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Minimally invasive dentistry in primary health care: education-service integration

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Abstract The aims of this study were to present an experience case report on the use of Minimally Invasive Dentistry in the intervention, treatment, and prevention of dental cavities in children attending public schools through the integration of a Higher Education Institution along with the Brazilian public health system known as Unified Health System, and the community. For this action, the intervention was divided into: Phase 1 - application of the dental care guidelines following the Atraumatic Restorative Treatment (ART) and Phase 2 - critical analysis of the effectiveness of phase 1 actions, for potential reproduction under the context of resumption of face-to-face school activities after COVID-19 pandemic. During Phase 1, last period undergraduates of Dentistry from a state university carried out a clinical survey with the ART technique in 275 patients from a public municipal elementary school, in schoolchildren aged 6 to 15 years old. Based on Phase 2 findings, it was possible to recognize, through a descriptive analysis of the experiences lived and the evaluation of the first follow-up, carried out two months after performing ART, that this initiative was highly successful. It served as a valuable model in the context of resuming face-to-face school activities, mitigating the challenges caused by social distancing measures and the temporary suspension of elective dental appointments due to the pandemic. The education-service integration with the implemented action promoted a better quality of life and reduced vulnerability and risks to oral health.
Descriptors: Primary Health Care. School Health Services. Dental Atraumatic Restorative Treatment. Higher Education Institutions.

Odontología mínimamente invasiva en la atención primaria de salud: integración enseñanza-servicio
Resumen El presente estudio tuvo como objetivo presentar un relato de experiencia con el uso de la Odontología Mínimamente Invasiva en la intervención, tratamiento y prevención de caries en escolares públicos a través de la integración de una Institución de Educación Superior con el sistema de salud pública y la comunidad. Para esta acción, la intervención se dividió en: Fase 1 - aplicación funcional de las pautas de atención dental siguiendo el Tratamiento Restaurador Atraumático (TRA) y Fase 2 - análisis crítico de la efectividad de las acciones de la fase 1, para la reproducción potencial en el contexto de reanudación de actividades escolares presenciales. En la Fase 1, estudiantes del último período de Odontología de una universidad estatal realizaron la encuesta clínica y atención con la técnica de TRA en 275 pacientes de una escuela de la red de escuelas primarias públicas municipales, en estudiantes de 6 a 15 años. A partir de la Fase 2 (Análisis crítico de la efectividad de las acciones) se pudo reconocer, mediante un análisis descriptivo de las experiencias vividas y la evaluación del resultado del primer control realizado dos meses después de la realización de la TAR, que esta actividad fue efectivamente un modelo de éxito en la integración enseñanza-servicio, capaz de ejemplificar una experiencia potencialmente significativa para su uso en contextos de reanudación de actividades escolares presenciales, minimizando los problemas generados por el distanciamiento social y la interrupción temporal de las consultas electivas en Odontología. La integración enseñanza-servicio con la acción realizada promovió la calidad de vida y redujo la vulnerabilidad y los riesgos para la salud bucal.
Descriptores: Atención Primaria de Salud. Servicios de Salud Escolar. Tratamiento Dental Restaurador sin Trauma. Instituciones de Educación Superior.

Odontologia minimamente invasiva em atenção primária à saúde: integração ensino-serviço

Resumo O objetivo do presente estudo foi apresentar um relato de experiência com utilização de Odontologia Minimamente Invasiva em intervenção, tratamento e prevenção de cárie em crianças de escola pública por meio da integração de uma Instituição de Ensino Superior com o sistema público de saúde e comunidade. Para tal ação, a intervenção foi dividida em: Fase 1 - aplicação funcional das diretrizes de atendimento odontológico seguindo o Tratamento Restaurador Atraumático (ART) e Fase 2 - análise crítica da efetividade das ações da fase 1, para potencial reprodução sob contexto de retomada das atividades escolares presenciais. Na Fase 1, graduandos do último período de Odontologia de uma universidade estadual realizaram o levantamento clínico e atendimento com a técnica do ART em 275 pacientes provenientes de uma escola da rede pública municipal de ensino fundamental, em escolares na faixa etária de 6 a 15 anos de idade. A partir da Fase 2 (Análise crítica de efetividade de ações) foi possível reconhecer, por meio de uma análise descritiva das experiências vivenciadas e da avaliação do resultado do primeiro controle realizado dois meses após realização ART, que essa atividade foi efetivamente um modelo de sucesso na integração ensino-serviço, capaz de exemplificar uma experiência potencialmente significativa para emprego em contextos de retomada das atividades escolares presenciais, minimizando os problemas gerados pelo distanciamento social e interrupção temporária das consultas eletivas em Odontologia. A integração ensino-serviço com a ação realizada promoveu a qualidade de vida e redução da vulnerabilidade e riscos à saúde bucal.

