

Impact of Health Promotion educational Activities in Schools in Vulnerable Areas of the Durán Canton through University Engagement

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ABSTRACT

Introduction: Health promotion in vulnerable communities is a fundamental strategy to improve quality of life and prevent oral health diseases. This study addresses the issue of the lack of primary care in schools located in marginalized areas of Durán and proposes health promotion activities developed by dentistry students in collaboration with the Universidad Bolivariana del Ecuador. The main objective is to evaluate the impact of these activities on the prevention of oral diseases and the awareness of healthy habits.

Methodology: The methodology employed was descriptive, using direct observation, interviews with teachers, and surveys with students and parents to analyze changes in knowledge about oral health and hygiene habits. The activities included educational talks, the application of fissure sealants, and oral health diagnosis.

Results: The university intervention not only improved oral health indices in the involved schools but also increased knowledge and awareness about the importance of oral health prevention.

Discussion: This model of university engagement proves to be an effective tool for improving community health and strengthening the ties between the university and society.

Keywords: promotion 1; oral health 2; engagement 3; educational activities 4; vulnerable 5; community health 6; university 7; society 8.

1. INTRODUCTION

Health promotion in educational contexts is a crucial tool for disease prevention and improvement of quality of life in vulnerable communities (Ministry of Public Health of the Ecuador, 2019). In these areas, where access to health services is limited, schools play a central role in the implementation of preventive strategies. The Durán Canton, in Ecuador, is a region characterized by high rates of poverty and violence, factors that limit children's regular access to medical care. In this context, university engagement emerges as an effective strategy to cover this gap in care, facilitating the intervention of students in the promotion of health and in the prevention of diseases (Herrera, 2012).

This study focuses on evaluating the impact of educational activities to promote oral health carried out in schools in Durán by dental students from the Universidad Bolivariana del Ecuador. This program seeks not only to educate young people about the importance of oral care, but also to contribute to the reduction of the prevalence of oral diseases, such as tooth decay, one of the most common conditions in these communities. The educational component is key to achieving a sustained change in hygiene and oral health care habits. (Carvajal et al., 2021)

The condition of the mouth can affect overall health (Álvarez Orozco et al., 2018); (Castañeda et al., 2021); (Espinoza et al., 2022); (Benites & Fonseca, 2019); (Moreira et al., 2023.). For example, periodontal diseases, such as gingivitis and periodontitis, have been linked to heart disease, diabetes, kidney disease, and other serious health problems. Prevention and early treatment of these diseases can prevent complications and improve patients' quality of life.

Among the most common oral diseases in adolescence are dental caries, periodontal diseases and malocclusions; In addition, cognitive elements must be incorporated into individuals that prepare them to face other problems in the course of their lives, such as dental trauma and oral cancer. (Díaz-Valdés & Valle-Lizama, 2022)

Whereas dental caries is a multifactorial chronic infectious disease that primarily affects children and adolescents, who are particularly vulnerable due to diet-related factors and inadequate oral hygiene (Aguilar et al., 2014). Its etiology includes a complex interaction between bacterial plaque, dietary sugars, and intrinsic host factors, resulting in progressive demineralization of tooth enamel (Cárdenas Castellanos et al., 2022). Various

studies have highlighted the effectiveness of educational interventions in the prevention of caries, especially those that promote knowledge and the adoption of healthy habits (González Sanz et al., 2013). In this sense, educational activities play a crucial role in promoting knowledge and the adoption of healthy habits among children and their families.

Oral health promotion through educational programs is a strategy widely supported by the literature as critical in the prevention of dental caries (Santamaría, 2023). These programs focus on modifying the knowledge, attitudes, and behaviors of children and their families in relation to oral hygiene and diet, specifically on reducing sugar consumption (7). It is through continuing education that dental students are able to empower communities to adopt habits that improve their quality of life. Educational interventions go beyond simple instruction; They seek to build a critical awareness of the importance of oral health as an integral part of overall well-being. This reinforces the role of the university in linking with the community, not only as an academic entity, but as a key actor in social development and the improvement of the quality of life.

