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ORIGINAL ARTICLE

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Evaluation of an oral health intervention project in an educational center in the central jungle of Peru

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ABSTRACT

Objective: To assess the effectiveness of an oral health intervention project in Oxapampa, Peru, from April to July 2023. **Materials and methods:** This longitudinal study involved 135 primary education students from the I.E. Bardo Bayerle educational institution. The research focused on two main variables: dental caries experience, measured using the DMFT index and dmft, and oral hygiene, assessed through the Simplified Oral Hygiene Index (OHI). Both descriptive and bivariate statistical analyses were conducted. **Results:** At the initial assessment, the OHI was 1.42 (SD = 0.68). By the conclusion of the study, this value had decreased to 0.45 (SD = 0.29), with the reduction being statistically significant ($p < 0.001$). **Conclusion:** Positive results were achieved in the oral health intervention project “Let’s Smile Together” in Oxapampa, Peru, from April to July 2023.

Keywords: dental health services; program assessment; program development; health program; intervention project; oral health.

INTRODUCTION

Oral health represents a fundamental component of general well-being and quality of life of people all over the world (1). However, despite the advancements in dentistry and oral health education, the issues in this field remain a significant global challenge, considering that dental caries is one of the most prevalent diseases worldwide (2, 3). In 2019, the Ministry of Health in Peru (Minsa, for its Spanish acronym) confirmed that 90.4% of the population was affected by dental caries, being the rural population more affected by it than urban population (4). From the total population, 85.6% of children between 3 and 15 years old have cavities, a very high percentage for school-age population. This issue has a primary impact on the young population, since many of them do not have direct access to health services, therefore treatment opportunities are limited. This leads to the loss of their permanent teeth at an early age, thus affecting their oral health and, consequently, their general well-being (5).

Oral health promotion and prevention are crucial for the reduction of caries prevalence, especially in children and infants who are in the midst of dental development. Not only do dentists treat cavities, but they also have a fundamental

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role to educate and work with vulnerable communities where their impact can be long-lasting (6). It is vital to focus on instilling oral hygiene habits from an early age, which requires a close cooperation from parents. Not only does this cooperation benefit the children, but it promotes oral health in the whole family and, at a larger scale, it can have significant impact on the whole population's oral health in general (7). Different interventions have been developed with a focus on health promotion and prevention in order to address public health issues, including oral health, which aims at maximizing the efficacy and effectiveness in the use of resources. These programs tend to include health promotion and disease prevention components. In the Peruvian context, the National Coordinated Health Plan (from the Spanish name Plan Nacional Concertado de Salud) aims to reduce oral diseases, decrease the decayed component in the Decayed, Missing, and Filled permanent Teeth index (DMFT), and promote pre-emptive dental care for pregnant women and vulnerable population, emphasizing the promotion of oral hygiene habits and the use of fluoride (8).

From the beginning of the undergraduate stomatology program at Universidad Peruana Cayetano Heredia (UPCH), students complete their studies with the Social Dentistry Internship, whose objective is for the student to do a shift at a primary health center in a rural area, allocating half of their time to the development of an Oral Health Intervention Project (OHIP). On the other hand, the Universidad de Concepción (UdeC), in Chile, offers an Internship in Family and Community Health which aims to train its future professionals. These similarities have allowed a variety of students to be able to take their internship in Chile or Peru through a convention between the two institutions.

The project called “Sonriamos Juntos” (“Let’s Smile Together”) was created and executed by two dentistry

students from UdeC in an exchange with UPCH. The purpose of this project was to improve oral health of school students through promotion and prevention activities for oral health in Oxapampa, Pasco region, Peru. This city, capital of the town and province of the same name, is in the central jungle of Peru and it stands out for its biodiversity and culture, due to its foundation by Austro-German immigrants, which has led to the convergence of indigenous and European traditions. Therefore, its importance lies as a hub for representative biological research in the country. The objective of this study was to evaluate the outcome of an oral health intervention project in Oxapampa, Peru, between April and July 2023.

MATERIALS AND METHODS

This study had a longitudinal design. The population consisted of 135 children between 5 and 8 years old attending the I. E. Bardo Bayerle school in Oxapampa, Pasco, Peru, who were part of the “Sonriamos Juntos” project between April and July 2023. The whole population was considered; therefore, there was not a size or cohort selection, and all school children and parents that confirmed their participation were included in the project.

The variables of the study were the experience of dental caries measured in the decayed, missing, and filled primary teeth index (dmft) and DMFT index, as well as the simplified oral hygiene index (OHI-S), which follow the parameters established by the World Health Organization (WHO); the latter measured at the beginning (diagnosis) and at the end of the intervention. Before starting the intervention, it was necessary that both parents and children sign an informed consent to confirm their wish to be beneficiaries of the «Sonriamos Juntos» project, as well as to consent the use of information for this six-phase research (figure 1).