Descritores: Atenção Primária à Saúde. Serviços de Saúde Escolar. Tratamento Dentário Restaurador sem Trauma. Instituições de Ensino Superior.

INTRODUCTION

Dental cavities in permanent teeth are the clinical manifestation of the most prevalent chronic non-communicable disease among all diseases in the world and affect about 2.5 billion people (34.1% of the world population) [1]. Although its epidemiology has changed over time, due to the better understanding of its factors such as: economic development, sugar consumption behavior and fluoridation of public supplywaters [1], its prevalence in deciduous dentition is also still high, being estimated to affect around 573 million children (7.8% of the world population) [2].

Collective health actions are crucial in reducing caries rates in primary teeth and providing both prevention and treatment in large-scale when needed. This is particularly important within the school environment, as emphasized by the National Oral Health Survey[3] conducted to assess the oral health status of the urban population in Brazil in 2010. The survey results highlighted the need for a differentiated approach to the child population. Data shows that 53.4% of Brazilian children with 5 years old have experienced dental cavities, meaning that more than half of the population in this age group requires clinical intervention in oral health. This index, when considering the dental element, translates into an average of 2.43 decayed teeth per child, of which only 20% were treated at the time of the research's evaluation. In this same direction, the City Hall of São Paulo city presents another alarming fact: about 25% of the child population concentrates 70% of the oral health treatment needs, placing this age group as a high risk for dental caries[4].

The outbreak of the SARS-CoV-2 pandemic prompted the need to comprehend the emergence of new demands in health surveillance and the corresponding responses within the global context[5,6]. Consequently, necessary and drastic measures were implemented, such as the suspension of in-person school activities, temporary closure of non-essential businesses, cancellation of events, and the adoption of social distancing measures. In this perspective, health education actions and programs such as health at school were interrupted and the clinical dental practice - which demands proximity to the upper airways and contact with fluids such as the patient's saliva, in addition to the generation of aerosols, propagating and suspending particles in the outpatient environment - underwent adjustments to the current reality, with the suspension of elective care, and maintaining only emergency care.

The lack of regular dental appointments enhances the installation and/or evolution of carious lesions and periapical infections[7], that may evolve into tooth loss, being necessary the search for safe alternative interventions with proven scientific efficacy in face of the challenge presented. A viable answer for this demand is the Minimally Invasive Dentistry, considered as a philosophy, is a tool for maximum preservation of the body's tissues[7] and adaptation of the oral environment, through minimally invasive interventions to ensure that the teeth are kept functional in the individual, not restricted to the management of dental caries, but the most diverse areas of oral health[8].

Regarding Minimally Invasive Dentistry, an intervention widely spread and considered highly effective in maintenance and recovery actions for oral health, specifically in terms of dental caries and oral cavity adaptation, is the Atraumatic Restorative Treatment (ART), which "comprises preventive, therapeutic, and restorative measures regarding dental caries and its control."[9] ART, is a technique recognized by the World Health Organization (WHO), and combats the bacteria remaining in the cavity through the cariostatic effect and the sealing capacity of glass ionomer, which acts as a physical barrier[10]. The procedure involves excavating the carious dentine, followed by filling the cavity with cariostatic filling material, commonly glass ionomer[11,12]. The choice for this material is due to its good biocompatibility properties, adhesiveness to the dentin structure and the fact that, after the time of attachment, the glass ionomer cements release fluoride into the oral environment, which inhibits the demineralization of enamel and dentin and prevents secondary caries injuries[12].

