Distribution of dental caries and its association with variables of social protection in children 12 years of age in the county of Avellaneda, Province of Buenos Aires

Distribución de caries dental y asociación con variables de protección social en niños de 12 años del partido de Avellaneda, provincia de Buenos Aires

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ABSTRACT Different international organizations have indicated the need to analyze the conditions of each population in order to identify groups and individuals at risk as an operational strategy in pursuit of greater equity, efficacy and efficiency in the health system. The aim of this study was to identify differentials in the dental caries profiles of children attending public schools in the county of Avellaneda (Province of Buenos Aires, Argentina) and their association with variables of social protection. In 2014, an observational, analytical and cross-sectional study was performed with a sample of 656 students 12 years of age from 40 public schools in the 8 county districts (out of a total universe of 3580 individuals distributed in 70 schools). The dental status of 12-year-old schoolchildren living in the localities evaluated showed an unequal distribution; sub-groups with high caries prevalence, morbidity and severity were identified, requiring the targeting of health interventions. An association between untreated disease and lack of social protection was observed.
KEY WORDS Health Profile; Dental Caries; Social Determinants of Health; Social Policy; Argentina.

RESUMEN Diferentes organismos internacionales han planteado la necesidad de un análisis de las condiciones de cada población para la identificación de los grupos e individuos de riesgo como estrategia operacional en la búsqueda de una mayor equidad, eficacia y eficiencia del sistema de salud. El objetivo de este trabajo fue identificar diferenciales en los perfiles de caries dental en la población escolar del partido de Avellaneda (provincia de Buenos Aires, Argentina) y su asociación con variables de protección social. En 2014, se realizó un estudio analítico observacional de corte transversal sobre una muestra de 656 escolares de 12 años de 40 escuelas públicas de los ocho distritos del partido (universo = 3580 individuos distribuidos en 70 escuelas). El estado dentario de los escolares de 12 años en las localidades evaluadas mostró una distribución desigual, se identificaron subconjuntos poblacionales con elevada prevalencia, morbilidad y severidad de caries, que requieren focalización de las intervenciones sanitarias. Se observó asociación entre enfermedad desatendida y carencia de protección social.
PALABRAS CLAVES Perfil de Salud; Caries Dental; Determinantes Sociales de la Salud; Política Social; Argentina.

INTRODUCTION

Oral health is an important socioeconomic and behavioral indicator that may be considered when studying health care inequalities.[1] The most prevalent problem regarding oral health is dental caries, a chronic disease which is preventable, cumulative and considered to be the leading cause of pain and loss of dental pieces in its most advanced stages. The consequences of this disease have long-term effects.[2]

The global report on incidence, prevalence and years lived with disability due to diseases (acute and chronic) and lesions, based on 188 countries, shows that comorbidity has increased considerably and in absolute terms from 1990 to 2013. In 2013, dental pain due to caries in permanent dentition was found among the 12 diseases and lesions present in a number of incidental cases ranging from 100 million to 1 billion. Among the main causes associated with chronic diseases or lesions with chronic sequelae, painless dental caries in permanent dentition was one of the 8 causes that affected more than 10% of the world population. Tooth loss (from 1 to 10% prevalence) is one of the health conditions that have low global impact in terms of disability but high global impact in terms of resources and public health planning. Caries in primary teeth is one of the 17 diseases that increased their incidence in the last two decades.[3]

Several epidemiological studies suggest that the disease is not evenly distributed across the different populations. The systematic and potentially avoidable differences in populations or population groups regarding one or more aspects of health in social, economic, demographic or geographic health terms are known as health inequalities. Inequality is defined as the measurable manifestation of inequity, an intrinsic process of society,[4] which is often expressed by the differences concerning the risk of contracting a disease and dying. Almeida Filho[5] defines inequality as the difference with collective and demographic dimensions. In terms of empirical evidence, inequity can be expressed by means of indicators. According to Lopez, et al., these risks originate, in turn, in the heterogeneous life conditions that exist with respect to the access to goods and services.[6] Other researchers consider that the concept of inequality acknowledges the differences that people have regarding their access to resources, both in quality and quantity.[7] The study of these factors is important because the access to resources is related to people's living conditions.

Social inequalities during the stages of child development are one of the main factors that contribute to inequalities in adult life and, consequently, to the creation of a circle of intergenerational disadvantage. Different methods to measure inequalities have been proposed, and these require a critical analysis for their application in each particular context.

As for oral diseases, especially dental caries, social inequalities with social gradient have been detected in a concordant manner, with every used indicator and in all ages.[8] Squassi, et al., analyzed variables related to poverty and their relation with oral and dental health in both preschool and school children who reside in urban and suburban areas of Buenos Aires. These variables showed a significantly higher level of dental diseases in the socially vulnerable groups and a greater number of children at high risk with cariogenic activity was detected in neighborhoods with the highest social risk.[9] This relation was demonstrated both in developing countries and in vulnerable groups of developed countries with different health-care systems.[10,11,12,13,14,15,16] Dental caries is a tracer disease of both oral health and the social phenomenon of poverty.[17]

