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Research Article

Prevalence of Caries among Spanish Born and Immigrant Pediatric Population

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Abstract

The World Health Organization (WHO) has defined dental caries as a localized infectious process of multifactorial origin with high prevalence worldwide, but this prevalence depends on many factors, among which is the geographical origin specifically of children. The purpose of this study was to investigate the prevalence of dental caries in a Spanish and immigrants pediatric population in an independent not-profit foundation in Madrid, Spain (Odontología Solidaria), using a descriptive, cross-sectional, prospective, and correlational design. The sample consisted of 68 children and adolescents between 3 and 15 years old, male, and female, who attended a Odontología Solidaria Foundation in Madrid, Spain. The inclusion criterion consisted of having attended the Odontología Solidaria Foundation in Madrid, Spain between the months of January and July of 2022. Self-administered questionnaire and dental clinical examination were performed to obtain information about oral dental caries and ethnic background. The data is recorded in individual files and input into a database developed in the SPSS program. Spearman's correlation was carried out with a level of statistical significance p: <0.05. The total sample, 97.05% showed caries with a higher prevalence in males, aged between 3 and 6 years with 50%, that is, that the highest prevalence was the ECC. Regarding caries indexes, the dmft/DMFT was higher in the age group of 10 to 15 years and dmf-t/DMF-T in the age group of 3 to 6 years due to the presence of ECC. Although it is descriptively shown that children born outside of Spain but who have migrated to this country have a higher prevalence of caries, the calculation of the correlation using Spearman's statistical test showed an inverse, moderated between gender and the dmft/DMFT : likewise, between the dmf-t/DMF-T with the age group in a negative and significant way; that is, the older the child, the lower their dmf-t/DMF-T index, since the primary teeth exfoliate as age increases. The country of origin did not correlate with any of the variables evaluated. Conclusions: This study showed that the prevalence of caries was increased in the sample and mainly in children between 3 and 6 years old, which is where early childhood caries (ECC) were found, which is why these children constitute a problem of Public Health. Children and adolescents from America showed the highest value of dmf-t/DMF-T, meaning that they presented a higher proportion of early childhood caries (ECC), while the dmft/DMFT index had the highest average in immigrants from other countries.

Keywords: Caries; Prevalence; Geographical Origin; Age; Sex

Introduction

Caries is one of the most common diseases in humans. According to the World Health Organization (WHO) in 2019 [1], oral diseases, including caries, affected more than 3.500 million people worldwide. In other words, about 50% of the world's population suffers from oral health problems and "during the last three decades, the global prevalence of dental caries, periodontal diseases and tooth loss has remained at 45%, whichrepresents a higher prevalen-

ce to that of any non-communicable disease" [2], therefore, dental caries is a publichealth problem.

Likewise, Castro Reino insists that tooth decay is "the most common childhood disease", being 5 timesmore common than asthma, 7 times more frequent than hay fever, 4 times the number of cases of childhood obesity and 20 times more prevalent than diabetes. In total, 7.5 million hours of school are lost due to caries, even though for every euro invested in prevention, 20 euros of treatment are saved, according to data from dentists [3,4].

According to the WHO in 2018, it states that with regards to children and adolescents, between 60 and90% are affected by caries and with respect to early childhood caries (ECC), defined as a pathology that if compared to children over six years of age, develops rapidly compared to permanent teeth due to the composition and structure of this type of teeth. Additionally, it has a prevalence that can reach up to 90% in highly vulnerable populations [5].

Dental caries is a biofilm-mediated, diet modulated, multifactorial, non-communicable, dynamic disease resulting in a net mineral loss of dental hard tissues, characterized by the gradual destruction of its calcified tissues as a result of the bacterial action of different types of microorganisms on the substrates that make up dental plaque, which accumulates on the tooth surface; although there is an association with various factors of the economic, cultural, and social structure, as well as educational level, among others [6]. In fact, theeconomic, social, and demographic situation of the family determines the care that children usually receive in terms of oral health risks. This family situation varies depending on whether we are dealing with a developed country or not [6,7]. All these factors mentioned are cited as barriers to treatment [8].