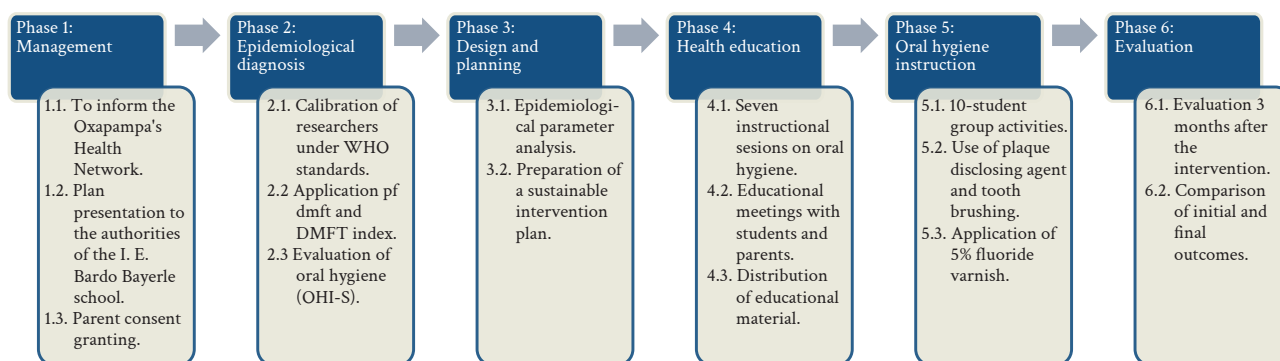


Figure 1. Project outline of the “Sonriamos Juntos” oral health intervention, in Oxapampa, Peru.

Phase 1: Management

The project, conceived and coordinated by the team in charge, implies a series of processes with the Oxapampa's Health Network to report on the execution of activities outside of hospital hours. In addition, there was a presentation provided to the executive team of the I. E. Bardo Bayerle school with the aim to explain the proposed intervention plan to pertinent authorities. This step is essential to allow the participation of primary school students, always with the prior consent of their parents, to ensure the effective participation in the project.

Phase 2: Epidemiological diagnosis

This study was carried out by the researchers that were previously calibrated as part of the induction process to access the Social Dentistry Internship following the WHO guidelines. In the case of dental caries experience, the dmft and DMFT indexes were used. This calibration process included an initial theoretical stage followed by inter-examiner calibration with a gold standard. This process included the random evaluation of 30 teeth to estimate validity. Following that, the inter-examiner calibration took place throughout a week, where the number of dental pieces were similarly evaluated to assess reliability. In all cases, the validity and reliability values were calculated using the Kappa coefficient, which delivered results greater than 0.80. In the case of OHI-S, a theoretical stage was considered followed by an inter-examiner calibration with a gold standard, evaluating 5 patients. After that, the same calibration in a week's time with the same number of patients. In this case, validity and reliability were achieved using the intraclass correlation coefficient with results greater than 0.90.

Phase 3: Design and planning

A thorough analysis of the parameters evaluated during the epidemiological diagnostic phase was carried out. Considering the results obtained and the different variables of the students' social context, an intervention is planned with a favorable prognosis. The purpose of this stage is to design a sustainable plan of action for the community, with the expectation of achieving short-term positive results.

Phase 4: Health Education

With the participation of students, seven oral hygiene instructional sessions were carried out in each

classroom, using a large-scale model of the oral cavity. There were also scheduled meetings with both students and their parents to provide educational and clarifying sessions about different aspects related to oral health in general. During these meetings, educational material was distributed, such as brochures for parents, and an adequate space was created to answer questions and solve any doubt about the topic addressed during the meeting. In all cases, the educational sessions had a duration of 30 minutes, which were outlined in an educational session matrix in three stages: beginning, development, and closure. This allowed each session to be standardized, which were repeated in each of the interest groups with adaptations according to age and type of participant.

Phase 5: Oral hygiene instruction

There were activities distributed in small-group classrooms. It was considered to work with 10 students per intervention and a plaque disclosing agent was used to create awareness of its meaning. Then, the plaque was removed through tooth brushing. Subsequently, topical fluoride was applied with 5% fluoride varnish, following the recommendations of the Clinical Guidelines for Dental Caries by Minsa (9). The purpose of this activity was to pedagogically demonstrate the consequences of poor dental hygiene, and to teach the correct brushing technique, as well as to reinforce protection by applying topical fluoride.

Phase 6: Evaluation

The evaluation was made approximately three months after making the initial diagnosis, when the intervention ended. For that purpose, a new oral hygiene evaluation was carried out, following the same conditions used during the initial diagnosis. The purpose of this last stage is to compare and contrast the results before and after the intervention, aiming at observing a positive progress in oral hygiene.