Poverty is widely considered as heterogeneous since it is not the same in all parts of the world, and people who suffer from this condition experience it in a different way depending on the sociocultural context to which they belong. Poverty is also multidimensional given that it involves the social, psychological, cultural, ideological, spiritual and intellectual dimensions of a human being. The groups of materially deprived

households are distinguished by the type and intensity of their lack of resources, thus there are several indicators and methods to measure poverty. To address the social component in this study, the work team has focused on two central concepts: the notion of urban poverty from Katzman's heterogeneous perspective[18] and the concept of coverage/social protection as a mechanism to cope with inequalities.[19] Katzman's approach includes social structure as an explicit element of the conceptual framework with which the phenomena of poverty are interpreted. Thus, the location of the poor within that structure varies not only depending on the depth of the gaps that separate them from other social categories in the labor market, but also on the level of segmentation in terms of the quality of all types of services and the level of residential segregation. According to this author, these considerations enable us to broaden our understanding field of the phenomena of poverty beyond the schemes that conceive it as a product of the vicissitudes of economy, or a consequence of the portfolio of household resources and its capacity to mobilize them efficiently.

Income disparities and the differences regarding labor protections and stability are also expressed by the location of social classes in the urban territory. In fact, one of the most remarkable manifestations of the reduction of the areas of informal interaction among different socioeconomic strata is the progressive polarization in the social composition of neighborhoods. The result of these processes is the increasing social isolation of the urban poor from the main currents of society. Such isolation becomes an important obstacle to the accumulation of the assets needed to stop poverty, which turns socially isolated urban poverty into the paradigmatic case of social exclusion. In short, urban poverty acknowledges the social isolation of individuals as a result of the segmentation in the labor, educational and residential fields, mutually reinforcing each other and affecting the civic, individual and collective social capital.[18]

To complement this perspective, the coverage/social protection dimension was included, which represents a way of incorporating the role of the State into the dimensions or the contributions that the State makes directly to its society by facilitating access, through social security coverage, to situations that enable people to enjoy better living conditions.[20] The systems of social protection and security coverage are mechanisms to face inequalities, whose goal is to enable people to deal with contingencies of any kind and control certain levels of risk or deprivation that are considered unacceptable in society. These systems intend to compensate for the absence or the significant reduction of earned incomes, to aid families with children and provide them with medical care, housing, drinking water and sanitation, education or social work. This assistance may involve cash or in-kind support, ranging from pensions, exemptions from costs and subsidized services. In Argentina, the organizational model between employment and social protection was related to the idea of a welfare State, which strongly emerged in several European countries in the 1950s. Among the bases that gave rise to the welfare States, people travelled the employment route and, in doing so, they got the protection they needed for facing several situations, such as disease or retirement. The condition of being the beneficiary of an *obra social* (employment-based health insurance) is an indirect indicator of formal employment. The heavy burden of informal employment reinforces the foregoing job instability, the absence of institutionality and the lack of access to technology and markets.[19] In Argentina, as in other countries of Latin America, the household social programs mostly provide noncontributory transfer incomes to poor social groups characterized by employability issues, thus becoming vulnerable and/or excluded sectors from the protection systems derived from protected employment.[21]

Regarding oral health, the "new goals for the year 2020" jointly established by the World Dental Federation (FDI), the World Health Organization (WHO) and the International

Association for Dental Research (IADR) in the year 2003 include global goals and focal point applications intending for every government or entity to conduct an initial analysis of their situation and allocate resources to establish their own, specific and real goals.[22] Alazraqui and Spinelli[23] put forward the need to generate studies about inequalities concerning micro areas (municipalities, programmatic areas and neighborhoods) which are suitable for guiding decision-making and the local working processes. One of the limitations identified by Almeida Filho in the studies on inequalities in Latin America is that only a few of those that are conducted locally include primary data.[5]

The lack of epidemiological information regarding the dental status of the population that resides in the county of Avellaneda, which was acknowledged by the team that gave rise to and carried out this investigation, is the first step to exploring the inequalities in this geographical space. Estimating the magnitude of the problem and identifying differential behaviors in the dental profile of focused groups in the county of Avellaneda intend to contribute to the appropriate decision-making for the realities of the context. Thus, the goal of this study is to identify differentials in the dental caries profiles in the school population of the county of Avellaneda (province of Buenos Aires) and its association with variables of social protection.

MATERIALS AND METHODS

An observational, analytical and cross-sectional study was conducted. The design of the study can be observed in Figure 1.

To select the sample, the following inclusion criteria were considered: 1) 12-year-olds and 2) attendance to public schools in the county of Avellaneda (the first section of Greater Buenos Aires). The age of 12 years has been established by the World Health Organization as the global age to control

dental caries in international comparisons and surveillance of disease trends, thus, students of this age were selected to participate in this study.[24] The delineation of the universe of study, which was centered on public schools, is intently focused on the social classes with less income attending these schools.

This phenomenon is what Katzman describes as an educational segmentation of the urban poor.[17]

The study universe was composed of 3580 individuals distributed in 70 public schools that were invited to participate in this study. Forty (40) public schools agreed to participate in the study, among which informed consent forms were distributed. Finally, a sample of 656 individuals of the eight districts of the locality was obtained (Table 1).