Migration and dental caries in children and adolescents

Migration is a growing phenomenon worldwide that generally occurs from underdeveloped to developed countries [9], and the fact that Spain is a very attractive country for immigrants receives people fromdifferent continents such as Africa, Asia, and Latin America among others [9]. However, the people who migratebring life habits, beliefs, and knowledge about the oral health of the family and therefore of their children determining elements for the establishment of preventive behaviors with respect to dental caries [9], among which are eating habits that vary considerably from one society to another, as well as the habit of having good oral health [9-11]. Additionally, in the health system, oral diseases are one of the most frequent causes of consultation of immigrants in receiving countries [7].

A study published in 2022 reported that immigration status/ethnic disparities in dental caries are important. In fact, when comparing the Spanish Gypsy and Romanian ethnic groups, researchers found that these variables (immigration status and social inequalities) affected the caries results, both in primary and permanent teeth. Thus, the results showed that Gypsy children and Spanish immigrant children had a higher probability caries in primary and secondary school and caries in primary and permanent teeth with a the dmft/DMFT index ≥ 1 [12].

Another research conducted by Portero de la Cruz and Cebrino, 2020 [13], showed a prevalence of caries in Spanish children of 9.29% compared to 18.58% in immigrants. On the other hand, in Italy, in the year2022, the data obtained in a study showed how in preschool age, dental caries is an unresolved public health issue, mainly in those with a non-European background [12]. Castro, in 2019 reported that foreigners have twice as many dental caries as their Spanish counterparts [3].

Epidemiology of dental caries

In 2019, the Global Burden of Disease Study reported that more than 520 million children in the worldhad dental caries in their primary teeth with loss of dental units or filling of others, in children under six yearsof age, also known as early childhood caries (ECC) [14]. The American Academy of Pediatric Dentistry (2021)reports prevalence of 1% to 12% in developed countries, and up to 70% in underdeveloped countries and in populations with social risk [4]. ECC has an impact on eating patterns, making chewing difficult and can cause growth deficiencies [11]. Regarding permanent teeth, 2 billion people suffer with caries, which represents an economic burden for the family and society [15].

In Spain, it is estimated that some 33 million Spaniards have caries. As for adolescents, 30% have cavities and in relation to children under 6 years of age who have ECC, their percentage reaches 31%. Meaningthat, 7 million primary teeth have ECC. In these children and adolescents, the socioeconomic incidence is important, since low-level preschools present this pathology up to four

times more [4]. Furthermore, between 80 and 90% of this caries have not received the necessary treatment [2].

According to the Oral Health Survey in Spain (2020), the percentage of caries in children between 5 and 6 years old with deciduous dentition corresponded to 35.5%, while, in this same age range, the percentageof permanent teeth with caries was 1.3%. In addition to this, 28.6% of 12-year-old children presented with caries, and in 15-year-old adolescents, 35.5% of them had caries [16].

In addition to age, in this survey, caries was associated with variables such as sex, country of origin of the child and adolescent (Spain/foreign), observing that caries in girls between 5 and 6 years old was higher with 53.4%, while at age 12, the highest percentage was in males with 50.9%; meanwhile, those who were 15 years old also showed a caries prevalence higher than 50.9%; however, this was regarding females. Regardingthe country of birth variable, it is observed that there are differences with higher rates of caries in those born abroad vs those born in Spain (44% vs 26.7%, respectively) [16].

In this sense, the objective of this study was to determine the prevalence of early childhood caries (ECC) in a group of Spanish and immigrant children and adolescents who attended an independent charity (not-profit) foundation in Madrid, Spain in the period January-July 2022.

Materials and Methods

Study design and frameworks

It was a descriptive, cross-sectional, prospective, and correlational study.

Study setting and population

The sample consisted of 68 children and adolescents between the ages of 3 and 15, male and female, who attended a dental office in Madrid, Spain: *Odontología Solidaria Foundation.* The inclusion criterion consisted of having attended the *Odontología Solidaria Foundation* in Madrid, Spain between the months of January and July of 2022.

Data collection and tool

For this study, all the medical records of the children who were examined between the months of January and July 2022 were reviewed. The variables evaluated, in addition to the presence of caries, were the sex, age, and country of origin of the children (born in Spain and immigrants). To calculate the caries indexes, the dmf-t/DMF-T and the dmft/DMFT indexes were used.

Data analysis

The main variable studied is the presence of caries. The data is recorded in individual files and input into a database developed in the SPSS program, where the descriptive analysis of these is carried out and for the data analysis, descriptive statistics and Spearman's correlation were carried out with a level of statistical significance p: < 0.05.

