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Time of pH Reduction Artificial Saliva Exposed with Coffee Candy and *Streptococcus mutans*

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Abstract

Background: Saliva is a fluid in the oral cavity that acts as an indicator of oral health. *Streptococcus mutans* is a bacterium found in the oral cavity, the presence of sucrose stimulates the metabolism of *Streptococcus mutans* bacteria, which can produce acid resulting in dental caries. People often consume sweets, including coffee candy. It is not yet known how long it takes for the process of lowering salivary pH due to exposure to coffee candy and *Streptococcus mutans* bacteria.

Purpose: To determine the length of time for the occurrence of a decrease in the pH of artificial saliva exposed to coffee candy and *Streptococcus mutans* in vitro.

Methods: One grain of coffee candy is dissolved with aquades, then added to artificial saliva that has been mixed with *Streptococcus mutans* bacterial suspension. Artificial saliva is incubated for 5 minutes, 8 minutes, 10 minutes, and 12 minutes. pH saliva measurement using pH meter. Statistical test with paired t test and regression test.

Results: There was a significant decrease in the pH of artificial saliva ($p < 0.05$) after adding coffee candy solution and *Streptococcus mutans* bacterial suspension. Regression tests showed that coffee candy solution had a major effect (95.3%) on reducing the pH of artificial saliva. The most decrease in salivary pH within 12 minutes.

Conclusion: The length of time exposure to coffee candy can lower the pH of artificial saliva that is suspended *Streptococcus mutans* bacteria in vitro.

Keywords : pH saliva, coffee, *Streptococcus mutans*

Introduction

Dental caries is one of the oral health problems that has become a public health problem. The incidence of dental caries is widely experienced by both children and adults. Dental caries is a disease of the teeth due to the interaction of various factors, one of which is sweet foods and drinks. The occurrence of dental caries due to the role of bacteria that cause caries, one of which is *Streptococcus mutans* bacteria[1]. Dental caries is a multifactor process that occurs through the interaction between teeth and saliva as hosts, bacteria in the oral cavity, and easily fermented food. Among these factors, saliva is one of the factors that has a major influence on the severity of dental caries[2].

Saliva affects the process of caries because saliva always wets the teeth, thus affecting the environment in the oral cavity. The degree of acidity (pH) of saliva is one of the important factors that play a role in dental caries, periodontal abnormalities, and other diseases in the oral cavity[2,3]. Normal saliva acidity (pH) levels in the mouth are at 7 and if the salivary pH value falls ≤ 5.5 it means that the condition is very critical[4]. Saliva is a complex fluid produced by the salivary glandula, and has an important role in maintaining the oral cavity. Saliva consists of 99% water and 1% dissolved solids, namely proteins, electrolytes, glycoproteins, enzymes, and antibacterial compounds[5].

Streptococcus mutans bacteria are capable of producing acids (acidogenic properties) from fermentable carbohydrates[2]. *Streptococcus mutans* generally has an acid tolerance range of 4.5 –5.5, the optimal pH for growth *Streptococcus mutans*. However, these bacteria can live in sucrose-rich areas and produces an acidic surface by lowering the pH in the oral cavity to 5.5 or lower which makes enamel easily soluble, then there is a buildup of bacteria and disrupts the work of saliva that serves to clean the bacteria. This causes the hard tissue of the tooth to be damaged and at risk of dental caries[6].

In Indonesia there has been a change in diet due to the increasing use of refined carbohydrate or in everyday life known as confectionery, chocolate, and other foods that contain lots of sucrose. These foods are generally easily attached to the surface of the teeth. If someone is lazy to clean his teeth, then the rest of the food will be converted into acid by bacteria in the mouth, then it can cause dental caries[7]. Sucrose or sugar is found in various processed candy foods. Sucrose can be broken down into monosaccharides by the enzyme glucosyltransferase produced by *Streptococcus mutans*. The results of this breakdown are in the form of glucans and fructans, which are used in the process of glycolysis metabolism to

produce energy and acids that can later cause caries. Hard candy products are widely found because they are easily obtained at a fairly affordable price, besides that there are various flavors of hard candy, one of which is coffee candy[8]. Coffee candy has a composition including sugar, glucose, and coffee extract. In coffee contained simple carbohydrates in high concentrations such as monosaccharides and sucrose[9].