Variables and indicators

Dental status was considered the dependent variable, and the analyzed aspects were the following:

- Dental morbidity: it was characterized by the decayed, missing and filled teeth (DMFT) index with its discriminated components (the percentage of participation of each component was established in the global indicator) and the decayed, extracted and filled teeth (deft) index.[24]
- Prevalence of dental caries: percentage of affected individuals.
- Severity of caries: it was characterized by the number of caries-free individuals (DMFT + deft = 0); individuals with low caries severity (LSC) = DMFT < 3 (the cut-off point to determine low severity was established as the average of a third of the population with the lowest value of the D component of the DMFT, index score of 3); and individuals with high caries severity = DMFT > 6 (the cut-off point to determine high severity was established as the average of a third of the population with the highest value of the D component of the DMFT, index score of 6).
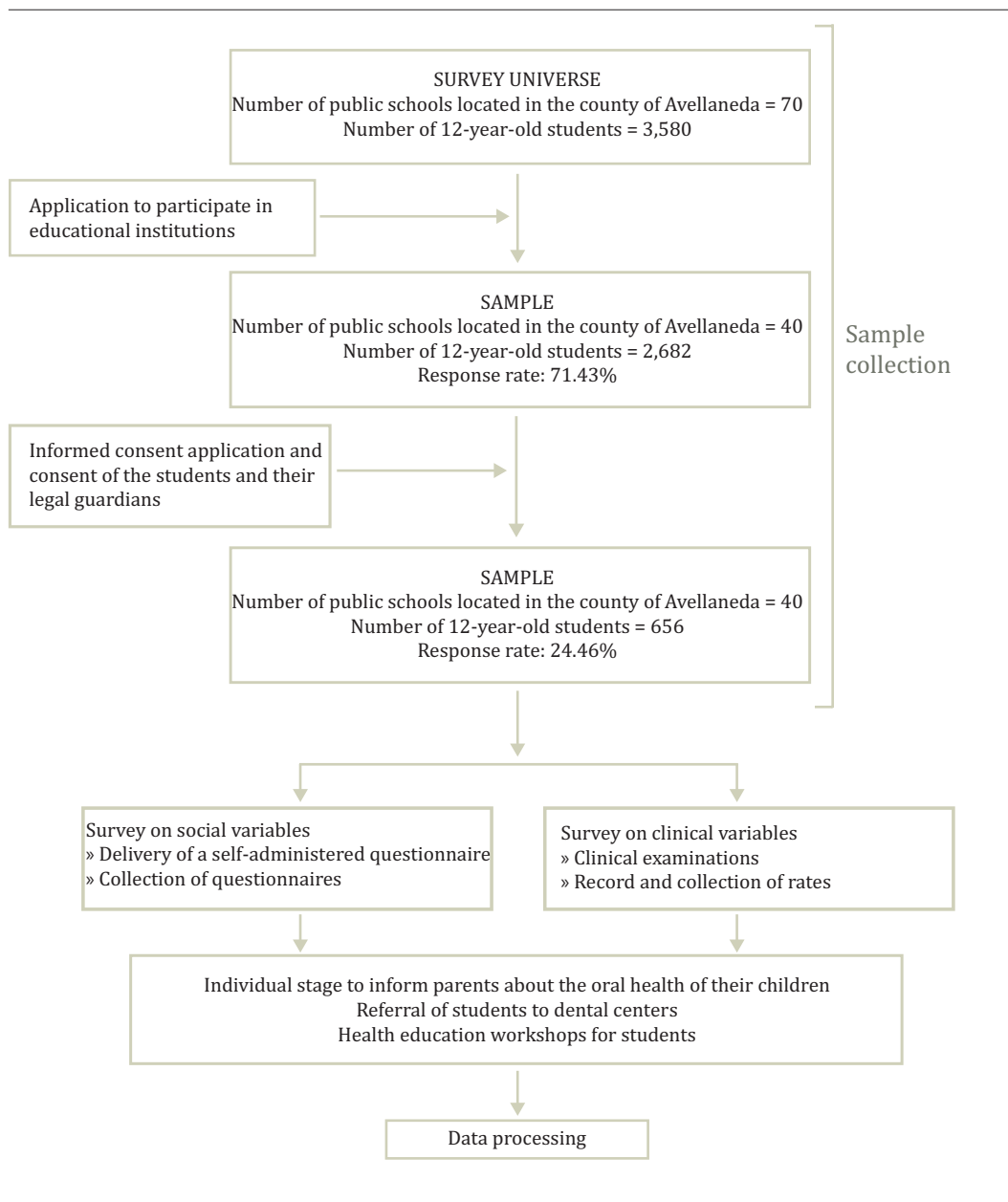
Figure 1. Steps in the sampling process and data collection.

Source: Own elaboration.

The following were considered independent variables: place (geographical) of residence, the condition of beneficiary of an *obra social* and being a beneficiary of household social programs. This selection is supported by the fact that the analysis of the variable "locality" or "district" intends to report the phenomenon of residential segmentation, whereas the analysis of being a beneficiary of an *obra social* or household social programs intends to report a combination of phenomena such as labor segmentation and coverage/social protection/social security coverage as State mechanisms that enable us to face inequalities.[17,18,19]

Methods of data collection

Clinical diagnoses for determining the levels of dental caries were conducted in the educational institutions, more precisely, in well-lit classrooms that were prepared for such purpose.

The visual-tactile method was used for the diagnosis of caries in accordance with the criteria proposed by the WHO for the development of epidemiological studies.[25] Based on the obtained data, the DMFT and deft indexes along with their individually differentiated components were calculated in accordance with the criteria proposed by Klein, Palmer and Knutson that were published by the WHO[26] in 1997.