Given the characteristics of this technique and its accessibility for large-scale care, the present study presents a case report intervention for the treatment and prevention of dental caries in children attending a public school, as a potential functional plan to address the demand for care adapted to the reality of the pandemic and the pursuit of restoring care and health conditions. This was achieved through the collaboration between a Higher Education Institution, the Brazilian public health system (Unified Health System), and the State's Department of Education, contributing to the strengthening of citizenship.

Education-service integration is a tool that enables the training of professionals to actively engage in society and be aware of their role as healthcare professionals. It also contributes to strengthening the guarantee of social rights and citizenship, promoting quality of life and reducing vulnerability and health risks associated with social determinants.

Given what has been presented, the aim of this study is to present a experience case report with the use of Minimally Invasive Dentistry in intervention, treatment, and prevention of caries in public school children through the integration of a Higher Education Institution along with the public health system.

EXPERIENCE REPORT

The present report was an experience developed by students of the Community Dentistry (Fieldwork) course, taught in the final year of the Dentistry curriculum at Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Campus de São José dos Campos.

The course is part of the mandatory curricular structure of graduation in Dentistry, with a total workload of 150 hours, with 130 hours of supervised internship required with the community. Among its goals, it stands out the promotion of students' education with more sensitive and aware perspectives of the different social realities existing in Brazil. They become knowledgeable about social issues, providing opportunities for the development of skills and capacities for social interaction that enables them to contribute to the development and improvement of society. This takes into consideration the configuration aspects of the system, health care strategies, social control, as well as promoting integration between the university and public and private health services. It also involves interaction with other healthcare professionals through observing the routines developed within the scope of the Unified Health System.

The activities carried out and its subsequent analysis were divided into two phases: 1. Application of dental care guidelines following ART (Atraumatic Restorative Treatment); and 2. Critical analysis of the effectiveness of Phase 1 actions, for potential replication in the pandemic context.

Phase 1 - Application of dental care guidelines

The current study was performed after obtaining ethical approval from the Human Research Ethics Committee (with code: 22414619.3.0000.0077, number 3.711.308.).

The work began with the presentation of the health action proposal to the Oral Health Center of the Health Department and the Permanent Education Division of a municipality in the countryside of a Brazilian state.

For this action, the Permanent Education Division designated a school belonging to the municipal public network that served elementary school children aged between 6 and 15 years. After presenting the project to the school board and its pedagogical collaborators, as well as establishing a schedule and deliberations on the organization of activities, the work began in the school environment in order to bind health actions and pedagogical practices.

Parents or legal guardians were informed about the purpose of the study and agreed with the collection of data by signing the Free and Informed Consent Form (ICF). Child's consent was collected in two moments: a first moment with an ICF sent to the legal guardian; and a second moment before the beginning of the procedures, after detailed explanation of the action, in a specific form containing images and language accessible to the child's reality.

The actions were carried out with the participation of dentistry undergraduate students who were regularly enrolled and attending the Community Dentistry discipline. Initially, the students were introduced to the project and received training on reception, obtaining the child's consent, screening, and data tabulation. The training was based on the manual "Oral Health Surveys - Basic Methods"12 and considered the criteria for indicating Atraumatic Restorative Treatment (ART): teeth with cavitated carious lesions in the intermediate phase, carious lesions that allow access through the occlusal surface, cavities that allow the insertion of manual instruments, dental elements that do not require extraction, absence of pulp exposure, fistula, and/or abscess, and absence of painful symptoms that may indicate irreversible pulpitis.

The delivery of the ICF duly signed by the parents and/or guardians was an inclusion criteria for the child's participation in the project. A total of 275 children participated in the study. The screening and indication for Atraumatic Restorative Treatment (ART) was carried out in 3 consecutive days, previously agreed between school and university, one day was destined to students of the 1st grade of elementary school, another day for students of the 2nd and 3rd grade and a third day destined to students of the 4th and 5th grade of elementary school. The undergraduate students' operators performed the task in pairs, alternating the examiner and note taker roles. There was a total of seven pairs of undergraduate operators, in addition to two undergraduate students responsible for collecting the child's consent. Data collected during the screening was recorded on pre-prepared forms developed in accordance to codes and criteria recommended by the World Health Organization (WHO), following the "Oral Health Surveys - Basic Methods"13 guidelines. Children who presented demands that did not fit care in ART were referred to the Basic Health Unit of reference.