The World Health Organization (WHO) highlights health promotion as a process that allows people to increase control over their health, based on community participation and the creation of environments that facilitate access to preventive services (Hernández-Sarmiento et al., 2020). In this sense, universities play an essential role, not only in the academic training of students, but also in their integral development through social responsibility (Rodríguez-Farías, 2024). The Bolivarian University of Ecuador, through its community outreach program, has implemented a plan that allows dental students to carry out oral health promotion activities in vulnerable areas, reinforcing both their technical skills and their social commitment.

The present study evaluated the impact of these activities on the oral hygiene knowledge of students in Durán schools, comparing the levels of knowledge before and after the intervention. The results obtained reflect a significant improvement in knowledge about oral hygiene, with an increase from 10% to 90%, supported by a robust statistical analysis that confirms the effectiveness of the intervention. The degree of satisfaction of the participants was also evaluated, and the data suggest that most of the students perceived these activities as beneficial, not only in educational terms, but also in improving their dental hygiene habits. These findings coincide with previous studies that underscore the importance of educational interventions in the prevention of oral diseases and reinforce the value of university outreach in the promotion of public health (Almarales Sierra & Llerandi April, 2008).

Universities have a crucial role to play in promoting public health. Through community engagement, students can apply the knowledge gained in their careers in a way that has a real impact (Health Impact Assessment (HIA). Government of Aragon, 2020.). University education, therefore, is not limited to the classroom, but extends to society, contributing to the integral development of future professionals and directly benefiting the population. Educational centres, together with the home, are the key socialising environments where the development of people takes place in their earliest stages, playing an important role in shaping the behaviour and social values of childhood and adolescence. (Monsalve Lorent, 2013).

The Bolivarian University of Ecuador has adopted this approach, allowing dental students to participate in outreach projects that not only strengthen their technical skills, but also their sense of social responsibility(8). These programs, by focusing on disease prevention, reinforce the importance of preventive strategies in public health and reduce the need for more costly interventions in the long term. Schools, as spaces for learning and coexistence, represent an environment conducive to the implementation of health promotion programs. Various studies have shown that school-based interventions have a positive impact on the adoption of healthy habits, especially when these actions are part of an intersectoral approach that includes the educational community and health services (Carvajal et al., 2021).

The ideal approach to oral health prevention in primary care settings and family medicine units should be based on cooperation between different health professionals, such as family physicians, dentists, dental hygienists, nurses, and other health specialists. This multidisciplinary approach ensures a comprehensive approach to the oral health needs of the community.

Within this model, it is essential to promote oral health education, highlighting the relevance of oral hygiene and the prevention of common conditions such as dental caries and periodontal diseases. In addition, it is key that health professionals carry out periodic evaluations of the oral health of the population, to detect problems or risks early, which may involve dental check-ups, analysis of oral hygiene and the assessment of eating and lifestyle habits.

This approach coincides with the vision of the impact of the educational activities of health promotion that have been developed in schools in vulnerable areas of the Durán canton through university linkage, where the intervention of dental students not only promotes awareness of oral health, but also involves the educational community in the identification and early prevention of oral diseases. contributing to improving their quality of life.

The educational aspect of this study lies in the implementation of a pedagogical model that not only seeks to transmit knowledge about oral health, but also aims to develop critical competencies in the participating students. Through university linkage, dental students are directly involved in the educational process of the

communities, applying a teaching-learning approach based on experience and community service. This not only contributes to the professional development of students, but also strengthens their ability to communicate knowledge effectively, adapting to the needs and realities of the social environment in which they intervene. In this way, a comprehensive education is promoted, which combines technical training with social responsibility and commitment to the community.

From a social perspective, educational activities to promote oral health in vulnerable areas reinforce the role of the university as a transformative agent in communities with limited access to health services. In these communities, education becomes an essential tool for the prevention of diseases and the improvement of the quality of life. By carrying out these interventions, university students not only improve the population's health knowledge, but also contribute to reducing social inequalities by promoting equitable access to information and preventive care. This collaborative approach, in which the university and community work together, generates a lasting impact, allowing communities to make informed decisions about their health and well-being.