Each student was examined while lying down (dorsal decubitus position), with a plane mirror and a dental explorer No. 5, under natural lighting and flashlights. The tooth surfaces were kept dry using rubber pipettes and relative isolation. Before the medical examination and to remove the dental biofilm (a precondition for the medical examination), instructions for the oral hygiene technique were provided individually, followed by a supervised tooth brushing using new toothbrushes that were provided for that purpose.

The examiners were four professors of the Preventive and Community Dentistry course in the School of Dentistry at Universidad de Buenos Aires, who, in turn, were part of the permanent staff of the Municipal Institute of Pediatric Dentistry of Avellaneda (IMODI) [*Instituto Municipal de Odontología Infantil de Avellaneda*] and were calibrated to a gold standard examiner until they reached interrater reliability with Kappa coefficient ≥ 0.8. These professors were assisted by 6th year students of the Preventive and Community Dentistry course in the School of Dentistry at Universidad de Buenos Aires. These students were trained and supervised by their professors.

The examiners were randomly assigned to each locality and data were collected during the period from March to November of the years 2014 and 2015. Data about coverage/social protection were obtained from primary sources through the implementation of a self-administered questionnaire aimed at the students' families.

Table 1. Universe and sample of 12-year-old children attending public schools in the county of Avellaneda, Province of Buenos Aires, 2014-2015.

Locality	Population		Sample	
	n	%	n	%
Dock Sud	175	6.5	49	7.5
Sarandí	279	10.4	105	16.0
Gerli	280	10.4	81	12.3
Wilde	1,035	38.6	112	17.1
Villa Domínico	253	9.4	109	16.6
Piñeyro	161	6.0	126	19.2
Downtown Avellaneda	499	18.6	74	11.3
Total	2,682	100.0	656	100.0

Source: Own elaboration.

Compliance with ethical principles

Legal guardians signed informed consent certificates to authorize the participation of the schoolchildren in this study. Each schoolchild was asked to provide their formal consent to participate in the clinical interventions. Completion of the questionnaires was completely voluntary. This research project was approved by the ethics committee of Universidad de Buenos Aires (UBACYT 20020120100324BA).

Statistical processing

The descriptive statistical study included, for the numerical variables, the calculation of the arithmetic mean and standard deviation, the median, and the 25th and 75th percentiles of the total population and by localities; and, for the categorical dependent variables, the calculation of the distribution of frequencies and percentages.

The bivariate and multivariate statistical study included, for the comparison of the ANOVA quantitative variables with Welch's robust tests, the application of Games-Howell *post hoc* tests. For comparing the relationship among qualitative variables, the Chi-Square test of independence was used. For the comparison among groups, the test used was that of independent proportions approximated to the normal or binomial distribution, depending on the case, applying Bonferroni's *post hoc* correction. For the appraisal of risk, the *odds ratio* and its 95% confidence interval were applied.

In every case, the statistical tests were applied to independent samples. A level of significance of less than 5% was used to reject the null hypothesis.

RESULTS

The sample consisted of 656 12-year-old schoolchildren attending public schools in all localities of the county of Avellaneda.

The distribution of the examined subjects according to their household coverage/social protection/social security and the locality in which the school they attended is located can be observed in Table 2. In the locality of Dock Sud, the proportion of households in which schoolchildren were not covered by an *obra social* or household social programs was significantly higher than in the rest of the localities (p < 0.05). In public schools from the locality of Downtown Avellaneda, the proportion of households covered by an *obra social* but not by household social programs is significantly higher than in the rest of the localities (p < 0.05) (Table 2).

The mean of permanent caries-affected dental pieces at the age of 12 in the sample of the total numbers in Avellaneda (n = 652) showed a mean of 2.95 (median of 2), while the total number of caries-affected teeth in the same sample was of 3.5 (median of 3) (Table 3). A percentage of 53.52% [95%CI (49.95; 57.08)] of the affected pieces showed untreated disease (D component in DMFT).

The prevalence of caries in the total sample was 86%, out of which 43.6% accounted

Table 2. Distribution of 12-year-old children attending public schools in the county of Avellaneda according to social benefit, by locality. Province of Buenos Aires, 2014-2015.

Locality	With an obra social (n=341)				Without an obra social (n=293)			
	Without household social programs		With household social programs		Without household social programs		With household social programs	
	n	%	n	%	n	%	n	%
Downtown Avellaneda	17	2.7	6	0.9	49	7.7*	1	0.2
Dock Sud	30	4.7*	5	0.8	6	0.9	0	0.0
Gerli	28	4.4	10	1.6	30	4.7	9	1.4
Piñeyro	51	8.0	24	3.8	46	7.3	5	0.8
Villa Dominico	37	5.8	17	2.7	45	7.1	7	1.1
Sarandi	32	5.0	19	3.0	41	6.5	8	1.3
Wilde	42	6.6	23	3.6	46	7.3	0	0.0
Total	237	37.4	104	16.4	263	41.5	30	4.7

Source: Own elaboration. *p< 0.05 (Chi-square test and comparison of independent proportions test, applying Bonferroni's post hoc correction). No data = 22 cases (n=634).

