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Oral Health Promotion Intervention In Rural Contexts: Impact assessment. Córdoba, Argentina.

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Abstract: Introduction: The study was carried out in Cruz del Eje Department, Cordoba Province, Argentina. It was based on diagnosis of conceptions of health, concentration of fluoride in drinking water and accessibility to dental coverage in 71 rural schools. Additionally, parents and teachers' conceptions of general and oral health, dental clinical status and sialochemistry of students from eight schools were considered. Objective: To evaluate a community intervention strategy for promoting oral health in rural contexts. Through the participation of the teacher as a mediator of healthy pattern, this strategy was developed. Methods: In order to elaborate oral health promoting strategies, educational workshops, epistolary communication and on site tutorials meetings were implemented. Specific health projects to be added to the Educational Institutional Programs, as a contextualized mediating strategy for promoting oral health were designed by teachers. The strategy was evaluated comparing dental caries increase (CI) detected the previous year and the one following the implementation of the educational plans. Mac Nemar's test was applied, and $p < 0.05$ was set to indicate statistical differences between both periods. Results: A 30.43% CI ($p < 0.0001$) was observed the year before implementing the educational programs as well as a CI reduction to 17.39% ($p = 0.0002$) a year after their application. Conclusion: The drop off in 57.14% of the CI in rural areas, confirms the intervention strategy of designed for this particular context. Keywords: community intervention, oral health promotion, rural communities.

Intervención para la promoción de salud bucal en contextos rurales. Evaluación de impacto. Córdoba, Argentina.

Resumen: Introducción: El trabajo se desarrolló en el Departamento Cruz del Eje, Córdoba, Argentina, en base a diagnósticos sobre concepciones de salud, tenor de fluoruro en el agua de bebida y accesibilidad a la cobertura odontológica realizado en 71 escuelas rurales, y sobre concepciones de salud general y bucal de padres y maestros, estado clínico odontológico y condiciones sialoquímicas de escolares de 8 escuelas. Objetivo: Evaluar una estrategia de intervención comunitaria, para la promoción de salud bucal en contextos rurales, desarrollada a través de la participación del docente como mediador de pautas saludables. Material y método: Para el desarrollo de las estrategias de promoción de la salud bucal se implementaron talleres docentes, comunicación epistolar y encuentros tutoriales en terreno. Los maestros diseñaron proyectos específicos de salud integrados en los Programas Educativos Institucionales, como estrategia mediadora contextualizada de promoción de salud bucal. Se evaluó la estrategia comparando el incremento de caries (IC) detectado en el año previo y en el siguiente a la implementación de los planes educativos. Se aplicó la prueba de Mac Nemar, fijando $p < 0.05$ para indicar diferencias estadísticas entre ambos periodos. Resultados: Se observó 30,43% de IC ($p < 0.0001$) en el año previo a la implementación de los planes educativos y una reducción del IC al 17,39% ($p = 0.0002$) al año de comenzada la aplicación de los mismos. Conclusion: La disminución en un 57,14% del IC en los escolares rurales, valida la estrategia de intervención construida para estos contextos particulares.

Palabras clave: intervención comunitaria, promoción de salud bucal, comunidades rurales.

Introduction.

Dental caries is one of the most widely disseminated diseases worldwide. In most developed countries, preventive measures have significantly reduced its prevalence in the past 20 years¹⁻⁴. However, in developing, and some developed countries regions, especially those of low socio-economic status, both rural and urban, implemented preventive actions have not had the expected impact⁵. On the one hand, one of the responsible factors for this is that, in some cases, programs have not been systematically implemented. On the other hand, these programs are not based on an in-

depth analysis of the health-disease-care process from a contextualized attitudinal perspective⁵. Generally, implemented actions respond to extrapolated models which do not meet the needs of each community; instead, they seek homogenization by using methods and contents which are not according to the idiosyncrasies thereof.

Several epidemiological studies, performed at a global, regional and national level, show that in rural, remote and socioeconomic disadvantaged groups a higher caries prevalence occurs. This suggests that determinants exceed biological realms. In Colombia, Escobar *et al*⁶ reported that

60.44% of five-year-old children have history of dental caries in primary dentition. Meanwhile, Rivera Martinez⁷ registered 49.2% caries prevalence in pre- school children from a Chilean rural area, which whom also had a 2.4 dmft score (SD 3.5). Therefore, he proposed to intensify oral health promotion/education efforts, along with adding care resources to reduce the impact of oral diseases in the future.

