

Oral Health Surveillance in Childhood by Family Pediatricians in the Province of Trento - North Italy. Limits and Perspectives

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ABSTRACT

Introduction: The prevalence of dental caries in childhood has seen a significant decrease in the last few decades. The monitoring systems allow us to know the progress of the disease over time and the other aspects that require improvement. The study reports the temporal trend of the oral health state in children residing in the province of Trento (north east Italy) and evaluated at the age of 6 years. The study also analyzes, on the birth cohort of 2011 and assessed in 2017, by family pediatricians, the association of dental caries on deciduous teeth with socio-demographic factors.

Materials and Methods: The source of the data is represented by the forms filled by the family pediatricians on the occasion of the 6-year health assessment. Since the birth cohort of 2008, family pediatricians have been involved in the surveillance of oral health in childhood. On this basis, the trend of the prevalence of free caries and the trend of oral hygiene procedures followed by children over time have been calculated. The factors associated with the risk of decay of deciduous teeth have been analyzed with a multiple analysis according to the logistic model. Mother-related variables were retrieved using the Birth Assistance Certificate archive.

Results: There is a progressive increase in the proportion of caries-free children which is statistically significant. The prevalence at 2017 is 77%, higher in Italian than in foreign children. The proportion of children with optimal oral hygiene practice increased statistically significantly. The proportion of children who underwent fluoride prophylaxis within the age of 6 has been statistically significantly reduced. The proportion of children with at least one access to the dentist within the age of 6 recorded an increase in an initial period. The accesses for sealing the first molars have also increased over time with a statistically significant trend. Differences remain between Italians and foreigners. The presence of a mother of foreign nationality, a mother aged 24 or younger and a sub-optimal practice of oral hygiene are independent risk factors for the onset of decay of deciduous teeth at the age of 6.

Discussion: Family pediatricians can contribute to oral health surveillance in childhood. Family pediatricians can also play an important role, considering that he comes into contact with the child and his family from birth to puberty. It is necessary however integrate this professional into the network of local health services.

A revisit of the provincial program for the oral health promotion in childhood would seem necessary, improving the relations with schools and the interventions to the most vulnerable groups such as foreigners Women of childbearing age and during pregnancy should also receive special care, considering that the mother's lifestyle can have significant impact on the health and behavior of the child.

Keywords

Oral health, Childhood, Family Pediatrician, Risk factor, Health Promotion.

Introduction

The prevalence of dental caries in childhood has seen a significant decrease in the last few decades [1,2]. This decrease has been possible by health promotion initiatives in school communities and in the general population and by the application of evidence based preventive protocols [3-5]. The widespread use of fluoridated toothpastes has also provided a significant contribution [6,7]. Despite this decrease, dental caries remains one of the most common chronic childhood diseases. Worldwide, 60–90% of school children have dental cavities and in the light of changing living conditions and dietary habits, the incidence of dental caries will also increase in many of the developing countries [8,9]. Tooth decay is a multifactorial pathological process, where personal behaviors relating to oral hygiene and nutrition albeit modifiable play an important role [6,10]. However, this condition tends to manifest itself more frequently in subjects belonging to weaker socio-economic groups in which adherence to correct lifestyles or access to dental services is difficult [6,10,11-14].

The implementation of monitoring systems of the oral health in childhood is therefore important as it represents a necessary tool, on the one hand to monitor the progress of the disease over time and on the other to evaluate the effectiveness of prevention programs which, if well planned and conducted, should help to reduce the impact of social inequalities on health and in particular on oral health [4,5]. In the province of Trento (540,000 inhabitants as of 1.1.2019, north east Italy), a global promotion program for oral health in childhood has been activated since 1998 [15]. This program has been adapted over time to make it consistent with the Italian national guidelines on the promotion of oral health in childhood that saw the light in 2010 and had a first update in 2013 [16]. The subjects involved, as well as the children and their families, were, with an action of awareness and training, the schools and family pediatricians and with organizational interventions, the public dentistry services. In the context of the program, the activation of periodic monitoring of the oral health state, focused on 6 and 12 year old subjects was envisaged. The methods of monitoring refer to the WHO basic methods [17]. The actors involved in the evaluation of children and in the data collection have changed over time. Since the birth cohort of 2008, the evaluation of oral health in childhood has been carried out in the province of Trento on the basis of health surveillance provided by family pediatricians. The study reports the temporal trend of the oral health status in children residing in the province of Trento and assessed at the age of 6 by family pediatricians. These data are compared with those recorded when the program was launched in 1998. The study also analyzes, on the birth cohort of 2011 and assessed in 2017, the current prevalence of dental caries on deciduous teeth and the associated socio-demographic factors. The data reported by our study may be also useful in evaluating the results of the provincial program for the promotion of oral health in the age 0-14, after 20 years from its activation.