Table 3. Measures of central tendency of caries-affected dental pieces according to morbidity in 12-year-old schoolchildren attending public schools in the county of Avellaneda, province of Buenos Aires, 2014-2015.

Dental status	Mean	Median	Standard deviation	25th percentile	25th percentile
DMFT	2.95	2	2.7	1	4
D / DMFT	2.15	1	2.6	0	3
M / DMFT	0.17	0	0.6	0	0
F / DMFT	1.17	0	2.6	0	1
deft+DMFT	3.51	3	2.9	1	5

Source: Own elaboration. No data provided = 4 cases (n=652).

for low severity cases and 13.3% for high severity cases (Table 4).

Regarding the spread of the disease by district, some significant differences were observed in terms of morbidity (Table 5) and severity (Table 6). The locality in which schoolchildren showed higher levels of caries in morbidity (mean of dental pieces affected > 6) as well as in severity (> 25%) was Dock Sud, as its population has the lowest levels of social protection. On the other hand, the schoolchildren examined in the public schools of the localities of Gerli, Sarandí and Piñeyro showed the lowest levels of prevalence (with a mean lower than 3) and severity of caries (lower than 10%).

It was noted that the condition of high severity of caries was observed in 16.2% of the schoolchildren whose households were not covered by an *obra social*, in contrast with 9.8% of the children whose households were covered by that benefit. The OR was of 1.78 [95%CI (1.11; 2.88)], that is to say, the children who are not covered by an *obra social* are almost twice as likely to experience a higher severity of caries than those who are covered.

Figure 2 shows the gap between treated caries lesions (the F component in DMFT) and untreated caries (the D component in DMFT). In the subsets of the population with fewer social protection benefits, a larger gap between decayed and filled dental pieces was.

Table 4. Prevalence of caries and distribution according to severity in 12-year-old schoolchildren attending public schools in the county of Avellaneda, province of Buenos Aires, 2014-2015.

Dental status	n	%
No caries	90	13.8
Prevalence of caries	562	86.2
Low severity	268	43.6
Medium severity	297	29.3
High severity	87	13.3

Source: Own elaboration. No data provided = 4 cases (n=652).

Table 5. Measures of central tendency and dispersion, according to dental status and locality, in schoolchildren of 12 years of age attending public schools in the county of Avellaneda, province of Buenos Aires, 2014-2015.

Locality	Dental status (DMFT+deft)					p-value*
	Mean	Median	Standard deviation	25th percentile	75th percentile	
Piñeyro	2.6	2	2.4	0	4	
Sarandí	2.9	2	2.4	1	4	
Gerli	2.9	3	2.2	1	4	
Villa Domínico	2.9	2	2.6	1	4	0.001
Downtown Avellaneda	4.0	4	2.7	2	5	
Wilde	4.7	4	3.3	2	6	
Dock Sud	6.1	5	3.7	4	9	

Source: Own elaboration. No data provided = 4 cases (n=652).

Table 6. Distribution of prevalence and severity of caries, according to locality, in 12-year-old schoolchildren, attending public schools in the county of Avellaneda, province of Buenos Aires, 2014-2015.

Locality	Severity of caries (%)				Prevalence of caries (%)
	No caries	Low Severity	Medium Severity	High severity	
Gerli	11.1	53.1	29.6	6.2	88.9
Piñeyro	27.0	42.1	23.8	7.1	73.0
Sarandi	17.1	47.6	25.7	9.5	82.9
Villa Dominico	17.4	54.1	17.4	11.0	82.6
Downtown Avellaneda	4.1	43.2	40.5	12.2	95.9
Wilde	6.3	33.9	35.7	24.1	93.8
Dock Sud	0.0	20.0	46.7	33.3	100.0
Mean	13.8	43.6	29.3	13.3	86.2

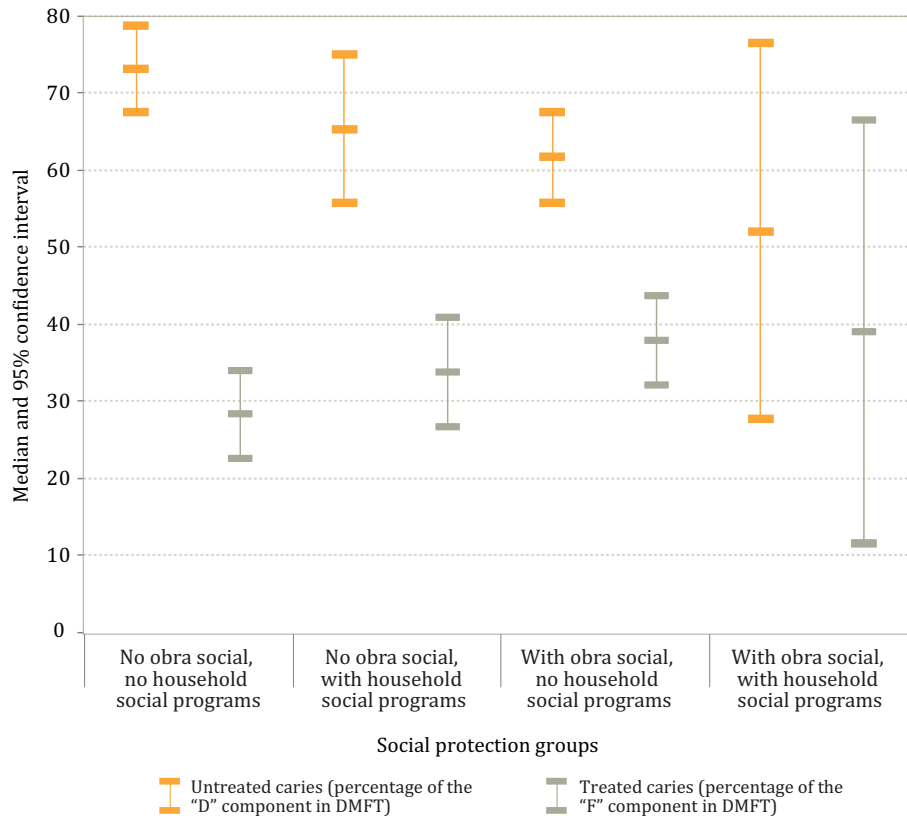Source: Own elaboration. No data provided = 4 cases (n=652).