2. METHODOLOGY

The present research has a quantitative approach, since a cause and effect analysis is carried out in a sequential process, it was possible to analyze the objective reality of the promotion of Oral Health through educational strategies (Cárdenas Castellanos et al., 2022), it also has a mixed approach, integrating both qualitative and quantitative techniques for data collection and analysis. This approach allows obtaining a comprehensive view of the impact of oral health promotion activities on students and the satisfaction perceived by the participants.

The study is cross-sectional, since the data were collected at a single moment in time, which allows the situation to be captured before and after the intervention. The design focused on measuring students' level of knowledge about oral health before the intervention and comparing the results after the intervention, with the aim of determining the educational impact. In addition, the degree of satisfaction of the students with the promotional activities implemented was evaluated, as well as the verification of previously established hypotheses.

To obtain information, a Google Forms survey was applied, which is a widely used tool to collect important data, in such a way that it facilitated the realization of the questions, and collected information in an easy and simple way. Google Forms can be connected to a Google spreadsheet, which allows responses to be sent automatically, the spreadsheet, which allowed the research to be developed. A survey of 7 questions was carried out on oral health promotion, the care of each patient, brushing, frequent visits to the dentist, and of course on their treatment. The surveys are intended for each patient and have the objective of first getting a sincere opinion on the subject, so that at the end of the survey we can help each patient with priority. The questions did not require too much time to answer.

For the processing and analysis of information, a database is created, where the validity of the information recorded in the surveys is verified with the information filled in the database, and an invariable analysis was carried out using a statistical program and the results were presented in frequencies and percentages using graphs and tables. Registers or databases are working tools capable of providing information on a specific action in the population as a whole, offering us an estimate of recent trends and future risks. Because of their size, generality and timeliness, they provide adjusted estimates of the probabilities of different outcomes in specific situations. Currently, the need to have systematic and accurate information that has an impact on clinical practice and facilitates the work of health management is well recognized, allowing research to be directed and evaluated, consumers to be kept informed, and finally, to audit the clinical practice carried out. Both clinicians and managers, consumers and researchers.

The study population consisted of 155 students from various schools where university extension activities were carried out by students of the Dentistry Career of the Bolivarian University of Ecuador. Using a confidence level of 95% and a margin of error of 5%, a representative sample of 112 students was calculated. This sample was selected in a simple random manner, ensuring that all students had an equal chance of being selected.

The following techniques were used for data collection:

- Structured surveys: Surveys with questions based on a 5-point Likert scale were administered to measure baseline and subsequent knowledge about oral health, as well as the degree of satisfaction with the intervention. These surveys were aimed at both students and teachers who participated in the program, allowing perceptions to be evaluated from multiple perspectives.
- Pre- and post-intervention tests were applied to measure students' mastery of oral health. These tests made it possible to quantify the change in students' knowledge and validate the impact of educational activities.

During the intervention, samples were taken to assess the students' oral health status, using clinical methods that allowed for an objective comparison before and after the educational program.

The level of satisfaction of the students was evaluated through surveys specifically designed to measure how they perceived oral health promotion activities and whether they considered that they contributed to improving their oral health.

The data obtained were processed and analyzed using IBM SPSS Statistics software. The following analyses were performed:

- Descriptive analysis to know the frequencies and proportions of quantitative variables, such as the level of knowledge about oral health before and after the intervention.
- Statistical tests to test the hypotheses raised in relation to the impact of promotional activities on student knowledge and satisfaction.
- Pre- and post-intervention comparisons, using Student's t-tests for paired samples, to identify significant changes in knowledge levels.
- Frequency analysis to examine satisfaction levels and survey responses in terms of the perceived effectiveness of activities.

