

Social disparity and oral health*

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Abstract: There is a clear reported association between social disparity and oral health, for example, between dental caries and malnutrition in children. This fact is detected in several studies, and also found amongst the Brazilian population. However, several efforts have been made to improve the quality of life of the population and to achieve the 2015 Millennium Development Goals. Oral health is a branch to be improved among these goals. The Brazilian experience has been drawing the attention of authorities, insofar as there have been direct improvements in oral health through state oral health programs, and also indirect results by improving the quality of life of the population. Included within the Brazilian oral health programs are the Family Health Program and Smiling Brazil Program. The former is a global healthcare program which involves primary oral healthcare, while the latter is a specialized oral care program. Among the social programs that would indirectly improve oral health are Family Stipend and the Edmond and Lily Safra International Institute of Neuroscience of Natal (ELS-IINN). In conclusion, although oral health problems are related to socioeconomic factors, the implementation of primary oral health programs and programs to improve the population's quality of life may directly or indirectly improve the oral health scenario. This fact is being observed in Brazil, where the oral health policies have changed, and social programs have been implemented.

Descriptors: Oral Health; Dental Caries; Malnutrition; State Dentistry.

Introduction

The 192 United Nation member states adopted a global action plan in 2000 to achieve the Millennium Development Goals by the year 2015. These include eradicating extreme poverty and hunger, achieving basic education for all, fighting epidemics such as HIV/AIDS and malaria, and developing a global partnership for development, among others.¹ According to the United Nations,¹ the effort to achieve the Millennium Development Goals relies on the support of organizations and individuals throughout civil society, faith communities, trade unions and local authorities, according to the slogan "think globally, act locally". Many of the countries that signed this document have succeeded in improving the quality of life of their deprived population. As examples, we can mention Peru, Fiji Islands, and also Brazil, noting specifically that Brazil was able to rescue over 20 million people from absolute poverty.²

Regarding healthcare, societies worldwide are facing tough challenges in terms of keeping healthcare affordable. Reasons include advances in technology, rapidly increasing healthcare costs, and changes

in demographics, resulting in changes in morbidity and mortality patterns.³ The beginning of this century evidenced instability in many social domains: economics, social life, ecological system and political domain, and also witnessed the collapse of the global economic system. The lives and health of billions are jeopardized because healthcare focuses on paying out money, while poverty-related diseases are neglected.³

Global health is emerging as an “area for study, research, and practice,” and oral health has been recognized as an important component of general health and quality of life. Therefore, both oral disease prevention and oral health promotion need to be included in chronic disease prevention and general health promotion programs.⁴

Importance of dental care for young children

Young children are a special part of the population that needs the attention of society and the government. At this age, they are still developing in body functions, ability and acquisition of fundamental knowledge, attitudes, beliefs, and behaviors. This is also an important age to establish positive health habits, and the lack of healthcare conditions can initiate chronic dysfunctions or disability. There are some social characteristics that correlate highly with young children’s health and healthcare:

- family income,
- racial and ethnic status,
- parental employment status,
- level of parental education,
- geographic location,
- family structure,
- gender,
- age,
- minority group,
- immigrant or migrant family background, and
- homeless family background.

Another group of young children who are particularly vulnerable are “children with special healthcare needs” (CSHCN), who are those with physical, mental, and emotional disabilities.⁵

Oral health and dental care are important and consequential for young children, because sound oral functions are required for effective eating, speech development, and formation of a positive self-image. Oral and dental conditions can predispose children to significant oral and systemic consequences, including dental pain, infection of oral tissues and the face, and failure-to-thrive. These consequences are exacerbated in cases of diabetes or HIV/AIDS. Dental decay in children in the US is correlated with social conditions of poor children under the age of five, who are five times more likely to present cavities than children from families with an income level 3 times greater than the poverty level. Dental caries treatment provisions are also not evenly distributed. Whereas 79% of the decayed teeth of poor 2- to 5-year-old children are unfilled, only 45% of decayed teeth are unfilled in the highest income group.⁵