Figure 2. Participation percentages of the "D" and "F" components in the DMFT indicator, in 12-year-old schoolchildren attending public schools in the county of Avellaneda, province of Buenos Aires, 2014-2015.

Source: Own elaboration

DISCUSSION

Through this study it was possible to characterize, on the one hand, the magnitude of dental morbidity, the prevalence and severity of caries among schoolchildren attending public schools, nearing the completion of primary education, in the county of Avellaneda (province of Buenos Aires). On the other hand, it was also possible to identify differentials in the dental profile of subsets of the population pertaining to a low-income segment, according to district and coverage/social protection benefits.

To establish the magnitude of a health problem from an epidemiological perspective, it is necessary to implement a pattern of comparison. Back in 1978, it was already established in the goals for the year 2000 that a median of 3 or less carious lesions at the age of 12 was the desirable goal.[27] In 2006, the Executive Committee of the Pan-American Health Organization proposed the following categories to establish caries profiles in that age range: *emergent* (DMFT > 5, no national salt and water fluoridation programs); *growth* (DMFT 3-5, no national salt and water fluoridation programs); *consolidation* (DMFT < 3, national salt and water fluoridation programs available).[28] From this perspective, the collected data helps us provide a frame for the caries profile of the studied global sample in the county of Avellaneda within the category of lowest level of pathology, given that the mean of DMFT observed was less

than 3 (2.95). It should be mentioned that, however, about half of the category component accounts for unattended lesions [53.52%, 95% CI (49.95%; 57.08)], which indicates an unresolved dental care need. If the epidemiological profile discriminated by localities is analyzed, the differential factors become apparent: of all the localities under study, four have higher profiles of pathology, and three in the category "*growth.*" The highest levels of prevalence, morbidity, and severity of dental caries (in the "*emergent*" category) were found in Dock Sud. Coincidentally, this locality shows the highest levels of household poverty, – according to unsatisfied basic needs (NBI) [*necesidades básicas insatisfechas*] (15.08%, entire locality 5.7%) – and the lowest levels of social protection. The NBI indicator is a direct method to assess the critical lack of resources of a population and to characterize poverty which, in general, uses indicators directly related to four aspects of basic human needs (housing, health care services, basic education, and minimum income), available in the population and housing censuses. In Argentina, it is considered that a sector of the population has NBI when it meets any of the following conditions: more than three people living in one room; dwelling in precarious houses or tenements, housing that lacks a toilet with a water flushing system; one child in the family between the ages of 6 and 12 that does not attend school.

Regarding the proportion of 12-year-old schoolchildren that are caries-free, the percentage was 13.8%, ranging from 0 to 27% depending on the locality. Piovano et al.[29] reported in a population of schoolchildren of the same age attending schools located in the City of Buenos Aires (School Districts 19, 21, 4 and 5) in districts with high density of vulnerable homes,[30] a value of 5.7% for this indicator, similar to Downtown Avellaneda and Wilde (4.1 and 6.3% respectively). The social vulnerability index (SVI) is a weighted index that assigns a score to each household according to its condition regarding a combination of characteristics. Each of the following dimensions contributes to the total score and can be subdivided according to the intensity or depth of the lack of resources: overcrowding (moderate or critical); housing material (moderate or critical deficit); dependency ratio per retiree (2 or more people in households with unemployed people); dependency ratio per working person (5 or more people in households without retirees); households that do not perceive incomes, neither from work, nor from retirement or pension.[31]

In the Latin American context, data about the distribution of dental caries shows scant systematization. In 2014, the Board of Representatives of the Pediatric Dentistry Societies [*La Mesa de Representantes de Sociedades de Odontopediatría*] of Latin America provided a summary of available data regarding the dental status of each of its countries. In this research study, we found that the prevalence of caries in schoolchildren aged 12 (86.2%, ranging from 82.9 to 100% of affected subjects) was similar to the data reported by the representatives of Peru, Paraguay, Venezuela and Mexico.[32] Regarding dental morbidity, Freire et al.[33] reported for Brazil in 2010 in a cohort of schoolchildren of 12 years of age, a mean DMFT value of 2.04 with variations in the capital cities of districts, which fluctuated between 0.77 in the south (Florianopolis) and 4.15 in the north (Porto Velho). In this research study, the data collected showed higher levels of morbidity (mean of 2.95, ranging from 2.6 and 6.1) than those of Brazil in 2010, and comparable to those of Paraguay in 2013 or Brazil in 2003.[32]