In studies concerning the oral health of children from a rural area of Tupungato Mendoza, Argentina⁸, a high severity level of caries prevalence was detected (dmft+DMFT)=4.64. In rural areas of northeastern Argentina, a caries prevalence⁸ of 64%, with varying degrees of severity and an average of four permanent molars lost at the age of ten, was reported. In rural areas of Cordoba, 49% to 90% caries occurrence was detected⁹⁻¹⁰.

Any preventive strategy involves cultural contents that the subject has to grasp. In relation to this, Vygotsky assigns a key role to mediators¹¹⁻¹³. The context in which people develop is essential; then, the school becomes one of the main mediators in the process of cultural appropriation¹²⁻¹⁴. In rural areas, where population density is low and families are unrelated, with inadequate roads and transportation, the school is an inviting center for recreational and cultural activities. In this context, teachers constitute the major mediators of cultural patterns, including health promotion and disease prevention¹⁵.

In the 90s, in Argentina, the economy of arid and semi-arid rural areas, such as the Department of the Province of Córdoba, suffered a noticeable depression, with the consequent negative impact on the community health status. This makes it necessary to restore the school as a center for health promotion and teaching as an effective mediator for healthy practices.

The interactionist sociological approach¹⁶ believes that health is a concept constructed by a subject from his interaction with the environment. In relation to the health-disease-care process at the oral component level, it is worth to investigate representations of general and oral health of the subjects whom integrate the community and the health practices they implement. The geographic, economic and/or cultural health services accessibility, particularly dental care, is another factor of interest within the socio-cultural dimension, due to its impact on the appropriate use of health services and consequently in the dynamics of the health-disease-care process¹⁷.

From the perspective of the interactionist model of health-disease-care process, in which interrelationships between different biological, physical, environmental and socio-cultural dimensions generate great interest, the community was intervened to develop and implement mediating strategies for oral health promotion. Built on the basis of an interdisciplinary diagnostic, which include the different involved dimensions, such as concepts of general

and oral health, preventive practices, dental clinical aspects, eating behaviors, access to medical and dental care and environmental conditions, were meant to meet the strengths and needs of the communities. In this paper, the effect of a community intervention to promote oral health, developed by the teachers as healthy patterns mediators, in depressed socio-economically rural areas in the north of the Córdoba Province, in Argentina, is evaluated.

Materials and methods.

An intervention longitudinal study focused on participatory action research was performed.

The study involved rural schools from Cruz del Eje Department, Province of Cordoba, Argentina. This context is characterized by low population density, geographic isolation and depressed economy. Educational communities are comprised of unrelated families, distributed in scattered hamlets, located between 70 and 90 km. away from urban centers, which have in some cases muddy impassable roads during rainy days. Schools are mostly multi-grade and staffed by a single teacher (ST). Teachers live in the same educational facility where students are given breakfast and lunch. School enrollment is low, between ten and twenty children, from three or four families in some cases.

The intervention was developed in three phases: diagnostic, development and implementation of oral health promotion and evaluation strategies. The appropriate methodological approach for each analyzed object was applied. Ethical guidelines of the Faculty of Dentistry from Universidad Nacional de Córdoba, in accordance with the Declaration of Helsinki, were taken into consideration. Teachers and children's caregivers gave their written informed consent.

Diagnostic stage

- In 71 rural schools, the fluoride content in drinking water was analyzed with the electrochemical¹⁶ method.

- Teachers (n=129) completed a questionnaire with open-ended questions designed to identify concepts, preventive practices and educational activities related to health. The information collected was analyzed by saturation of information¹⁸.

- Statistical data from the Health Ministry of Cordoba Province, to relieve dental care offers and thier complexity level from the regional public health institutions, was analyzed. In addition, data from the Provincial and Regional Dental Circle provided, with the number of dental professionals in activity, on the region, was taken into account.

- Representations about health services access, built by patients and dentist practitioners, through semi-structured individual interviews, applied in the waiting room of health centers to them, were investigated. In all cases, interviews were recorded in order to later proceed to their transcription

Workshop	Objective	Methodology
First	To present oral health specific contents.	Presentation and dialogue: Oral health specific contents.
	To analyze health paradigms.	Small group discussions: Reflection on models.
Second	To deepen oral health contents.	Symposium: Analysis of each school community possibilities in relation to oral health.
	To promote teachers reflection on their own health conceptions.	Presentation about oral health contents with more didactic transposition. Small groups: Recognition of health conceptions from teachers and educational communities. Regionalized health problems detection.
	To specify teaching foundation in order to plan health education integrated projects.	With dialogue: Interdisciplinary planning of integrated classroom projects. Small groups: Designing strategies to promote oral health related to PEI
Third	To design contextualized strategies for oral health promotion.	Oral health alternative learning resources gallery.