Materials and Methods

Family pediatricians represent a typical healthcare professional of the National Health Service in Italy. They are professionals that work in the community, with a reference of about 1,000 children aged between 0-14 years, providing care and prevention services on an outpatient and home basis. About 70 family pediatricians currently operate in the province of Trento. This professionals must also ensure, in accordance with Italian law, a surveillance over time of the global health of the children, also with reference to the provisions of the personal pediatric booklet that is delivered to the family at birth or at a later age, in the case of example in which a child moves to the province of Trento after birth outside the province. For the health surveillance some health checks at filter ages are provided from 0 to 14 years, whose chronology is shown in Table 1. At the health assessments of the 12th month, the 6th year and the 13th year, the family pediatrician must also fill in a paper form and send it to the competent health district which will record the data in a specific database. The recorded data are then made available to the Clinical and Evaluative Epidemiology Service for the analysis and the dissemination of the results. At the age of 6 and 13, the evaluation forms provide, starting from the birth cohort of 2008, also the collection of a series of variables aimed at assessing the state of oral health. The variables to be collected are represented in tab. 2 and refer, albeit a concise way, to the WHO basic oral health assessment sheet [17]. Based on the data recorded over time, the oral hygiene profile and the trend in the proportion of caries-free children at the age of 6 years, in the period 2014-2017, are reported. The data collected at the start of the program in 1998 are also reported. The significance of the temporal trends has been evaluated according to the Cochrane-Armitage criterion. The significance of the differences between the subpopulations compared was analyzed using the Chi-squared test. The factors associated with the presence of caries in deciduous teeth were analyzed, in the 2011 birth cohort, by means of a multiple analysis, using the logistic regression model in which the explanatory variables were, as for children: gestational age, gender, weight status at the 6-year visit, usual level of oral hygiene and as for the mothers: age range at birth, nationality (Italian vs. other), education level, smoking in pregnancy, residence (urban vs. rural). The variables relating to the mother have been retrieved through a record-linkage with the database of the Birth Assistance Certificate (BAC) related to 2011 birth cohort.

The following variables were used as connecting keys between the two archives, the 6-year pediatric card database and the BAC database: date of birth, gender, surname of the child, municipality of residence, number of the pediatric booklet. The latter is reported both in the BAC and in the corresponding personal pediatric booklet. Cases not linked directly were retrieved through a manual link. In Italy, the BAC is a mandatory document that every maternity unit must use to register the birth and monitor pregnancy, birth and newborn health [18]. Prevalence estimates and adjusted odds ratios are provided by 95% confidence intervals.

Table 1: Province of Trento. Chronology of health checks provided by family pediatricians for the periodic assessment of child health status.