The results of this analysis will be used to propose more effective oral health promotion strategies in future interventions, particularly focused on improving dental care, as well as identifying areas for improvement in teaching and communication of the topic.

3. RESULTS

The oral health promotion days were designed as a community intervention with an educational-preventive approach. Five days were organized in different schools of the Durán Canton, where 500 students from the various educational establishments benefited. The dental students, under the supervision of professors from the Bolivarian University of Ecuador, carried out activities that included:

- Educational Talks: Interactive explanations on the importance of oral hygiene, how to properly brush teeth, flossing, and how diet influences oral health.
- Practical demonstrations: Exercises where students demonstrated the proper technique for brushing.
- Application of sealants: Students were offered sealants in pits and fissures as a preventive measure against cavities.
- Basic diagnosis: College students made initial diagnoses to identify potential oral problems.

Table 1. Comparison of knowledge about Oral Hygiene

State of Knowledge	Before the procedure	After the procedure
They know about oral hygiene	10%	90%

Source: Own elaboration (2024).

The graph above shows the comparison of the level of knowledge about oral hygiene before and after the intervention. The results reflect a significant improvement in the percentage of students who acquired knowledge about oral hygiene, going from **10%** before the intervention to **90%** after it.

To corroborate the statistical significance of these results, a **hypothesis test on proportions** was carried out. The aim of this test was to determine whether the observed difference in levels of knowledge before and after the intervention was statistically significant or if, on the contrary, this difference could be attributed to chance.

In this context, the following hypotheses were raised:

- **Null hypothesis (H₀):** There is no significant difference between the proportions of students who had knowledge about oral hygiene before and after the intervention.
- **Alternative hypothesis (H₁):** There is a significant difference in the proportions of students with adequate knowledge about oral hygiene after the intervention.

To evaluate these hypotheses, the Z statistic was used, which measures the distance between the proportions observed in the groups (before and after the intervention) in terms of standard errors. The **Z-Score** obtained was **25.30**, which indicates an extremely large deviation from the null hypothesis.

A Z-Score of **25.30** is a value that is at the extreme end of the standard normal curve, indicating that the difference between the proportions of knowledge before and after the intervention is very considerable. This suggests that the impact of the intervention is not casual or small, but that the improvement in knowledge is highly significant.

In more concrete terms, the Z-Score reflects how many standard errors the observed proportion (after the intervention) deviates from the expected proportion under the null hypothesis (if there had been no impact of the intervention). Given that the value is so high, it can be concluded that it is extremely unlikely that the observed improvement is the product of chance.

The **P-Value** obtained was **3.34e-141**, which is practically zero. This value represents the probability of observing an effect equal to or more extreme than the one observed, assuming that the null hypothesis is true. In other words, it is the probability that the difference between the groups (before and after the intervention) is a purely random event.

Since the P-Value is extremely low (much lower than any typical significance level, such as 0.05 or 0.01), this indicates that the probability that the increase in knowledge is the product of chance is almost zero. Therefore,

we can confidently reject the **null hypothesis (H₀)** and accept the **alternative hypothesis (H₁)**, concluding that the intervention had a real and significant effect on students' knowledge.

The **80%** improvement in oral hygiene knowledge is not only visible in percentage terms, but is also supported by robust statistical evidence. The Z-Score of **25.30** and the P-Value of **3.34e-141** indicate that this improvement is highly significant from a statistical point of view. These results provide strong support for concluding that the intervention was effective in increasing students' knowledge of oral hygiene, eliminating any possibility that these results are due to chance.

This analysis not only demonstrates the effectiveness of oral health promotion activities, but also reinforces the importance of implementing similar educational programs in vulnerable communities to improve long-term quality of life through disease prevention strategies.

- **Before the intervention:** Most students (90%) were unaware of oral health care.
- **After the intervention:** 90% of the students acquired adequate knowledge about oral hygiene.