With the obtained information, the database was built in Microsoft Excel. Subsequently, the analysis was made in the STATA 17 program, with a reliability level of 95% and a $p < 0.05$. The analysis was descriptive, using means, standard deviation, minimum and maximum values of the variables, and the comparison of times using the Wilcoxon test. This was due to the fact that the OHI-S variable was not normal according to the Kolmogorov-Smirnov test.

The study was developed after the approval of the Scientific Ethics Commission of the Faculty

of Dentistry from Universidad de Concepción on April 17th, 2023, with CEC code N° 04/23, followed by a review and confirmation of approval by the Institutional Committee of Ethics in Research of Universidad Peruana Cayetano Heredia (CIEI-UPCH), with Certificate CIEI-189-19-24. Furthermore, the need to obtain the informed consent signature from the parents was emphasized to allow the participation

of their minor children, who, due to their young age, do not require assent. However, voluntary participation and anonymity for all students were ensured.

RESULTS

In the diagnosis, the mean DMFT index was 0.33 (SD = 0.80), the dmft was 6.73 (SD = 4.29) and the OHI-S was 1.42 (SD = 0.68) (table 1).

Table 1. Initial diagnosis of the dental caries experience and the “Sonriamos Juntos” (“Let’s Smile Together”) oral hygiene project, in Oxapampa, Peru, 2023.

Variables	X	SD	Min.	Max.
Dental caries experience				
DT	0.30	0.75	0.00	4.00
MT	0.00	0.00	0.00	0.00
FT	0.01	0.09	0.00	1.00
DMFT	0.33	0.80	0.00	4.00
dt	6.07	4.16	0.00	16.00
mt	0.44	1.05	0.00	5.00
ft	0.20	0.76	0.00	5.00
dmft	6.73	4.29	0.00	16.00
Oral hygiene				
SPI	1.21	0.57	0.00	2.66
CPI	0.21	0.28	0.00	1.00
OHI-S	1.42	0.68	0.00	3.33

X: mean; SD: standard deviation; Min.: minimum value; Max.: maximum value; DT: decayed permanent teeth; MT: missing permanent teeth; FT: filled permanent teeth; DMFT: DMFT index; dt: decayed deciduous teeth; mt: missing deciduous teeth; ft: filled deciduous teeth; dmft: dmft index; SPI: soft plaque index; CPI: calcified plaque index; OHI-S: simplified oral hygiene index.

Likewise, at the end, the OHI-S indicated a mean of 0.45 (SD = 0.29), being this reduction statistically significant ($p < 0.001$). For the case of soft plaque index (SPI), the initial diagnosis was 1.21 (SD = 0.57), and the

final one was 0.33 (SD = 0.25). For the calcified plaque index (CPI), the initial diagnosis was 0.21 (SD = 0.28), and the final one was 0.13 (SD = 0.17) (table 2). In all cases, a decrease in OHI-S values is observed.

Table 2. Oral hygiene changes between the initial and final diagnosis of the “Sonriamos Juntos” (“Let’s Smile Together”) project, in Oxapampa, Peru, 2023.

Oral hygiene	Diagnosis								p*
	Initial				Final				
	X	SD	Min.	Max.	X	SD	Min.	Max.	
SPI	1.21	0.57	0.00	2.66	0.33	0.25	0.00	1.16	<0.001
CPI	0.21	0.28	0.00	1.00	0.13	0.17	0.00	1.00	0.007
OHI-S	1.42	0.68	0.00	3.33	0.45	0.29	0.00	1.66	<0.001

X: mean; SD: standard deviation; Min.: minimum value; Max.: maximum value; SPI: soft plaque index; CPI: calcified plaque index; OHI-S: simplified oral hygiene index. *Wilcoxon test.

DISCUSSION

A OHIP is a group of activities done in a predetermined period of time, with specific resources, with the aim to address a specific issue in the benefit of a population that needs to receive dental care and/or treatment. It is based in a diagnosis of the current situation to make a change toward a desired situation (10). It is crucial to make a difference among plans, programs and projects. Plans focus on an institution's vision and mission, programs focus on the attainment of general objectives, and projects focus on solving specific problems (11). In the case of OHIP, the project cycle has three stages: design, implementation and evaluation (12). The design includes the situational diagnosis and the preparation of the technical document. The implementation stage covers the management and execution of activities according to an established schedule, while the monitoring is done simultaneously to correct any shortcomings. The evaluation at the end of the project determines its success and provides recommendations for future interventions (13-17).