Table 1. Objectives and methodology used in the teachers workshops.

on paper. Speeches were analyzed in individual and group reading to establish descriptive coding and construct explanatory matrices for recurrences¹⁸.

- The sample was comprised of eight schools which were randomly selected by choosing one out of five registered institutions in Cruz del Eje Department. The following evaluations were performed:

Dental clinical evaluation

Children were examined in well-lit rooms with natural light in the schools, following the touch-visual routine procedure by three previously calibrated dentists (level of inter and intra-examiner agreement Kappa: 0.85).

The number of decayed, filled and lost teeth or indicated extraction in primary and/or permanent dentition was recorded. For the diagnosis of caries and the dmft and DMFT indices determination, as well as for diagnosing malocclusion, WHO criteria¹⁹ were considered. Fluorosis was assessed according to Dean²⁰ and Simplified Oral Hygiene Index by Greene and Vermillon²¹.

Sialochemical analysis

Stimulated mixed saliva and salivary flow (vol/min) were assessed and pH was determined electrochemically in children. Additionally, as described by Cornejo *et al.*¹⁰, buffer capacity, total protein concentration, calcium and phosphorus were evaluated.

Parents and teachers' health practices

Semi-structured individual interviews with health themed scripts were applied in a casual sample of 25 parents from eight school communities under study getting ten hours of recording. All teachers (24) were also called to be interviewed, out of whom 20 (16

women and 4 men) agreed to participate in the study signing written informed consent, yielding a total of 15 hours of recording. The information obtained was the corpus of discursive data. While it was open information, using the constant comparative method, recovering the most significant speech expressions¹⁸, through the transcriptions of written records, a qualitative analysis was performed. Later, descriptive codes assignment, preparation of explanatory matrices and determination of categories for problem interpretation followed.

Development and implementation of educational plans

With the purpose of providing advice and assisting teachers in designing educational plans and contextualized strategies to promote oral health, workshops and tutorials

were developed.

Teachers' workshops: The use of workshops to design health promotion strategies, was considered, including "other voices" as the most appropriate, due to they allow the generation of working methods, which respect the logic of production, circulation and appropriation of knowledge that involves the entire learning process²².

They were conducted in three instances and coordinated by members of the research team. Information on oral health was focused on four basic areas for the promotion of oral health: dietary habits, hygiene, regular visit to the dentist and the importance of fluorides.

In the first workshop results of the diagnosis of the studied dimensions were reported and work was done on contents about interacting factors in the etiology of the caries process. In each workshops, teaching resources, specifically developed by the research team, taking into consideration the weaknesses identified in the diagnostic phase, were used. It was provided reading material selected for this purpose related to: concepts and paradigms of health, oral biochemistry, scope and importance of nutritional assessment, oral cavity, levels of preventive health, preventive dentistry, strategies and resources for oral health implemented by PAHO in different Latin American contexts. The objectives and methodology used in each workshop are presented in Table 1.

Tutorials: As of strengths and weaknesses, identified in the development of projects by the team, a support system was implemented through epistolary communication and on-site mentoring.

Each teacher, assisted by the research team with

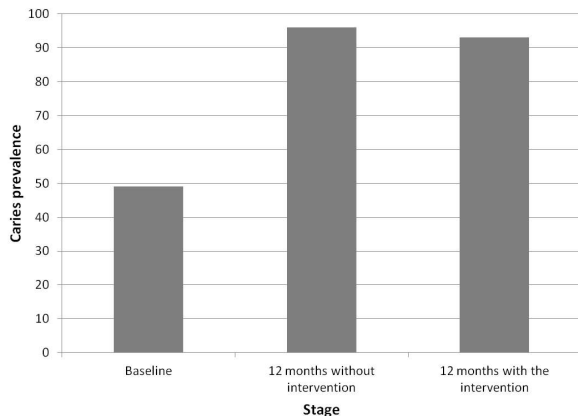


Figure 1: Caries prevalence at the three stages of the study.