Ethical considerations

Written informed consent was obtained from parents of all learners and from learners aged 18 years and above, while leaners below 18 years gave assent.

Results

The results presented are reported below. Only two of the children examined did not present caries, meaning that, 97.05% of the sample showed evidence of caries. And of all the children evaluated, much of the sample consisted of boys (63.2%) and 36.8%, girls (Figure 1).

Figure 1: Frequency distribution of the studied sample according to sex.

Figure 2: Frequency distribution of the studied sample according to age group.

This figure 2 shows that the children who attended the *Odontología Solidaria Foundation* weredistributed in the age groups as follows: 41.2% of the children were in the age group of 3 to 6 years, 42.6% were between 7 to 9 years old and 16.2% were between 10 and 15 years old.

	n	Female (%)	Male (%)
Total sample of childrenwith caries	66	37,87	62,12
3 to 6 years old (ECC)	33	45,45	54,54
7 to 9 years old	15	33,33	66,66
10 to 15 years old	18	22,22	77,77

Table 1: Frequency distribution of children with caries according to age and sex.

Here it is shown that, regarding the teeth with caries, 37.87 are female and 62.12 are male. In the representation of the age groups, 33 children from 3 to 6 years old presented early childhood caries (ECC), thisbeing a higher prevalence in boys than in girls with 54.54% and 45.45% respectively. In the age group from 7to 9 years old, 33.33% are girls and 66.66% are boys. In the age group of 10 to 15 years, 22.22% are girls and 77.77% are boys. It should be noted that the highest proportion of children with caries is located mainly in the3 to 6 age group.

This table shows that the mean value of the dmft/DMFT was higher in the 10 to 15 age group; while dmf- t/DMF-T was presented mainly in the 3 to 6 age group, which refers to ECC. The total

		n	Minimum Value	Maximum Value	C	DS
Total Sample	dmf-t/DMF-T Index	58	0.00	0.26	0.08	0.05
	dmft/DMFT Index	13	0.01	0.88	0.12	0.25
3 to 6 years old	dmf-t/DMF-T Index	28	0.01	0.26	0.11	0.05
7 to 9 years old	dmf-t/DMF-T Index	29	0.00	0.17	0.07	0.04
	dmft/DMFT Index	4	0.03	0.06	0.04	0.01
10 to 15 yearsold	dmf-t/DMF-T Index	11	0.00	0.04	0.01	0.02
	dmft/DMFT Index	8	0.01	0.88	0.17	0.30

Table 2: Minimum, maximum, and average values of dmf-t/DMF-T and the dmft/DMFT of the children and adolescents evaluated with caries.

sample and the 10 to 15age group showed similar the dmft/DMFT averages. Regarding severe early childhood caries (S-ECC), only one child was diagnosed with this.

Figure 3: Frequency distribution of the studied sample according to country of origin.

More than 50% of the children and adolescents seen at the clinic were Spanish, a quarter came from the continents, Asia, Africa, and Southeastern Europe (other countries) and 19% came from America, as shownin figure 3.

		n	Minimum Value	Maximum value	X	DS
Spain	dmf-t/DMF-T Index	37	0.00	0.17	0.08	0.05
	dmft/DMFT Index	4	0.01	0.06	0.04	0.02
America	dmf-t/DMF-T Index	13	0.00	0.26	0.10	0.07
	dmft/DMFT Index	2	0.03	0.03	0.03	0.00
Other Countries	dmf-t/DMF-T Index	18	0.00	0.19	0.06	0.05
	dmft/DMFT Index	6	0.01	0.88	0.22	0.34

Table 3: Minimum, maximum, and average values of dmf-t/DMF-T and dmft/DMFT of the children andadolescents evaluated according to the country of origin.

Spain (n: 37); America (n: 13); other countries (Asia, Africa and Southeastern Europe) (n: 18)

Here it is observed that children and adolescents with caries who are from America showed the highest value of dmf-t/DMF-T, that is, they presented a higher proportion of ECC, while the dmft/DMFT ndex had the highest average in immigrants from other countries.

This table allows us to observe that, according to Spearman's correlation, there was an inverse, moderate correlation between gender and dmft/DMFT: likewise, there was a negative and significant correlation between the dmf-t/DMF-T and the age group; that is, the older the children, the lower their dmf- t/DMF-T index, since the primary teeth exfoliate as age increases. The country of origin did not correlate with any of the evaluated variables.