Age	Health Check	Filling in the form
1th month		
3th month		
6th month		
12th month		x
24th month		
3th year		
6th year		x
9th year		
13th year		x

Results

The average annual number of children evaluated at the age of 6 in the period 2014-2017 by family pediatricians 13,393 (3,348 per year). The average coverage of the 6-year survey with respect to live births resident in the province of Trento is 65%. The number of the 2011 birth cohort evaluated by family pediatricians in 2017 consists of 3,505 subjects (1,787 males and 1,718 females) for an average coverage with respect to live births of 2011 equals to 67%; coverage is higher in children with an Italian mother than in children with a foreign mother and it is respectively 69% and 39%. 29% of children has been evaluated before their 6th year birthday, on average 32 days before, 1% has been evaluated exactly on their 6th year birthday, 70% after their 6th year birthday, on average 40 days later. 7.3% were born preterm and/or of low weight, 23.7% are overweight (20.7% male, 26.8% female), 7.4% obese (7.3% male, 7.5% female). The time course shows a progressive increase in the proportion of caries-free children which is statistically significant, both with respect to the program startup period (p trend 0.0001), and with respect to the start of surveillance by the family pediatricians (p trend 0,001). The prevalence of caries free in the last three years has been however substantially stable (Figure 1). The prevalence of caries free at 6 years, in the 2011 birth cohort, is 77.0% (CI 76, 5-78.5). The prevalence is slightly higher in females (77.5, CI 76.1-78.9) than in males (76.5, CI 75.1-77.9). The prevalence is higher in children with an Italian mother (78.3, CI 77.5-79.1) than in children with a foreign mother (69.0, CI 64.4-73.6) with a statistically significant difference ($p < 0,001$) (Table 2).

By calendar year

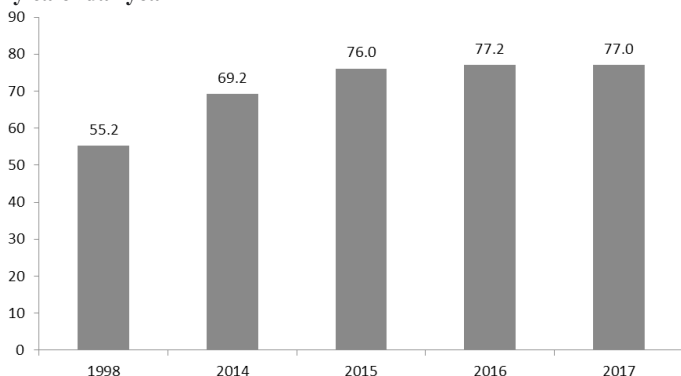


Figure 1: Trento Province. Proportion of children free from caries to deciduous teeth at the age of 6.

Table 2: Province of Trento. Variables on oral health collected by family pediatricians at the 6 years health check.

Oral Health			
Dental visit before the age of 6	[yes] [no]	[] for prevention	[] for treatment
Malocclusions	[yes] [no]	Orthodontic treatment	[yes] [no]
Deciduous caries	[yes] [no]	Teeth brushing twice a day	[yes] [no]
Permanent caries	[yes] [no]	Permanent teeth sealings	[yes] [no]
Fluoride prophylaxis	[yes] [no]	Fluoride prophylaxis for years	_____

Among children of foreign mothers, the prevalence of caries-free appears particularly lower among families from Eastern Europe. The prevalence of caries free also presents a significant variability amongst individual family pediatricians with a range between 35 and 85%. Considering various aspects that make up the oral hygiene profile, we obtain for the corresponding years, the values shown in Table 3. The proportion of children who underwent fluoride prophylaxis within the age of 6 has been statistically significantly reduced ($p < 0.001$), also due to the discontinuation by schools and local health services of the active supply of fluorine. The proportion of children with optimal oral hygiene practice (brushing teeth twice a day at least) increased statistically significantly ($p < 0.001$). The proportion of children with at least one access to the dentist within the age of 6 recorded a small increase partly explained by the economic and financial crisis of 2010-11 years making more difficult for families the access dental care. The accesses for sealing the first molars have also increased over time with a statistically significant trend ($p < 0,0001$). The oral health procedures ascertained in the subjects of the 2011 birth cohort, according to the citizenship of the mother, are represented in table 4. It shows a difficulty in accessing fluoride prophylaxis and dental services in foreign children. The multiple analyses aimed to verify the level of association of a series of variables with the risk of caries in deciduous teeth was performed on 2,872 subjects of 2011 birth cohort with valid data. Compared to the initial number of 3.505 cases, for 332 subjects there were no data relating to the birth and/or the mother since they were born outside the province of Trento for which a BAC was not available, a further 301 subjects were excluded from the dataset due to data missing. The presence of a mother of foreign nationality, a mother aged 24 or younger and not practicing optimal oral hygiene constitute independent risk factors for the risk of decay of deciduous teeth at the age of 6. We do not find differences in relation to the gender of the children, the state of birth at term or preterm and the weight status at 6 years. Smoking in pregnancy may play an effect even if it is not statistically significant. There is no clear association with the mother's educational qualification or urban/rural place of residence (Table 5).