All operators were trained in the university environment. The training included 5 hours of theoretical content on Minimally Invasive Dentistry (MID) / Atraumatic Restorative Treatment (ART), followed by 10 hours of practical laboratory sessions for procedure simulation, totaling 15 hours of training, with 5 hours of theory and 10 hours of practical work.

The place was previously organized and prepared for service. The preparation of the place was carried out using school desks covered by mats used for physical activity, on which the children lay down to perform the procedure with greater comfort. For the children to settle at the desks, a chair was placed next to the desk for easy access. The operators sat on school chairs arranged on the side of the desks, where the patient's head was positioned, and another school desk was used as an auxiliary table where the materials for use in each procedure were arranged (Figure 1).

Figure 1. Intervention site for phase 1, where it is possible to observe patients lying on mats.

The operators worked in pairs, using the 4-hand service system where one performed the procedure and the other assisted, thus providing greater control, agility, and effectiveness during the process. As the procedure adopted for the screening and indication for Atraumatic Restorative Treatment (ART), each grade participated in the action on a specific date in order to bind oral health action with pedagogical activities. The procedures occurred in two days, for periods of 4 hours: the first day for children in the first grade of elementary school, and the second day for 2nd to 5th grade students. For each day, 16 undergraduates were assigned: seven duos for clinical care, and two undergraduate students for post-procedure guidance.

By the end of the procedure, the children received guidance on diet and hygiene and a newsletter containing the diet and hygiene guidelines was sent to the parents/guardians.

The site disinfection procedures were performed before, at the end and in between each appointment. The staff made use of Personal Protective Equipment (PPE), being replaced at each appointment.

Dental instruments and consumables were prepared in properly packaged and sterilized individualized kits, kept in their own containers and storage to ensure the integrity of the sterilization process. Kits were composed by london college tweezers and dental mirror handle, dental spoon excavator, glass ionomer cement spatula, Heidemann spatula and Hollenback sculptor. The consumables used were cotton, glass ionomer cement, cotton roller, petroleum jelly and wooden spatula.

The study was conducted in 2019. The project development, negotiations between the city hall and university, and action planning took place in the first semester. The screening and Atraumatic Restorative Treatment (ART) procedures were performed in the second semester, and the first follow-up of the procedures was conducted in November 2019, two months after the interventions. Due to the COVID-19 pandemic, 2020 follow-up was not possible.

Phase 2 - Critical analysis of the effectiveness of Phase 1 actions

It was possible to analyze 275 children from 1st to 5th grade of elementary school – 06 to 11 years old, classified as high risk for caries disease. Of these, 37 children had carious lesions compatible with the ART technique and 51 procedures were performed according to Table 1.

Table 1. Quantitative distribution of students evaluated, number of those with ART indication and number of procedures performed, according to grade.

Grade	Students Evaluated	Students with ART Indication	ART Procedures Performed
1st	106	20	30
2nd	62	8	11
3rd	20	1	1
4th	36	5	5
5th	51	3	4
TOTAL	ART: 275	37	51

ART: Atraumatic Restorative Treatment.

The survey showed that 18.74% of these children had one or more cavity lesion proper to ART intervention, according to the criteria adopted. All the diagnosed children agreed to participate and consented to the procedure being performed. Only one of the students reported pain and was promptly referred to the Basic Health Unit of refence.

The first follow-up of the ART interventions was conducted two months after the procedures were performed. With the clinical records of the children in hand, a new evaluation was carried out in the school setting. All children who underwent Atraumatic Restorative Treatment were assessed, and the success of the treatments was observed, as satisfactory retention of the previously performed restorations and absence of painful symptoms were noted.

The follow-up of the action was initially planned for a period of two years, with the first follow-up conducted in 2019, and subsequently every six months until reaching two years after the procedures were performed. However, with the arrival of the pandemic and the interruption of face-to-face school activities, the planned follow-up was not possible. The follow-up will be resumed with the return of in-person school activities, to be determined in agreement with the responsible authorities, with an estimated timeframe of the first academic semester of 2022.

