need of at least one restoration: 15.8% vs. 6.5% (Table 4).

The mean value of fissure sealants per child in group M was significantly lower than the respective mean value in group N ($P < 0.001$). Furthermore, compared to children from group M, a higher proportion of immigrant children without any fissure sealant was registered (Table 5).

The proportion of immigrant children who were provided with an orthodontic treatment (completed or not) was significantly lower than that of the nonmigrant children: 31.7% vs. 48.3% ($P < 0.001$). Such a difference was observed in each age category (Table 5).

Discussion

This survey showed marked differences in the dental health of children with and without migration experience. In fact, the results show that the oral health of the immigrant children is less favourable compared to nonmigrants living at the same low socio-economic areas. Indeed, caries was more frequently observed in the immigrant children, while necessary restorations, visible preventive measures (here fissure sealants), and functional–aesthetical (orthodontic) treatments were less prevalent in the immigrant children compared to children without migration experience.

Because of the fact that most of the immigrants in Germany have a disadvantaged socio-economic status, our findings can be representative of all 11- to 13-year-old immigrant children in Germany. On the other hand, knowing that oral health is related to socio-economic status[8,9], and given that children without migration experience in our study generally came from underprivileged social areas, the results of the average native German children would be more favourable. We can therefore deduce that differences in oral health between the immigrant and the German children in general are even greater than those obtained in this study.

The effect of nonparticipation, which occurs in nearly all similar studies, should certainly be taken into account. There are good reasons to assume that the oral health of many of the nonparticipating children is less favourable than that of the whole group. It could be therefore postulated that the real results would have been poorer compared to those obtained in this survey, but since that the proportions of nonparticipation in both groups of our study seemed to be similar, we can assume that differences in the results between the groups would have been close to those obtained in the study.

These disparities regarding caries incidence between immigrant and non-immigrant are consistent with most previous publications performed in other parts of the country[3,10]. However, the mean DMFT values obtained in this study for both groups were lower and caries-free rates were higher than those reported in the other earlier publications. This suggests that the dental health of children in Germany, even that of immigrants, is improving, although inequalities still exist.

In other industrialized countries, a poorer oral health in immigrant and ethnic minority children compared to the general population was also observed[11–14]. However, few studies have reported that children of some specific immigrant ethnic groups had lower caries rates compared to the native children[12,15–17]. These were mostly children from regions known for their low caries incidences like the sub-Saharan region in Africa and some parts of South-East Asia. Immigrants from these regions are rare in Germany and were modestly represented in our sample (11.6% of group M).

In the year 2000, the Significant Caries Index was introduced to better estimate the caries prevalence in the population. A new goal was then proposed and consists of reaching a SiC Index of less than 3 in the 12-year-olds by the year 2015. Our results show that children without migration experience in Heidelberg have already reached this goal. Unfortunately, this was not the case for the immigrant children who exhibited a SiC Index of 3.69. These scores show, however, that within both groups, but especially in the immigrants, there are children still experiencing very high caries rates. Most of these children came from Eastern Europe and Turkey, countries known for their high caries prevalence. Our findings reporting the higher proportions of immigrant children with need of restorative treatment compared to children without migration experience are also in accordance with those of previous German publications[10]. Still, our proportions were lower indicating a notable amelioration in the amount of dental treatments offered for all the children in Germany since the last decade. However, the inferior fulfilment of unmet needs in the immigrant children indicates a lack in the dental care provided for these children.

Kühnisch *et al.*[3] as well as Van Steenkiste[10] observed that immigrant children had much less molars with fissure sealants than German controls. Our survey reveals an improvement in the amount of sealed teeth in both groups, but also demonstrates that inequality between both groups still exists.

It has also been abundantly reported that immigrant children present generally higher levels of caries and tooth loss in the primary dentition[4,10,13]; therefore, it could be expected that these children would have a higher need for orthodontic treatments than the nonmigrant children. However, our survey revealed a higher prevalence of orthodontic appliances in children without migration experience. Knowing that the costs of most dentist-recommended orthodontic treatments for all children living in Germany are generally paid or reimbursed by the social security system, this dissimilarity in making use of this treatment can be explained by a lower awareness of the parents, less attention given for these children by their dentists, and/or problems in communication between dentists and parents.