Discussion

Tooth decay is a global health issue. The prevalence varies between countries [14], and according to the age of the children, finding that ECC caries lead the prevalence, showing that it occurred in 50% of children between the ages of 2 and 5 years [17]. Furthermore, Kassebaum., *et al.* [18] estimated that 10% of dental caries are not treated, which becomes a significant burden of disease [18]. In this study, the prevalence of caries wasalso high (97.05%) of these, 50% corresponded to ECC. However, in the article Kazeminia., *et al.* [11], it was reported that in the last three decades, childhood caries, especially in permanent teeth, has decreased worldwide. This is corroborated by Campus., *et al.* [15], who publish, that public health initiatives regarding prevention programs and oral health education have led to a substantial decrease in the prevalence of caries. In fact, as expressed by Campus., *et al.* [15], in western industrialized countries they have achieved the WHO's European Oral Health Objectives for 2020, whose parameter regarding dmft/DMFT in 12-year-old children should not be equal to or greater than 1.5.

		Sex	Age Group	dmf-t/ DMF-T	dmft/ DMFT	Country of Origin
Sex	Correlation Coefficient	1.000	-0.165	0.188	-0.620*	0.009
	p	.	0.178	0.124	0.032	0.939
Age Group	Correlation Coefficient	-0.165	1.000	-0.615**	0.000	0.043
	p	0.178	.	0.000	1.000	0.726
dmf-t/ DMF-T	Correlation Coefficient	0.188	-0.615**	1.000	-0.008	-0.125
	p	0.124	0.000	.	0.981	0.310
dmft/ DMFT	Correlation Coefficient	-0.620*	0.000	-0.008	1.000	0.293
	p	0.032	1.000	0.981		0.356
Country of Origin	Correlation Coefficient	0.009	0.043	-0.125	0.293	1.000
	p	0.939	0.726	0.310	0.356	

Table 4: Evaluation of correlation between gender, age group, dmf-t/DMF-T, dmft/DMFT and country of Origin.

*p: significant correlation < 0.05 **p: significant correlation < 0.01

This criterion is reflected in the Oral Health Survey in Spain (2020), in which it was determined that in12-year-old children, the mean dmft/DMFT was 0.58, while in 15-year-old adolescents, the dmft/DMFT rises to 0.94 [16]. In this regard, in said survey, the dmft/DMFT in children between 10 and 15 years old corresponded to 0.88 [16]. When comparing these values with those obtained in the present study, children from 3 to 6 years old presented a dmf-t/DMF-T (ECC) of 0.11, those from 7 to 9 years old revealed dmf-t/DMF-T values of 0.07 and a dmft/DMFT value of 0.07. And children and adolescents between 10 and 15 years old showed a

dmf-t/DMF-T score of 0.01 and a dmft/DMFT D value of 0.17. All the values obtained were lower than those of the National Oral Health Survey in Spain (2020) [16].

In addition to age, in this study caries was associated with sex, with a higher percentage of males affected by caries with 62.12%. Considering the age intervals, it is evident that in girls between 3 and 6 years old they presented an ECC percentage of 45.45%, while girls located in the 7 to 9 age group reached a percentage of 33.33 and in the 10 to 15 age group, the girls showed a value of 22.22%. In general, the highest proportion of caries occurred in the 3 to 6 age group with 54.44% in boys and 45.45% in girls. Therefore, thereis a high proportion of ECC in this sample.

When contrasting these values with the National Survey of Oral Health, it was observed that caries in girls between 5 and 6 years old was higher by 53.4%, while at the age of 12, the highest percentage was in boyswith 50.9%; meanwhile, those who were 15 years old also showed a higher caries prevalence by 50.9%, but in girls [16]. In other words, the ECC ranks first with respect to the evidence shown in said survey [16].

Now, it is important to note that the industrialized countries, representing the regions of multiculturalmigration mainly of children with their parents and even some without them, when evaluating dental caries, it is observed that they have not reached the European objectives of Oral Health of the WHO for 2020 [13]. In this regard, some studies have shown that parental immigration status and/or ethnic inequalities in dental caries are widespread and have even increased [12]. In other words, immigrant and/or ethnic minority children makeup a particularly vulnerable population group in various health indicators, including dental caries [20-22].