Discussion

The health surveillance activity in childhood supported by family pediatricians fulfills an important task, even though it is not very developed in Italy considering that the data collected at the 12th month, 6th and 13th year health checks are valued, as well as the province of Trento, only in the Emilia Romagna Region. This makes difficult to compare our results with those of other Italian

Table 3: Province of Trento. Oral Health Procedures in 6 years old children. Period 1998-2017.

Calendar year	% children who underwent systemic fluoride prophylaxis within 6 years	% children with optimal level of oral hygiene (brushing teeth twice / day)	% children with at least one dental visit before the age of 6	% children with sealing of the first molars
1998	63.0	36.4	48.0	15.0
2014	33.7	70.0	49.7	35.4
2015	31.0	76.1	50.4	40.0
2016	30.4	77.7	51.3	45.2
2017	27.0	77.5	53.2	55.0

Table 4: Province of Trento. Oral health procedures in the 2011 birth cohort. Proportion by citizenship of mothers and 95% CI.

Oral health procedures	Italians	Foreigners
% children with at least one dental visit before the age of 6	60.0 (59.1-60.9)	48.4 (43.0-53.0)
% children who underwent systemic fluoride prophylaxis within 6 years	28.7 (27.7-29.7)	21.0 (16.2-26.4)
% children with optimal level of oral hygiene (brushing teeth twice/day)	77.0 (76.2-77.8)	78.0 (73.5-81.6)
% children with sealing of the first molars	60.2 (59.1-61.1)	43.1 (38.1-48.3)

Table 5: Factors associated with deciduous teeth caries at 6 years. Adjusted Odds ratios (95%CI).

Parameters	Odds Ratio	95% C.I.		p-Value
Females vs. Males	1.03	0.86	1.23	0.69
Preterm births vs. term born	0.89	0.62	1.26	0.51
overweight / obese vs. normal weight	0.97	0.80	1.18	0.79
Oral hygiene <2 times / day vs. at least 2 times / day	1.84	1.48	2.29	0.00
Maternal age <= 24 y vs. 30-34 y	1.43	1.03	1.97	0.03
Maternal age 25-29 y vs. 30-34 y	1.09	0.85	1.40	0.47
Maternal age 35+ y vs. 30-34 y	1.02	0.83	1.26	0.81
Smoking in pregnancy versus non-smoking in pregnancy	1.19	0.82	1.74	0.34
Foreign mothers vs. Italian mothers	1.69	1.23	2.31	0.00
Rural vs. urban residence	1.16	0.95	1.42	0.33
High school towards graduation	1.08	0.81	1.41	0.28
Middle school or lower vs. Graduation	1.19	0.95	1.54	0.12

regions or other European countries. Another limitation in the use and interpretation of the data provided by family pediatricians is represented by the fact that access to the planned health assessment is not mandatory but associated with the availability and sensitivity of the family. This can lead to differentiated access, linked to the social stratification of families. In the 2011 birth cohort, for example, the proportion of foreigners evaluated was 10%, a much lower value than the proportion of those born with a foreign mother, equal to 21%. This selection bias can cause a possible information bias with a potentially negative impact on prevalence estimates. It would be advisable to have an active call system on the occasion of health assessments at filter age by family pediatricians. This could contribute to increasing the coverage of the population assessed and the goodness of prevalence estimates. It should also be keep in mind that health surveillance carried out through family pediatricians, while important in itself, does not lend itself directly to carrying out evaluative or planned studies.