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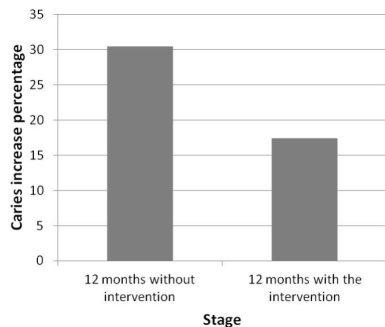


Figure 2: Caries increase after 12 months without implementing the educational plan and 12 months from its beginning.

students, implemented the project he developed. To track them, distance tutoring, complemented with a visit to each school, was carried out.

Intervention evaluation.

A longitudinal study evaluated the effect of the oral health intervention in rural school through the variation of two indicators: caries increment (CI) and simplified oral hygiene index (OHI-S), at the end of 12 months, without the application of educational plans and 12 months after their implementation. At all times, clinical examination was performed under the same conditions described for the diagnostic stage. All children, from five to fourteen years old, both genders, attending the sampled schools (n=199), were included in the diagnosis study. In the end, 46 students remained in the longitudinal study. Egress, migration or absence the day of the visit of the dental team produced sample attrition. High sample attrition did not allow maintaining age stratification in the longitudinal analysis.

After the first and second year of the study by the nominal variable "new cavities" (NC), whose categories were established as: NC: 0 (no new caries) and NC: 1 (with new caries), caries increment was assessed.

To know statistical significance for each study period, McNemar test was applied, setting $p < 0.05$ value to indicate significant differences. Data was

processed with Infostat Professional version 1.1 for Windows 2009.

Results.

Results of the diagnostic status of the different dimensions involved in the study, opportunely published^{10,23-27}, highlighted important differences between educational communities regarding: sialochemical clinical indicators, fluoride concentration in drinking water, geographic accessibility to health services, allowing to establish associations between the different studied parameters.

In relation to parents and teachers' concepts of general and oral health, a significant healing trend was observed in all communities. In oral health, parents have symptomatic and resigned attitude towards disease, prevailing extraction culture and self medication²⁸. Teachers' health representations are strongly linked to curative factors affecting their both behaviors when facing their own health and disease processes, and the actions they take in their role as socio-cultural animators²⁹. As for dental care services, offers proved to be insufficient and extraction was predominant. From the study of patients' health services accessibility representations, it is inferred that the main determinant of the curative value, in the patients dental demand, is the healing conception, historically constructed³⁰.

Characterization of communities considering dental clinical, socioeconomic, cultural and biological aspects was the foundation on which teachers, coordinated by the interdisciplinary team, designed educational plans to promote oral health. Different grabbing levels of the specific contents of oral health were observed among teachers. The production level of educational plans by teachers was uneven. While some developed a specific plan included in the Programa de Educacion Institucional (PEI), others only performed isolated actions.

Prevalence of dental caries in the three stages of the study is shown in Figure 1. Although a lower prevalence of dental caries was found after a year of the educational plans implementation in relation to the period without intervention (93% versus 96% respectively), the difference between the two assessments was not statistically significant ($p=0.687$). In relation to caries increment, the number of CN showed a significantly higher increase (30%) during the first 12 months of the study without implementation of the educational plan, compared with an increase (17%) ($p=0.0002$) observed during the next 12 months being under educational plans (Figure 2).

Comparison of children' oral hygiene status (OHI-S) between the two evaluation times was significantly lower ($p < 0.001$) for the OHI-S index in the second evaluation. None of the indicators showed significant gender differences ($p=0.078$) at the time of study.

Discussion.

The present study was conducted in educational economically depressed communities from semi-arid rural areas in the Northern regions of the province of Córdoba, Argentina. The residents of these communities can be considered of low socioeconomic status, according to their level of education and wage income. Most of them have only received complete - or incomplete - primary education. Women serve as homemakers and men as laborers without a stable job. The variability observed between the education level of the studied rural communities and students' dental clinic parameters²³, cannot be attributed solely to socioeconomic factors, as in all the studied communities, unfavorable socioeconomic characteristics are presented in a homogeneous way. This would evidence the need to analyze the context in which the health- disease-care process is developed taking into account that it results from complex interactions between biological, physical, environmental and socio-economic-cultural dimensions. Moreover, variations of fluoride concentration in drinking water and salivary factors among the different schools in the study^{16, 23} are a strong evidence that guides a prediction of risk in the pathology of caries. Moreover, it leads to consider the need to implement oral health promotion strategies, which collectively designed, particularized for each school, address the biological, environmental, socio- economic, cultural needs and potential in health services in their communities.