In the Rodriguez-Alvarez., *et al*. study [12], the prevalence of dental caries in the study population was 35.4%, with a higher burden in the Gypsy population with 20.6%. In essence, caries status was worse in gypsy and Spanish immigrant children compared to Spanish children (54.4%). Valcárcel [23], in her study found that children who arrived in Spain before the age of six, who have lived in Spain for 10 or more years and who spokea language other than Spanish at home, had a higher prevalence of caries than children born in Spain.Inequalities in caries prevalence between immigrant and native children were evident, favoring local childrenregardless of the family's socioeconomic circumstances. In regard to temporary teeth, the study reported that the proportion of Spanish children with at least one caries was 24.1%, while for Spanish gypsy and immigrant children, these proportions were of 70.6% and 42.6%, respectively [8].

Julihn., *et al.* [19], showed the association of the parent's country of origin, expressed as low, medium and high, with regards to the Human Development Index (HDI), with caries prevalence in children of immigrant families in Stockholm when evaluating the results obtained in said study which showed that the risk of caries was greater when the immigrant parents came from a middle or low country, but this also increased for high income country backgrounds, although it was greater in countries with low HDI. In other words, the study showed that the level of development of the parent's country of birth, as well as the socioeconomic position of the family in Sweden, influenced the risk of developing caries in their children.

The Oral Health Survey in Spain (2020) published a higher prevalence of caries in children born outsideof Spain [16], with higher rates of caries in those born abroad vs. those born in Spain (44% vs 26.7%, respectively). Regarding the report obtained in this study, it is evident that children and adolescents from America showed the highest value of dmf-t/DMF-T of 0.10, that is, of ECC. while the dmft/DMFT index had thehighest average in immigrants from other countries with 0.22, resulting in higher scores than those of Spanish children. Although in the results obtained, the country of origin did not correlate with any of the variables evaluated, perhaps due to the small size of the sample and the fact that the majority were Spanish. Another explanation that is that children are not taken to this health center, perhaps due to misinformation or becausethey do not give importance to oral health, especially when speaking about temporary teeth.

Additionally, the results of Portero de la Cruz., *et al*. [13] showed that there is a disparity in dental care between immigrant groups and the native Spanish groups due to cultural differences in the way families seek dental care and due to lack of information about health benefits. The fact that very few children attend the revised center can also be observed in the present study, where the population turned out to be 68 children over six months, with a majority of Spanish children represented by 54.4% while those from Asia,

Africa and Southeastern Europe represented 26.5% and those of American origin reached 19.1%.

When the dmf-t/DMF-T - dmf-t/DMF-T d and the dmft/DMFT indexes are observed by age group, in this study, it is found that in children aged 3 to 6 years, in reference to early childhood caries (ECC), their value of dmf-t/DMF-T was 0,11; while in children from 7 to 9 years old, the dmf-t/DMF-T decreased to 0.07 and the dmft/DMFT was found at 0.04 and in children and/or adolescents (between 10 and 15 years old) the dmf-t/DMF-T index was decreased to 0.01 and the the dmft/DMFT increased to 0.17. Regarding the Oral Health Survey in Spain (2020) [16], the prevalence of caries (COD/CAOD > 0), for each cohort was that the percentage of children under 5-6 years of age, who presented at least one tooth with ECC or filled, is 35.5%. At 12 and 15 years of age, the prevalence of young people with a history of caries in the permanent dentition is of 28.6% and35.5%, respectively [16].

When evaluating the correlation between gender, age group, dmf-t/DMF-T, the dmft/DMFT and country of origin, it was observed that, according to Spearman's correlation, there was an inverse, moderate correlation between gender and the dmft/DMFT: likewise, between dmf-t/DMF-T with the age group in a negative and significant way; that is, the older the child, the lower dmf-t/DMF-T index, since the primary teethexfoliate as age increases. The country of origin did not correlate with any of the variables evaluated.

Conclusions

- The prevalence of caries was high in the sample and mainly in children between 3 and 6 years old, which is where early childhood caries (ECC) were found. Thus, making these children and adolescents a publichealth issue.
- Children and adolescents from America showed the highest value of dmf-t/DMF-T, meaning that, they presented a higher proportion of early childhood caries (ECC), while t the dmft/DMFT he the dmft/DMFT indexhad the highest average in immigrants from other countries.

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