Taking into account that the social security system pays the costs of all dental treatments and preventive measures including fissure sealing for all the children living in Germany[18], and that the nonmigrant children came also from low socio-economic classes, differences in dental health observed are considerable. This proves that immigration still plays an important negative role in oral health provision. Dissimilar social values, low educational level, integration problems, inappropriate oral health skills, poor oral health knowledge, and difficulties in getting dental information are for sure the major problems confronting the immigrants and resulting in a poorer oral health[19–22].

In fact, dietary habits without concern to oral health, shift to western cariogenic meals, and higher levels in sugar consumption are the main reasons for the increased caries prevalence in immigrants and minorities[5,11,22]. In addition, immigrant parents' start brushing their children's teeth at an older child age compared to native parents, and they stop helping their children cleaning their teeth at a younger age. Later, they seldom control and remind their children of tooth brushing. As a

result, the children brush their teeth irregularly and less effectively[4,5,11,17,21]. Other adjuvants like the intake of fluoride tablets at a young age, and the use of dental floss at an older age were also rarely recorded in immigrant families[4,11]. Furthermore, immigrants and minorities do not visit the dentist as frequently and regularly as the nonminorities do[4,12,14]. Limitation in access to dental care can be due to many causes: language barriers, cultural issues, lack of familiarity with the healthcare system, fear of some extra cost, and low knowledge in dental health. The number of individuals seeking dental treatment for emergencies only appears to be higher in migrants[5,12,14,15].

Communication plays a key role between patients and dentists. Migrants are less likely to demand further explanation during a course of treatment. In addition, the time dentists spend for each patient from a disadvantaged group is in average lower than the time spent for other patient groups[23,24]. As a result, the patient's satisfaction with dental treatment and the trust to the dentist is lower in migrants[24]. Van Steenkiste reported in 2004 that 28.9% of respondents of a Turkish immigrant group knew about the availability of fissure sealants free of charge compared to 54.0% in a control group[24]. Our data on the use of fissure sealants are in accordance to these findings.

Even though there is an improvement of the caries incidence in general, inequalities in oral health between the immigrant and the German schoolchildren still exist and action needs to be taken quickly. The biggest part of the responsibility is undoubtedly related to the deficient oral health knowledge of the parents and the children. The immigrants have not yet been enabled to demand all preventive and therapeutic measures, which they are entitled to.

Nevertheless, many general dental practitioners might fail to offer the same care measures in quantity or in quality for immigrant and for nonmigrant children due to a lack of training in transcultural dental care. Public oral healthcare supervisors also need to develop and offer more targeted educational and preventive measures. In fact, information about dental health must not only be provided with a basic programme, but appropriate promotion campaigns seeking more specifically immigrant parents and their children must also be considered. Prevention should aim to have the same impact to the entire population; otherwise the gradient may increase, even if the overall dental health improves. The target should be therefore not only focused on the general mean level, but also on specific risk groups. A better coordination of public dental health authorities and private practitioners might be beneficial, but strict data protection legislation is an obstacle.

The present findings could be used to support in the planning of oral health programmes for children from risk groups and to establish a baseline for future oral health controls and evaluations. However, prospective longitudinal studies have also to be planned to follow the changes in caries incidence in immigrant children and to evaluate and improve new launched oral health preventive programmes.

What this paper adds

- It gives relevant information on caries experience, provided care, and unmet treatment need in 11- to 13-year-old schoolchildren with immigration background living in Germany.
- This study compared the dental health of migrant and nonmigrant schoolchildren having the same low socio-economic status ensuring that the inequalities described have to be contributed to migration as main factor.
- Germany has the largest number of immigrants in Europe. Oral health in migrants is therefore an important issue in public dental health and paediatric dentistry.

Why this paper is important to paediatric dentists

- The challenges for the oral health arising from migration point at the importance of specialized providers in paediatric dentistry despite an overall decline in dental caries.
- Public dental health programmes need to identify and target the individual risk groups with appropriate means.

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