Whereas any preventive behavior involves cultural content to be appropriated by the subject from the interaction with others, representations and health practices of "mediators" are of particular interest (parents, teachers, peers, health agents, etc.). In societies like the formerly described, which are structured on family basis, parents are natural mediators in the process of cultural content appropriation, including necessary measures to promote health actions¹¹.

The predominantly healing vision in the parents' representations of health²⁸ allows us to estimate that in the absence of intervention, children would play reparative attitudes without building healthy behaviors.

Besides, today the world is witnessing a process of globalization which is characterized by the rise of telecommunications, among other manifestations of technoscientific development. Health of a society cannot escape the decisive effect of globalization. This process implies phenomena of increased impact on public health such as migration to cities or countries, to more developed economies and overlapping cultures. In relation to the latter it has been observed that the acquisition of globalized habits can change the risk of illness. Against this, in rural areas characterized by low population density and the existence of unrelated families, the teacher, in his role as socio-cultural animator, must promote social practices in order to encourage initiative and participation of the community in their own development process. From this perspective, the school can become a center for health promotion and teaching as

an effective mediator of healthy practices. This is extremely important, especially in those communities which have shown a marked tendency towards curative health in their representations.

From the Vigostky perspective, a promotion strategy involves appropriating cultural contents¹¹, in a dynamic that plays a fundamental role in health representations and practices of mediators. Teachers' curative health representations²⁷ determine behaviors with which they face their own health and disease processes, and the actions they perform in their role of socio-cultural animator, thus interfering in the construction of the school as a health promoter. Therefore, it is evident the need for teachers to reconceptualize their own healing concepts to become effective health promoters.

Organizing workshops for designing health promotion strategies resulted in a collective construction between the research team and potential mediators. Thus, the proposed health promotion strategy was based on previous representation appropriations and preventive health practices by all participants to effectively assume a health promoter role.

Due to the difficulties regarding specific content appropriation in the first workshop, for the second workshop, a new teaching resource was developed. It consisted of a booklet with adapted technical language and information organized with graphics and visual resources. Prior to working in small discussion groups, the dentist team had to reinforce the contents from the first workshop and explain basic structure and function of the stomatognathic system and prevention levels. On their behalf, teachers could regionalize health contents and relate them with institutional projects already existing in each school.

Exposing about the foundations of integrated planning, and resources for the teaching oral health, designed by the interdisciplinary team as part of other investigations, in the third workshop helped teachers design specific projects under PEI^{31, 32}. While teachers showed readiness to redefine their health conceptions, difficulties to transfer the oral health contents in their classrooms were detected. Teachers' formation presents as another limitation in seeking to bring about change in the communities, as well as for including oral health content in the educational plans. Therefore, they do not have effective teaching strategies to enable them in order to promote oral health in their educational communities.

The support system developed, through epistolary communication and mentoring, helped recover the strengths and overcome the difficulties encountered during the development of educational plans as a strategy to promote oral health. Follow-up evaluation during the procedure allowed doing the appropriate settings according to the dynamics of the process itself.

The support and continuous evaluation through tutorials meetings and visits to schools during the implementation

of educational plans designed by each teacher facilitated the appropriation of their role as health promoters.

In terms of prevalence of caries, it is not possible to say that the intervention has been effective in controlling the disease. According to results, only two children (4.1%) had no cavities at the end of the rated operating time, this would be attributable to the change tooth and not the benefits of the educational plans. The high prevalence of caries, about 90% observed at both 12 months, after starting the study, in the absence of strategies to promote oral health and 12 months following the implementation of educational plans, led us to construct CI a variable to allow clinical evaluation of the effect of the educational health promotion plans.

Although, given the multifactorial nature of dental caries, its control cannot be attributed to a single factor. In this study, determinants, such as socioeconomic status, physical environmental conditions and access to care,

remained unchanged. The decrease in both the IHO-S and the CI, by 34% and 57.14% respectively, in rural schools under the educational plans, allows us to consider valid the intervention strategy built for these particular contexts, depending on the degree of reconceptualization efficiency teachers can achieve as mediators.

Absence of significant differences between genders can be attributed to the fact that the developed strategy could be generating a collective commitment which is independent of the gender. Whereas school enrollment, in some cases, comes from three or four families, in the study, the collective commitment may be facilitated by school children's family bonds among themselves and with other members of the community.

Based on the above, it can be said that the proposal for community action has been validated. It has allowed the development and implementation of strategies to promote oral health which respect the characteristics and potential

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