Worldwide scenario and the Brazilian experience

It is believed in the US that the problem of oral health disparities and access to dental treatment will continue to worsen for young children. The reasons include barriers created by parents, providers, payers, and healthcare systems, resulting from the lack of basic infrastructure, and dysfunctional insurance programs.⁵ It seems that improving the oral health of young children entails enhancing public education regarding oral health, providing early and periodic dental care, and primary prevention. Improvements in workforce numbers, distribution, diversity, and skills are also needed.⁵ Since oral health program improvement depends on political will, it is possible that inappropriate oral healthcare provisions may worsen the oral health status disparity among different social groups.⁴

In the Philippines, the caries level is within the highest in the southeast Asian region, with a prevalence of 82% and a DMFT of 2.9 among 12-year-olds in 2006.⁶ Moreover, a significant association was detected between dental decay and low body mass index (BMI) among 12-year-old Filipino children, particularly between odontogenic infections

(caries progression into the pulp) and below normal BMI.⁷ The data of this cross-sectional study indicate that children with odontogenic infection have an increased risk of having below normal BMI, as compared to children without odontogenic infections. It was suggested that oral care should be included in the primary care package for children, as a way of enhancing their growth and improving their well-being.

This correlation is relevant insofar as over one half of the 13 million annual childhood deaths has been estimated to be associated with protein-energy malnutrition (PEM) related to deficiencies in proteins, energy foods, or both, needed by the body.⁸ Moreover, it was shown that three quarters of all these malnutrition deaths were linked to mild and moderate PEM.⁹

This relationship between dental caries and malnutrition was also reported among the Brazilian population. A study involving 1,018 urban preschool Brazilian children aged 12–59 months attending a statutory National Children's Vaccination Day¹⁰ program also detected the relation between nutritional status and dental caries. Underweight children were 5.58 times more likely to have severe early childhood caries (SECC) than children of normal weight/height. Moreover, high levels of early childhood caries (ECC) were observed in children whose parents presented less than 8 years of education.

A literature review reveals that primary dentition caries has been associated with early childhood malnutrition, especially protein-related malnutrition. However, the effect on permanent dentition caries has not yet been established and is less substantiated because of the small number of scientific studies.¹¹ Enamel hypoplasia, salivary glandular hypofunction and saliva compositional changes may be mechanisms by which malnutrition is associated with caries.¹¹

An epidemiological study conducted in 1993, held in Bauru, Brazil,¹² assessed oral conditions and treatment needs in relation to the socioeconomic conditions of 6,539 people aged 3 to 65 or more years. It showed that the income level was inversely related to the caries index in the early stages of life.

For example, 5- to 6-year-olds from the lowest income group showed a deft of 3.17, and those from the highest income group had a deft of 2.47. Children 12 years of age from the lowest income group had a DMFT of 7.0, whereas those from the highest income group had a DMFT of 4.87. The DMFT for those aged 18 from the highest income group was higher (13.0), and the main component of DMFT was fillings. On the other hand, 18-year-olds from the lowest income group presented a DMFT of 11.33, and the main component was dental decay. At later stages of life, the indexes were similar for both groups. This study clearly showed that, at early stages of life, children from higher income groups probably had better feeding and teeth-cleaning habits, in comparison with children from lower income groups, but a good preventive program was missing for both groups, since the population of both groups at later stages of life presented similar scores of missing teeth.

We believe that the population must be aware of the causes of dental caries, as well as how to prevent and control it. Only with a good government program can this ideal condition be achieved. If a well-designed and continuous government program is established, good outcomes can be expected.

The first epidemiological dental survey was held in 19 urban capitals of Brazil, at almost the same time. It showed alarming caries indexes for children at age 12. Moreover, there were contrasting results among the regions surveyed, mainly between the wealthier Southeast and the Midwest, with a DMFT of 6.0 and 8.5, respectively.¹³ This survey showed that the adopted policies were not working and that a national program necessarily followed up by a surveillance committee had to be implemented.