The "Sonriamos Juntos" project benefited a total of 135 children between 5 and 8 years old from the I. E. Bardo Bayerle school in Oxapampa, Cerro de Pasco, Peru, between April and July 2023. This project was carried out by two exchange students from UdeC, main researchers of this study, within the Social Dentistry Internship of UPOCH university. Funding and resources were managed jointly by both researchers, as well as the intervention's coordination and implementation. Oral hygiene promotion and prevention classroom activities were considered, such as health education for students and their parents, oral hygiene instructions, application of 5% fluoride varnish, and lastly, oral hygiene control to do a contrast of the outcomes achieved during the diagnosis stage.

Inside the educational institution facilities, a baseline was established using the dmft, DMFT and OHI-S indexes. The results revealed a high rate of caries overall, both in first- and second-grade children. This translates into a high mean of dmft, indicating a very high level of experience. Furthermore, it is relevant to point out that girls show more favorable indicators than boys in most of the components. Regarding DMFT, means closer to zero are observed in each component, being classified as very low. It is relevant to highlight that, just like the dmft, girls present higher indicators than boys. Moreover, a fairly high mean bacterial plaque index is evident overall, while the calcified plaque index remains low, indicating regular hygiene. Additionally, considering that the

children are between 6 and 8 years old, it is likely that the permanent teeth present in their mouths have recently erupted.

According to the aforementioned, oral health indicators reveal a concerning situation, characterized by a high prevalence of dental caries, as well as a lack of adequate access to oral health services, and a limited knowledge on effective oral hygiene practices (18). This reality not only has a negative impact on the community's oral health, but it may also influence their overall quality of life, affecting their capacity to feed themselves properly, speak to the community and maintain social relations without restriction and, thus, have a healthy development (18-20). However, after the implementation of the "Sonriamos Juntos" program, there is a notable change observed in the target population, based on the oral hygiene improvement of the school children; changes that can be observed over the course of the intervention. Not only does this improvement have a positive impact on oral health of the benefited population, but it also contributes to improve overall well-being and to promote a healthier and more resilient community. In addition, the project lays the foundation for long-term positive change by strengthening awareness on the importance of oral health, both in children and their parents, and to foster preventive practices that can remain over time. This means, an oral health intervention not only addresses immediate needs of the community, but it also contributes to the improvement of their overall health and quality of life (19-22).

The strategy used to organize the intervention in phases, enabled a methodical execution, facilitating a detailed follow-up and documentation of every stage of the planned process. This structure ensured an effective OHIP implementation, which guarantees the success of an intervention. Oral health care is a practice that must be established during the first years of life. Parents, caregivers or guardians of an infant must instruct oral hygiene routines and habits that will be maintained for the entire life of that developing and growing individual. However, this is a utopia in many parts of the world, where oral health seems to be a constant fight more than a right exercised in a healthy manner, due to the lack of accessibility to health services, or issues in the implementation of adequate practices (23-27). This type of educational experiences allows for an approach to other realities outside of the typical practice in dental offices, with all the technological and resource conditions, while contributing to the humanistic training of dentists.

When analyzing scientific evidence, despite the fact that the practice of oral health interventions is recurrent, publications on the subject are limited. Much of the information available consists of academic works leading to degrees or titles that do not get published. Among the limited information, it can be summarized that research is mainly focused on educational interventions with sessions like those outlined in this project, and, in some cases, those that have implemented preventive interventions through the application of topical fluorides or by encouraging dental care. In all cases, outcomes are always favorable, being the populations of educational institutions in urban and rural areas of Peru the primary beneficiaries (28, 29). Additionally, it is important to differentiate that many of these interventions, like the one in this study, assess results in real conditions, meaning that they are effectiveness evaluations and that is why they are relevant. There are few community trials that evaluate efficacy under controlled conditions, and even fewer are those that consider the use of resources for effectiveness evaluations (30).

It is important to note that the study had certain limitations, among which the deadlines to carry out activities stand out. These were limited due to the duration of the internship. This stopped the execution of longer interventions that could have had a more significant impact on the indexes analyzed. Additionally, this short time cannot reflect changes in the dental caries experience. Furthermore, another limitation was the low participation and interest of parents, who showed limited time for a more proper commitment to their children's oral health. Despite these limitations, the results obtained suggest that this type of intervention can have a positive effect in the oral health of the communities. These findings provide support for the standardization of different interventions in oral health, implementation of improvement, and the promotion of awareness on the importance of oral health in overall well-being.

CONCLUSIONS

In conclusion, the "Sonriamos Juntos" project has demonstrated to be an effective intervention to improve oral health in first- and second-grade students at the I. E. Bardo Bayerle school in Oxapampa, Peru. By means of a comprehensive approach that involved education, practical activities and regular controls, a significant decrease in the oral hygiene of patients was achieved.

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