Social indicators used to identify social inequities in the epidemiological studies conducted so far have been highly variable. Health determiners related to differentials in dental profiles, which are reported in the bibliography, include socioeconomic variables such as education level, family income, and work status of family members; contextual variables such as access to the healthcare system and access to fluoridated drinking water.[34,35,36] In this research study, we have included the coverage/social protection dimension as an indirect indicator of work conditions (access to formal employment related to social protection in the form of an *obra social*) and, on the other hand, of the social

protection provided by the State as a plausible mechanism to face inequalities, in the form of household social programs. In this sense, this approach has facilitated the observation of a difference in the proportion of schoolchildren experiencing high caries severity among those whose households have the benefit of an *obra social* (associated with formal employment). The highest proportion of unattended dental lesions was concentrated in the subset without any kind of social benefit from the State. An aspect to highlight here is that the selected sample for this study was intentionally centered on the schoolchildren attending public schools, which group those segments of the population with the lowest income. Research studies conducted in Montevideo (Uruguay)[36] and Córdoba (Argentina)[37] showed differences in the dental profiles of 12-year-old schoolchildren attending public schools and private schools, with the highest levels of disease having been found in public schools. Our results evidence the heterogeneous nature of dental profiles in this segment of the population.

Among the limitations of this research study, we can mention the sampling type, which was not representative, but rather based on convenience. In this sense, some localities might have been underrepresented or vice versa.

The relevance of this type of research study lies in the fact that, by identifying the different variables concerning health in a reduced geographical space of population, it is possible to identify gaps and intervene specifically and differentially, and to monitor the changes that arise in the identified problems of each area, depending on their specific characteristics, which are reflected through the modification of health indicators. Although the data gathered in this research study are insufficient to establish inequities; we, however, consider that this study based on primary data might constitute a valuable asset for management at a local level.

In conclusion, this study has helped identify subsets of the population that exhibit high levels of prevalence, morbidity, and severity of caries, which require focalized public health interventions. An association between unattended disease and lack of social protection has been observed.

REFERENCES

1. Thomson WM. Social inequality in oral health. Community Dentistry and Oral Epidemiology. 2012;40(Suppl 2):28-32. doi: 10.1111/j.1600-0528.2012.00716.

2. Oliveira LJC, Correa MB, Nascimento GG, Goettems ML, Tarquínio SBC, Torriani DD, Demarco FF. Inequalities in oral health: are schoolchildren receiving the Bolsa Família more vulnerable? Revista de Saúde Pública. 2013;47(6):1-9.

3. Global Burden of Disease Study 2013 Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2015;386(9995):743-800. doi: 10.1016/S0140-6736(15)60692-4.

4. Breilh J. Epidemiología crítica: Ciencia emancipadora e interculturalidad. Buenos Aires: Lugar Editorial; 2003.

5. Almeida Filho N. Inequalities in health based on living conditions. Washington DC: OPS; 1999.

6. López E, Findling L, Abramzón M. Desigualdades en salud: ¿Es diferente la percepción de morbilidad de varones y mujeres? Salud Colectiva. 2006;2(1):61-74.

7. Borrell C, Benach J. Les desigualtats en la salut a Catalunya. Barcelona: Editorial Mediterrània; 2003.

8. Font-Ribera L, García-Continente X, Davó-Blanes MC, Ariza C, Díez E, García- Calvente MM, Maroto G, Suárez M, Rajmil L, Grupo de Determinantes Sociales de la Sociedad Española de Epidemiología. El estudio de las desigualdades sociales en la salud infantil y adolescente en España. Gaceta Sanitaria. 2014;28(4):316-325.

9. Squassi A, Mauro S, Mauro MJ, Sánchez G, Bordoni N. Relationship between oral health in children and poverty related factors. Acta Odontológica Latinoamericana. 2008;21(1):49-56.

10. Jones CM, Woods K, Taylor GO. Social deprivation and tooth decay in Scottish schoolchildren. Health Bulletin. 1997;55(1):11-15.

11. Vargas CM, Crall JJ, Schneider DA. Sociodemographic distribution of pediatric dental caries: NHANES III, 1988-1994. Journal of the American Dental Association. 1998;129(9):1229-1238.

12. Nainar SM. Longitudinal analysis of dental services provided to urban low-income (Medicaid) preschool children seeking initial dental care. ASDC Journal of Dentistry for Children. 1998;65(5):339-343, 355-356.

13. Sweeney PC, Nugent Z, Pitts NB. Deprivation and dental caries status of 5-year-old children in Scotland. Community Dentistry and Oral Epidemiology. 1999;27(2):152-159.

14. Tickle M, Williams M, Jenner T, Blinkhorn A. The effects of socioeconomic status and dental attendance on dental caries' experience, and treatment patterns in 5-year-old children. British Dental Journal. 1999;186(3):135-137.

15. Kuriakose S, Joseph E. Caries prevalence and its relation to socio-economic status and oral hygiene practices in 600 pre-school children of Kerala-India. Journal of the Indian Society of Pedodontics and Preventive Dentistry. 1999;17(3):97-100.