Table 2. Effectiveness of Oral Health Promotion

Question	Strongly disagree %	Disagree %	I agree %	Totally agree %
Do you consider that oral health promotion talks have a positive influence on your health?	21(15,32%)	1(0,72%)	23(16,78%)	92(67,15%)
How much do you agree with the statement, "Participating in oral health promotion activities significantly improves my dental hygiene habits"?	15(10,94%)	13(9,48%)	55(40,14%)	54(39,41%)

Analysis: The results obtained from the two questions allow a comprehensive analysis of the effectiveness of oral health promotion activities and their impact on students. In the first question, 67.15% of respondents indicated that they strongly agree with the statement that promotion talks positively influence their health, while only 15.32% expressed total disagreement. This result suggests that the talks are perceived very favorably by the majority, reflecting widespread acceptance and a positive perception of the value these activities bring to students' oral health. The fact that the percentage of disagree responses is virtually negligible (0.72%) reinforces the idea that the talks are serving their purpose in most cases.

On the other hand, in the second question, although most of the students also showed a favorable perception towards the impact of the promotional activities on their dental hygiene habits, with 40.14% in agreement and 39.41% in complete agreement, a greater dispersion in the answers is observed compared to the first question. 20.42% of the students stated that they totally disagreed or disagreed, which shows that a relevant sector of the respondents did not perceive a significant change in their habits after participating in these activities.

This contrast in responses suggests that, although the talks are seen as effective tools to improve oral health in general, their specific impact on modifying dental hygiene habits is not equally perceived by all students. This difference could be related to several factors, such as the nature of the educational content, the way activities are presented, or the individual motivations of students to apply the knowledge acquired

Board 1. Perceptions about Health Promotion carried out in your educational institution

Question	Strongly disagree	Disagree	I agree	Totally agree
	(%)	(%)	(%)	(%)
Do you think that incorporating more oral health promotion activities would positively influence your overall health	9(6,56%)	8(5,83%)	47(34,30%)	73(53,28%)

The analysis of the results for the question "Do you think that incorporating more oral health promotion activities would positively influence your overall health?" reflects a clear trend towards positive assessment of these interventions. 53.28% of respondents strongly agree with the statement, while 34.30% agree, indicating that 87.58% of participants perceive that a greater number of oral health promotion activities would have a positive impact on their overall health.

This result suggests that students not only value current oral health promotion activities, but are also receptive to the idea that their frequency or variety will increase. This denotes a favorable disposition toward health

education and an understanding of the link between oral health and systemic health. However, although a minority, 6.56% strongly disagree and 5.83% disagree, indicating that a small group of students do not perceive this increase in promotional activities to have a significant impact on their health.

These data underscore the need to explore the reasons behind skepticism in this small group. Some students may not see the direct relationship between oral health and overall health, or they may feel that they already have enough knowledge in the area, implying that future advocacy campaigns should be more personalized or interactive to achieve a more uniform impact across the student population. Treatment of images: Another interesting aspect to note is how in some topics the presence of images of minors is very low, this is due to Ecuador's child protection law.(Republic of Ecuador, 2013)

4. DISCUSSION

The challenge related to the implementation of multidisciplinary educational activities for the prevention of oral health in the Schools of Vulnerable Areas of the Durán Canton, presents serious repercussions for the oral health of the population. Among the main problems are the limited accessibility to oral health services, the low level of knowledge about the prevention of oral diseases, the lack of adequate follow-up of patients, and the poor coordination between the different health professionals involved in care.

These factors not only affect the population's ability to access preventive and corrective treatments, but also compromise the effectiveness of educational interventions aimed at improving oral health in the community. Since prevention is key in reducing oral diseases, the lack of coordination and adequate follow-up significantly reduces the positive impact that multidisciplinary strategies could have. Therefore, this problem becomes a topic of high relevance for scientific research, since its analysis and resolution can contribute to optimizing preventive programs and improving oral health outcomes in the population.