Practices in health promotion and disease prevention should be integrated into routine clinical planning and procedures, especially at tenuous ages when habits are forming and there is a greater willingness to acquire knowledge. Oral health interventions are more effective and conservative if they follow the direction of interrupting the evolution of the installed disease and empowering individuals through knowledge acquisition, thereby fostering autonomy, and improving quality of life. A booklet published by the Municipal Health Department of São Paulo to support the implementation of ART on a large scale indicates that dental caries can be reduced and/or prevented through preventive actions and interruption of the natural disease progression process[4].

The initial follow-up of the action after two months matches with reports found in the literature[14,15]. In addition, this statement was supported by the adherence of parents and children to the action, as well as by other factors such as its practicability, the ability to reduce bacterial load in the oral cavity, the interruption of active lesions, the ability to control the disease at predetermined intervals, and its low execution cost compared to other restorative procedures. Another favorable aspect is that it is conducted in a school environment, during the child's school period. This avoids displacements that deviate from family routines, minimizing issues such as the need for the child and guardian to travel, which can sometimes result in work absences for the guardians and disruptions in the daily lives of families.

Thus, with phase 1 completed, it was possible to recognize that this activity was indeed a successful model in integrating education and service. It also presented a potentially valuable experience that could be applied in unprecedented contexts like the COVID-19 pandemic, mitigating the challenges arising from social distancing measures and the temporary suspension of certain Public Health System's services, including routine dental care appointments.

FINAL CONSIDERATIONS

Higher Education Institutions, particularly those of health courses, have the duty to train humanized professionals prepared to work with the specifics of their community. Thus, the teaching-learning process with practical experiences of interinstitutional and democratic integration within the community provides undergraduate students knowledge of the

functioning structures of public health services, as well as an understanding of the social role of the profession and oral health policies, and the ability to identify contemporary regional needs[16]. The integration of education and service in healthcare is a collective effort that involves undergraduate students, university faculty, and healthcare services with the aim of enhancing professional training, promoting job satisfaction among healthcare workers, and improving healthcare delivery, making the Unified Health System a network for practical learning in the workplace[17].

The school, especially the elementary school that covers the age group between 6 and 15 years of age, is a space for human development, which contributes to the construction of personal values, concepts, habits, self-knowledge, and interaction with the world that directly interferes in the social and political formation of the individual[17].

With the new reality brought by the pandemic, there was a change in care and education format in which children were removed from face-to-face teaching and health care activities reorganized to adapt to the new reality, altering the structure of action towards the triad of health promotion, protection, and recovery.

This scenario reinforced the effectiveness of actions in primary healthcare, under the guidelines and principles of the Unified Health System established by the Organic Health Laws 8080[18] and 8142[19] of 1990. This is because the vital discussions among the social, political, and economic spheres promulgate the relationship of various instances of society, such as academic institutions[20]. Therefore, collective actions involving different spheres of public administration, public agents, and Higher Education Institutions are extremely important for the improvement of the population's quality of life and for the training of professionals who holistically understand the concept of healthcare within its contemporary context[21].

Considering Oral Health, the current study allowed a critical analysis of dental practice under the context of resuming face-to-face school activities. It builds upon a previous action and aligns with the current needs by presenting Atraumatic Restorative Treatment (ART) as an accessible method. ART does not require a clinical setting, uses manual instruments, and contributes to improving the oral environment[22].

Epidemiological data demonstrate that caries in permanent and deciduous teeth are a highly prevalent condition in the world[23,24]. In this context, the municipality where the study was conducted, implemented Oral Health actions specifically targeting elementary school students and generating, in 2019, a caries disease risk assessment revealing that 37.35% of the schoolchildren in the municipality had one or more cavities, highlighting the need for regular and ongoing interventions. In addition, the study also pointed out that 18.74% of children classified as high risk could benefit from integrated actions in oral health.

The low cost, simplicity, and effectiveness of this strategy make it possible to expand oral health actions[25], even in unique and challenging situations. It helps reduce bacterial load in the oral cavity, intercept active lesions, and maintain control over the disease at regular intervals[8]. Effective curative actions conducted in schools greatly benefit the health of students, particularly in municipalities with limited access to dental care professionals. Furthermore, the coordinated actions proved to be efficient and effective, eliminating the need for student displacement and optimizing time usage by conducting the intervention over a span of 5 days, with 4-hour sessions.