Another study carried out from 1996 to 2006 with non-privileged Brazilian preschool children from 1 to 5 years old¹⁴ showed that the occlusal caries lesion prevalence at age 5 in 1996 was 2.65, down to 1.25 in 2006. A reduction in the rate of caries progression was also detected. It is important to point out that this survey was conducted with children that attended nursery schools subsidized by the state government on a full-time basis, that had daily access to fluoride toothpaste from the

age of 3 years onward, and that practiced routine tooth brushing. This study reinforces the idea that isolated actions can improve the caries indexes but do not determine a caries-free population, probably because the conditions of the children living outside the nursery were different.

It has been recognized that the major challenges addressing health issues relate to how knowledge and experiences can be applied to oral disease prevention and health promotion in the form of concrete, workable action programs.⁴ Changes should also be made in the educational system to expose students from the health area to the real needs of the population, by offering them updated tools for precise diagnosis in their areas of expertise, and by improving their understanding of the best treatments that can be offered at the public health level. It is important to mention the Brazilian experience currently being implemented, known as Pro-Health: National Program for Restructuring Professional Health Education.¹⁵ To understand how the Brazilian government has been implementing this program, we have to review the country's history in previous years.

Brazil was a very unequal society in 1986, after emerging from nearly 20 years of military dictatorship. The wealthiest 10% of Brazilians held 49.5% of the national income; the poorest 10% were left with just 0.7% of the national income. At that time, Brazil had a social health insurance system that covered a minority of employed workers and excluded most citizens; the poor class of the society relied on intermittent care provision by charities. A consensus for a unified public health system was reached during the 8th National Health Conference held in Brasilia (March 1986), with the participation of nearly 5,000 people from academia, civil society and social movements, as well as activists. The decision to offer this health system was incorporated into the 1988 Constitution, leading to the creation of Brazil's unified public health system (SUS).^{16,17}

The SUS goals are to promote knowledge of health determinants, to reduce the risk of disease, to create universal and equitable access to services, and to provide integrated curative and preventive health services. Its funding depends on a complex mecha-

nism in which federal, state, and municipal revenues from taxes and intergovernmental transfers are allocated to health, social security, and social protection. SUS provides universal coverage, free of charge.¹⁷

The Program was implemented gradually, and in 1994 evolved into the Family Health Program, based on a simple model of multidisciplinary teams, comprising a doctor, nurse, nurse auxiliary, and four to six community health workers. The team works in health units set up in geographically defined areas, each covering no more than 5,000 residents. A very important aspect of this team is the presence of a community health worker who takes care of up to 120 families in his area of action and visits every household at least once a month. Community health workers are well trained to be completely integrated into the primary care team. They are multifunctional, and although the bulk of their work involves child and maternal health, they also provide curative care, conduct triage, make referrals to health units, offer health promotion for chronic diseases, and both support and encourage community participation. It is indispensable that community health workers belong and live in the same community where they work.

In 2009, 95.6 million people (52% of the population) were served by the Family Health Program. Of this total, 73.9 million lived in urban areas and 21.7 million lived in rural areas, representing a coverage of 47% for urban areas and 73% for rural areas. Coverage is highest in the poorer northeastern region, reaching 72%, and is lowest in the wealthier southeastern region, with only 36% coverage, suggesting that the program has worked best where it is most needed.

Currently, SUS offers comprehensive coverage to everyone, but is mostly used by the lower income population. However, it seems that the proportion of people enrolling in private insurance plans is falling gradually, especially those in middle income brackets. Two examples of health programs that are both universal and equitable are the HIV therapy program and the immunization program. The AIDS program within SUS combines universal free access to highly active antiretroviral treatment with

prevention campaigns. Since most private insurance providers do not cover the high cost of the antiretroviral drugs, even the middle and upper classes seek the public system, which responds effectively. The immunization program has also been successful in achieving broad coverage among all income brackets. The Family Health Program costs only US\$31.50 per capita per year.