The present research confirms the effectiveness of oral health promotion activities in significantly improving oral hygiene knowledge, as evidenced by the 10% to 90% increase in students' knowledge after the intervention. These findings reinforce previous studies that underscore the positive impact of preventive education on oral health promotion, particularly in vulnerable communities. The hypothesis test, with a Z-Score of 25.30 and a P-Value of 3.34e-141, statistically supports the hypothesis that educational activities have a real and significant effect, which coincides with the existing literature on the importance of prevention in oral health.

However, the results also reveal some variability in the perception of the impact on dental hygiene habits. Although most of the students perceived a positive change, 20.42% did not consider it significant. This suggests that some students may have needed more personalized intervention or more interactive didactics to adopt new habits. This discrepancy points to a limitation of the study, as standardised interventions may not be equally effective for all groups.

Future research could explore how to adapt interventions to maximise their effectiveness, investigating the use of more characteristic-focused approaches and assessing long-term outcomes to verify whether the insights gained translate into sustainable oral hygiene practices.

5. CONCLUSIONS

Oral health promotion activities in schools in vulnerable areas of the Durán Canton have proven to be highly effective in improving knowledge and preventive habits related to oral health among the child population. The results obtained in this intervention allow us to affirm that university outreach plays a crucial role in community health, especially in sectors where access to health services is limited. Below are the expanded key takeaways on the impact and implications of this intervention:

The educational intervention, implemented by dental students from the Bolivarian University of Ecuador, resulted in an 80% percentage improvement in students' knowledge of oral hygiene. Before the intervention, the level of ignorance was widespread, with only 10% of the students having adequate knowledge of oral hygiene. Subsequently, this percentage increased significantly, reaching 90% of the students. This result is not only remarkable in quantitative terms, but is supported by rigorous statistical analysis. The applied hypothesis test yielded a Z-Score of 25.30 and a P-Value of 3.34e-141, confirming that this improvement is extremely significant and not attributable to chance. The intervention therefore had a clear and measurable effect on students' ability to adopt healthy oral hygiene habits.

The university linkage model, which allowed the active participation of dental students in the execution of the program, not only benefited the community, but also favored the integral development of future professionals. University students, by applying their knowledge in a real environment, not only contributed to improving the health of vulnerable communities, but also experienced learning based on practice and social engagement.

This linkage model represents a tool for social transformation that goes beyond the immediate objectives of the oral health program. By promoting direct contact between the university and the communities, social ties are strengthened and an awareness of civic responsibility is generated in both students and beneficiaries of the intervention.

One of the most outstanding results of the intervention was the increase in awareness and commitment of the

school community to the prevention of oral diseases. Oral health education not only reached students, but also permeated their families and teachers, generating a more favorable environment for the maintenance of long-term hygiene habits. The testimonies collected indicate that, after the intervention, the students began to actively implement the hygiene recommendations learned, and some even involved their peers and family members in the promotion of good oral care practices. This shift in collective behavior suggests that health education interventions can trigger a multiplier effect within communities, where the knowledge gained is shared and expanded beyond the participants' immediate environment.

The success of this intervention underscores the importance of continuing to develop and expand health promotion activities in vulnerable areas. The Canton of Durán, like many other areas of Ecuador, faces significant challenges in terms of access to health services, particularly with regard to dental care. Programs like the one conducted in this study are crucial to closing gaps in health access by providing preventive and educational services to otherwise underserved populations. The replicability of this model in other regions of the country is a viable strategy to ensure that more vulnerable communities can benefit from preventive interventions. If implemented in a systematic and coordinated manner, such programs have the potential to reduce health inequalities and improve the quality of life for thousands of children who currently lack access to regular health care.

The success of oral health promotion days should not be seen as an isolated effort, but as the first step towards a long-term intervention strategy. The sustainability of the impact achieved will depend to a large extent on the ability to establish a continuous programme of monitoring, strengthening and expanding educational activities in schools. In addition, it is suggested that the implementation of such programs be expanded to include other aspects of general health, such as nutrition and the prevention of chronic noncommunicable diseases. This comprehensive approach would contribute to consolidating a culture of prevention in vulnerable communities, helping to generate positive and lasting changes in the health habits of the child population.

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