16. Prendergast MJ, Beal JF, Williams SA. The relationship between deprivation, ethnicity and dental health in 5-year-old children in Leeds, UK. Community Dental Health. 1997;14(1):18-21.

17. Bordoni N, Pistochini A, Squassi A. Epidemiología de caries dental en niños. In: Bordoni N, Castillo Mercado R. Odontología pediátrica: La salud bucal del niño y el adolescente en el mundo actual. Buenos Aires: Editorial Medica Panamericana; 2010. p. 881-892.

18. Katzman R. Seducidos y abandonados: el aislamiento social de los pobres urbanos. Revista de la CEPAL. 2001;75:171-189.

19. Repetto F, Potenza dal Masseto F. Sistemas de protección social en América Latina y Caribe (LC/W.508). Buenos Aires: CEPAL; 2012.

20. Tovar JAO. Teorías del desarrollo y el papel del Estado: Desarrollo humano y bienestar, propuesta de un indicador complementario al índice de desarrollo humano en México. Política y Gobierno. 2014;XXI(2):409-441.

21. Gentile N. Funcionamiento de los planes sociales: ¿Dan respuesta a problemas de inserción laboral o fomentan la vagancia?, un estudio exploratorio a partir de indagar en las opiniones y expresiones de quienes reciben la asistencia social del Estado [Internet]. 2013 [cited 12 Nov 2015]. Available from: http://tinyurl.com/gpuybw4.

22. Hobdell M, Petersen PE, Clarkson J, Johnson N. Global goals for oral health 2020. International Dental Journal. 2003;53:285-288.

23. Spinelli H, Alazraqui M. Abordaje conceptual de las desigualdades en salud en el nivel local/municipal. In: Alazraqui M, Spinelli H. Desigualdades en salud en el nivel local/municipal. Lanús: Ediciones de la UNLa; 2008. p. 17-32.

24. World Health Organization. Continuous improvement of oral health in the 21st. century the approach of the WHO Global Oral Health Programme. Geneva: WHO; 2003.

25. Klein H, Palmer CE, Knutson JW. Studies on dental caries: I dental status and dental needs of elementary school children. The Journal of the American Dental Association. 1938;25(10):1703-1705.

26. Organización Panamericana de la Salud. Salud oral (CD40/20) [Internet]. 1997 [cited 10 Nov 2015]. Available from: http://tinyurl.com/ztbh83y.

27. Organización Mundial de la Salud. Atención Primaria de Salud: Informe de la Conferencia Internacional sobre Atención Primaria de Salud, Alma-Ata, URSS, 6-12 de septiembre de 1978. Ginebra: OMS; 1978.

28. Organización Panamericana de la Salud, Organización Mundial de la Salud. Propuesta de Plan Regional Decenal sobre salud bucodental (CE138/14) [Internet]. 2006 [cited 10 Nov 2015]. Available from: http://tinyurl.com/za5csyd.

29. Piovano S, Bordoni N, Doño R, Argentieri A, Cohen A, Klemonskis G, Macucho Me, Pedemonte Z, Pistochini A, Squassi A. Estado dentario en niños, adolescentes y adultos de la Ciudad Autónoma de Buenos Aires. Revista de la Facultad de Odontología (UBA). 2008;23(54/55):34-42.

30. Golovanevsky L. Vulnerabilidad Social: una propuesta para su medición en Argentina. Revista de Economía y Estadística. 2007;XLV(2):53-94.

31. Con M, Susini S, Catalá S, Quinteros S. Índice de vulnerabilidad social (IVS): Documento metodológico. In: Informes temáticos de la Dirección de Investigación y Estadística del Ministerio de Educación del GCBA [Internet]. 2011 [cited 10 Nov 2015]. Available from: http://tinyurl.com/jrp26x8.

32. Paiva SM, Vidigal EA, Abanto J, Cabrera-Matta A, López-Robles RA, Masoli C, Echevarría-Lopez SA, Mongelos-de-Idoyada MG, Guerra-Gamboa ME, Amado-Schneider AR. Epidemiología de la caries dental en América Latina. Revista de Odontopediatría Latinoamericana. 2014;4(2).

33. Freire MC, Reis SC, Figueiredo N, Peres KG, Moreira RS, Antunes JL. Individual and contextual determinants of dental caries in Brazilian 12-year-olds in 2010. Revista de Saúde Pública. 2013;47(Supl 3):40-49.

34. Organización Mundial de la Salud, Comisión sobre Determinantes Sociales de la Salud. Subsanar las desigualdades en una generación [Internet]. 2008 [cited 12 Nov 2015]. Available from: http://tinyurl.com/j84jz8b.

35. Narvai PC, Frazão P, Roncalli AG, Antunes JLF. Cárie dentária no Brasil: declínio, polarização, iniqüidade e exclusão social. Revista Panamericana de Salud Pública. 2006;19(6):385-393. doi: 10.1590/S1020-49892006000600004.

36. Lorenzo S, Alvarez R. Prevalencia de caries en escolares de 12 años de diferente nivel socioeconómico, Montevideo, Uruguay, 2003. Odontoestomatología. 2009;11(13):27-36.

37. Yankilevich ERLM, Battellino L. Prevalencia de la caries dental en escolares de nivel primario de una región metropolitana de la Provincia de Córdoba, Argentina. Revista de Saúde Pública. 1992;26(6):405-413.

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