The public health system was also restructured to include a social protection program called *Bolsa Família* (Family Stipend). Families with a monthly per capita income up to US\$83 (R\$140.00) are eligible to receive a monthly cash benefit ranging from R\$22.00 to R\$200.00. Continuous payment of the benefits is conditioned by compliance to fulfilling a basic health and education agenda. All children under 17 years of age, from participating households, must present a minimum school attendance rate of 85%. Children must receive all immunizations included in the official schedule and attend growth monitoring sessions up to 7 years of age. Pregnant or breastfeeding women must attend all scheduled prenatal and postnatal care visits. Currently, this program benefits about 60 million people.

The Oral Health Team was introduced in the Health Family Program in 2000. Municipalities have received financial support from the federal government to implement the structure of Basic Health Units (UBS), in which the Oral Health Teams (ESB) will work, aiming at improving infrastructure and equipment, and at allowing the teams to complete their introductory course.

At the beginning of its implementation and even currently, this program has been subject to some criticism. However, we believe that this is an essential component of the success of the Brazilian health program, mainly on account of the preventive measures established, the educational aspect and the additional money given to assist families in meeting their basic needs. The program is currently being supervised by the integrated action of different government ministries.

When the Oral Health Team joined the Family Health Program, approximately 80% of adults and more than 90% of elderly people had problems which could result in tooth loss. This led the federal

government to launch the Smiling Brazil policy, directed at the entire population and covering various aspects of oral health.

Prior to launching the Smiling Brazil Program, in 2004, only 3.3% of dental services provided by the Unified Health System (Sistema Único de Saúde - SUS) consisted of specialized treatment. Nearly all the procedures were simple, such as tooth extraction, restoration, minor surgery, and topical fluoride applications.

Smiling Brazil is driven by the following guidelines:

- making water fluoridation at treatment stations feasible for public supply, and
- promoting the reorganization of primary and specialized care by implementing Dental Specialty Centers and Regional Dental Prosthesis Laboratories.

Currently, the Dental Specialty Centers are prepared to offer the population at least the following core services:

- oral diagnosis, with special attention to oral cancer diagnosis;
- specialized periodontics;
- minor oral surgery on both soft and hard tissues;
- endodontics; and
- services for patients with special needs.

Over the past 15 years, the progress in the Brazilian public health system has been remarkable. Infant mortality has dropped from 48 per 1000 to 17 per 1000. In just the past five years, hospital admissions due to diabetes or stroke have decreased by 25%, the proportion of children under 5 years old who are underweight has fallen by 67%, and diphtheria, tetanus, and pertussis (DTP) vaccine coverage in children under 1 year of age is over 95% in most municipalities.¹⁶ Even the United Nations Millennium Development Goals have lower achievements rates in comparison to these results.¹

The initial results related to dentistry are already evident, as follows:

- Integration between primary care services and dentistry schools, along with a preliminary service learning experience.

- The degree of integration and the extent of community-based clinical placement vary between schools.
- Experiences are recognized by many dental educators in Brazil as a useful way of preparing dental professionals.
- New professionals are better prepared to work in the Brazilian National Health System (SUS).
- Professionals present a broader concept of their role as healthcare providers and a better understanding of health policies.
- Improvement of a student's communication and interpersonal skills, driving a gradual gaining of self-confidence.
- Regarding the technical and operational issues, two initial measures were implemented:
 1. Establishment of a Technical Advisory Committee (CTA-COSAB/SVS), with 12 members from several universities of Brazil and consultants from the Ministry of Health;
 2. creation of 8 Collaborating Centers in Oral Health Surveillance (CeCol), working in close collaboration with the Ministry of Health, based on a joint effort between public services and academic centers (USP/FSP, ENSP/FIOCRUZ, UFSC, UFG, UFRN, UPE, PUCPR, PUCMG).

We believe that the establishment of these two groups, formed by experts with epidemiological background and knowledge of epidemiological statistics, and representing different regions of Brazil, was a milestone in this program.