The high variability in the prevalence of caries free estimate among individual family pediatricians should be noted. With these limitations in mind, we believe that family pediatricians can provide an important contribution in the surveillance of oral health in childhood and that our experience provides information that can be considered useful. A reduction in the prevalence of dental caries in childhood, in particular in 6-year-old subjects, is confirmed also in the province of Trento, as in other national and international realities. The proportion of caries free of deciduous teeth in the province of Trento, relating to 2017, substantially coincides with what is reported by local or multi centric Italian surveys in recent years, albeit relating to children evaluated at different years, especially at 4 years of age, a reference considered today more suitable, together with that relating to 12 years [19-23]. Overall, we are still far from the caries free target indicated by the WHO for the age of 6 by 2020 which is 90% [9]. Over time, there has been an increase in the proportion of children who perform optimal oral hygiene, without significant differences in relation to gender or citizenship. This is contrasted by a reduction in the practice of fluoride prophylaxis, whose efficacy in promoting oral health is well documented whether it is delivered in a systemic or not [24,25]. This reduction can be explained by the absence, from 2011, of the active offer by schools and local health services of fluoride tablets and which has not been replaced by family practice. The practice of systemic fluoride prophylaxis up to the age of 6 would also be justified by the lack of fluoride in the drinking water of the province of Trento. The average concentration of fluoride in drinking water is in fact, on the whole of the province of Trento, less than 0.03 ppm /l. The maintenance of systemic fluoride prophylaxis could be useful to reduce possible inequalities, linked for example to citizenship. In fact, the practice in the 2011 cohort was reduced more in foreigners than in Italians. Access to dental services, despite having been negatively affected by the economic and financial crisis of 2010-2011, presents satisfactory aspect overall, even if it confirms the differences between Italian and foreign citizen. The diversity of access to prevention and treatment services in relation to the different ethnic group is widely reported in the literature [11-13,26,27].

Multiple analysis highlights the importance, as a risk factor, of being a foreign citizen, as well as the role of poor oral hygiene [5,6,10]. An effect linked to the mother emerges, not so much associated to the education level, even if the risk increases as the education level of the mother decreases, but above all to the age. In fact, being a young mother is associated with a greater risk of decay in the deciduous teeth of their children at the age of 6. It could be

argued that this can be ensured to a deficiency in parenting skills in younger women. Alternatively, this could be associated with a drop in interest about the oral health issue which has occurred in schools and in the general population of the Trento province in the last decade. This has affected the entire territory of our province, considering that there are no differences in relation to the various territorial areas. There is a small effect linked to smoking in pregnancy even if it does not appear statistically significant. This aspect could be better evaluated considering the exposure to environmental smoke in the first years of the child's life [28,29].

Our data do not confirm the associations with the gestational age and birth weight of the child, nor with the BMI calculated at the 6-year assessment [30-34]. Possible selection biases related to the 6-year series may be involved. A revisit of the provincial program for the oral health promotion in childhood would seem necessary, improving the relations with schools, reconsidering the practice of fluoride prophylaxis and the interventions to the most vulnerable groups such as foreigners [35,36]. Women of childbearing age and during pregnancy should receive special care, considering that the mother's lifestyle can have significant impact on the health and behavior of the child. On the other hand dental care during pregnancy is safe and recommended and can also reduce maternal *Streptococcus mutans* levels [37-39]. Family pediatrician can play, in the context of an oral health promotion program, an important role, considering that he comes into contact with the child and his family from birth to puberty [40].

This professional can act as an informative and educational multiplier, can identify in advance the subjects at greatest risk of caries and also facilitate taking charge by community dental service [41]. Oral health surveillance in childhood by the family pediatrician can be convenient but it is however necessary to improve his knowledge and skills with respect to oral health in childhood and to integrate this professional into the network of local health services. All of this can help to mitigate the impact of social inequalities on health and in particular on oral health in childhood [42]. Promoting oral health in childhood means laying the foundations for maintaining oral health in adulthood [43,44] with the benefit of reducing the costs of dental care by families and by health services and improving quality of life too [45].

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