The possibility of oral healthcare intervention in the school setting mitigates significant issues such as financial burdens associated with transportation and eliminates the need for the child and guardian to travel, which can often lead to work absences and disruptions in the daily families' routines. These factors, which may hinder attendance at elective appointments, are effectively addressed. Therefore, considering the excellent outcomes of ART in controlling dental caries, it can be implemented as a public health policy. This is supported by a study conducted in Mexico, which reported survival rates of 73.1% for restorations in primary teeth and 48.8% for restorations in permanent teeth within the public healthcare system[26].

In a 5-year clinical trial, researchers compared high-viscosity glass ionomer restorations performed in ART with conventional composite resin restorations in patients with intellectual and/or physical disabilities. The results of the trial supported the use of ART as an evidence-based treatment option, contributing to the reduction of disparities in oral health care access among the evaluated population[14]. Regarding the evaluation of clinical performance, researchers

evaluated the efficacy of ART treatment after 4 years of intervention using two brands of high-viscosity glass ionomer cement; concluding that the clinical performance of ART restorations was excellent for both high-viscosity glass ionomer cements during the 4 years offollow-up[15]. In the current report, the planned follow-up, initially scheduled every six months for a period of two years after ART intervention, was disrupted by the COVID-19 pandemic. As a result, the first follow-up could only be conducted two months after the intervention, as face-to-face school activities were suspended, and health services had to be readjusted and restructured in 2020.

Phase 1 of the study shows that the commitment of social actors enables regular pedagogical activities, and its success was achieved through the dedication of all involved parties. This was possible through negotiations between the Higher Education Institution, the Oral Health Center of the municipality, and the Education Division of the municipality, who believed in and supported the project. This commitment and preparation of the oral health team was the fundamental key to the effectiveness and assertiveness of the action. Professionals involved must comprehend the project's framework and demonstrate commitment, which can only be achieved through continuous education, updates, guidance, and active participation in order to ensure the mastery of the technique.

The results suggest that ART has the potential to actively promote health by not only providing effective treatment but also offering educational interventions for all students, fostering self-care and individual autonomy. To accomplish this, it is crucial for public health professionals to maintain proficiency in health management as an ongoing practice.

Alongside the positive outcomes, there were also certain limitations observed. These included the technical difficulties experienced by undergraduate students during their training, specifically in carrying out dental procedures in a non-traditional setting like a school environment, which lacked the usual dental equipment. However, as the actions progressed, these challenges were gradually addressed and overcome. This demonstrates the impressive adaptability of dental undergraduate students, especially when they recognized the significant benefits they were providing to the children they were treating. Other limitation found referred to the ART technique itself. The study revealed that several caries lesions identified in the survey did not meet the criteria for ART treatment and therefore were unlikely to receive the necessary interventions. This finding underscores the importance of comprehensive oral health promotion, which includes educational and preventive measures alongside curative treatments.

This action highlighted the significance of Higher Education Institutions and their undergraduate students' involvement in Primary Health Care, emphasizing the integration of education and service for professional training aligned with the guidelines set by the National Curricular Guidelines for undergraduate Dentistry courses[27]. The education-service integration provides the training of professionals who are active in society and aware of their role as healthcare professionals, contributing to the strengthening of social rights and citizenship, promoting quality of life, and reducing vulnerability and risks to oral health related to social conditioning factors.

The involvement of Higher Education Institutions in Primary Health Care, through the integration of education and service, proves to be a crucial strategy for ensuring care and mitigating the effects of the COVID-19 pandemic. It serves as an important tool for health promotion and the uninterrupted provision of dental care in the public system, especially in the context of resuming school activities and regular dental services after vaccination.

The results presented suggest that ART restorations have been effective in preventing and controlling caries, while also ensuring a comfortable and anxiety-free experience for patients. The success of this action can be attributed to the organization and commitment of all involved, highlighting ART as a viable alternative for oral health promotion.

The education-service integration action improved the quality of life and minimized the vulnerability and risks to the oral health of the participating schoolchildren.

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