The success of this program can be measured by the outcomes from the survey conducted in 2010 by the Brazilian government in 177 municipalities with 38,000 people from different age groups (SB2010). The survey shows a 26% reduction in the cavities of children 12 years of age, since 2003.¹⁶ Another relevant result from SB2010 is the number of caries-free children at the age of 12, up from 31% to 44%. This means that, just recently, 1.4 million children presented no decayed teeth, 30% more children than in 2003.

The decrease in DMFT was even greater in the age range of 15 to 19 years: from 6.1 in 2003 to 4.2

in 2010, a 30% reduction. Among adolescents, 87% presented no tooth loss. The need for partial prosthesis (replacement of one or a few teeth) among adolescents dropped 50%.¹⁶

Brazil has been sharing its knowledge ever since the International Policy Center for Inclusive Growth opened in 2004. The Center has published over 280 papers and evaluations of social program from over 70 countries, and has trained over 7,500 government representatives from over 50 countries.¹⁸

Another experience implemented in Brazil to improve the quality of life of its population is the Edmond and Lily Safra International Institute of Neuroscience of Natal (ELS-IINN) founded by Miguel Nicolelis under the slogan "When science and its values are applied to any social activity, there is transformation."¹⁹

With this in mind Miguel Nicolelis chose one of the least developed sites in Brazil, the city of Natal and its outskirts, to establish the Brain Research Center. Miguel Nicolelis is a neuroscientist, the first Brazilian scientist to be awarded the National Institutes of Health (NIH) Director's Pioneer Award in recognition of his research for the development of brain-machine interfaces. He was also distinguished with the 2010 Director's Transformative R01 Award by the National Institutes of Health (NIH). He is the first person to receive both the NIH Director's Pioneer Award and the Director's Transformative R01 Award in the same year.

With a Human Development Index (HDI)/income of only 0.636 and an illiteracy rate of 34% (according to the Development Program - UNDP),¹ the city of Macaíba, located 14 km from Natal, in the state of Rio Grande do Norte, was carefully selected as the main site to set up most of the facilities and projects of the Edmond and Lily Safra International Institute of Neuroscience of Natal (ELS-IINN).¹⁹ The purpose of this project is to employ science as an agent to promote transformative social and educational changes, and also to detect the important factors driving the production and dissemination of scientific knowledge to promote social and economic progress in developing countries like Brazil.

The Alberto Santos Dumont Association for Research Development (AASDAP) intends to use

the campus of the Edmond and Lily Safra International Institute of Neuroscience (ELS-IINN) to attract public and private investments in order to turn the metropolitan region of Natal into the Brazilian “City of the Brain.”¹⁹

ELS-IINN has already inaugurated the first units of an educational complex now being used to produce and host a variety of integrated activities and educational projects, such as science education programs for youth and adults, and activities involving sports, health, culture and leisure. These facilities are broadening the opportunities for local citizens to participate in social and cultural programs, and are providing an important building block in overcoming the current barriers of social, educational and technological exclusion.

It is important to mention the private and public support as well as foreign participation in ELS-IINN provided by the Brazilian Ministries of Science and Technology, Health, and Education, by contracts and grants from the Project Funding Agency (FINEP) and CAPES, and donations from Duke University and the Sirio-Libanes Hospital of São Paulo. The ELS-IINN mission is also supported by AVINA, and through a long-term partnership

with the University of Rio Grande do Norte.

The immediate impact of the above mentioned developments is the newly kindled active participation of students in scientific projects and daily classroom activities. In the past, this participation was fragmented because students lacked interest. Teachers, on the other hand, are enrolled in continuous training programs, resulting from an internal motivational drive among educators, considering that teachers have traditionally been a neglected class in Brazil.

Conclusions

In conclusion, although oral health problems are related to socioeconomic factors in children, the implementation of primary oral health programs and programs to improve the quality of life of the population may directly or indirectly improve the oral health scenario. These programs may be the drivers to improve oral health, because changing the socioeconomic status might indirectly improve oral conditions. This trend is being noticed in Brazil, where oral health policies have changed and social programs are being implemented.

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