The results of previous studies have shown that the length of interaction time with food in the oral cavity can affect the acidity condition of saliva. Research by Siswosubroto (2015) on research subjects who consumed yogurt found an increase in salivary pH, but the response of each individual was different for the length of salivary pH changes. The pH time becomes normal (pH 7) at minute 5 as many as 4 samples, minute 10 as many as 11 samples, and minute 15 as many as 15 samples close to normal pH[10]. It is not yet known how long the decrease in salivary pH occurs after consuming coffee candy. Based on this description, we need to prove the effect of coffee candy on the pH of artificial saliva induced by *Streptococcus mutans* in vitro.

Materials and Methods

Research Design

This study is a *True Experimental Design with Pre-Post Test Control Group Design* to determine the difference in pH of artificial saliva before incubation and after incubation with *Streptococcus mutans* bacteria and added coffee candy solution. This study used 4 treatment groups and 1 control group. The treatment group was artificial saliva exposed to *Streptococcus mutans* bacteria and added coffee candy solution, incubated for 5 minutes, 8 minutes, 10 minutes, and 12 minutes, with 4 repetitions.

Artificial Saliva

Artificial salivary solution is made based on McDougall's formula with a mixture composition of 58.8 grams of NaHCO₃, 42 grams of Na₂HPO₄·7H₂O, 2.82 grams of NaCl, 3.42 grams of KCl, 0.24 grams of CaCl₂, and 0.72 grams of MgSO₄·7H₂O with 5 liters of aquades, then shaken with CO₂ slowly. This artificial saliva is made to reach pH 6.7 [11].

Addition of *Streptococcus mutans* bacterial suspension

Streptococcus mutans bacteria are prepared from BHI broth media. The bacterial sample used in this study was *Streptococcus mutans* obtained from the Research Center of the Faculty of Dentistry, Universitas Airlangga. To obtain a cell suspension containing 0.5 x 10⁶ to 2.5 x 10⁶

CFU/ml is done by taking 1 ml (from a tube containing 10^8 CFU/ml) then mixed with 9 ml of 0.85% sterile NaCl. So that a cell suspension with a concentration of 10^7 CFU/ml was obtained. The process is then continued once again until it reaches the concentration of the bacterial suspension used for the test, namely a cell suspension containing 0.5×10^6 to 2.5×10^6 CFU/ml[12]. Add 1 ml of *Streptococcus mutans* bacterial suspension to each tube.

Making Coffee Candy Solution

The process of making coffee candy solution is carried out by means of coffee candy as much as 1 piece soaked in 10 ml of aquades.

Test the effect of long indwelling time of coffee candy solution on the pH of artificial saliva induced by *Streptococcus mutans*

Five sterile test tubes were provided, each of which had been inserted 1 ml of artificial saliva added to the suspension of *streptococcus mutans* bacteria and had been incubated at 37^0 C for the previous 18-24 hours. In the treatment tube, a coffee candy solution of 1 ml is added and then let stand for a predetermined time with the details of tube 1 let stand for 5 minutes then measure salivary pH using a pH meter, tube 2 is allowed to stand for 8 minutes then measure salivary pH using a pH meter, tube 3 is allowed to stand for 10 minutes then measure pH saliva using a pH meter, tube 4 allowed to stand for 12 minutes then measure salivary pH using a pH meter.

Data Analysis

Analysis of research data using paired t test and regression test.

Results

From the results of this study, a decrease in the pH of artificial saliva was given *Streptococcus mutans* bacterial suspension and coffee candy solution, after incubating for 5 minutes, 8 minutes, 10 minutes, and 12 minutes. We found that there was a significant difference ($p < 0.05$) salivary pH before and after being given coffee candy solution, after incubating for 5 minutes, 8 minutes, 10 minutes, and 12 minutes. The greatest decrease in salivary pH is within 12 minutes. The results of the salivary pH Regression test obtained an *R square* value of 0.953 so that it showed that the application of coffee candy solution had an effect of 95.3% on the pH of artificial saliva. The salivary pH results are shown in Figure 1.

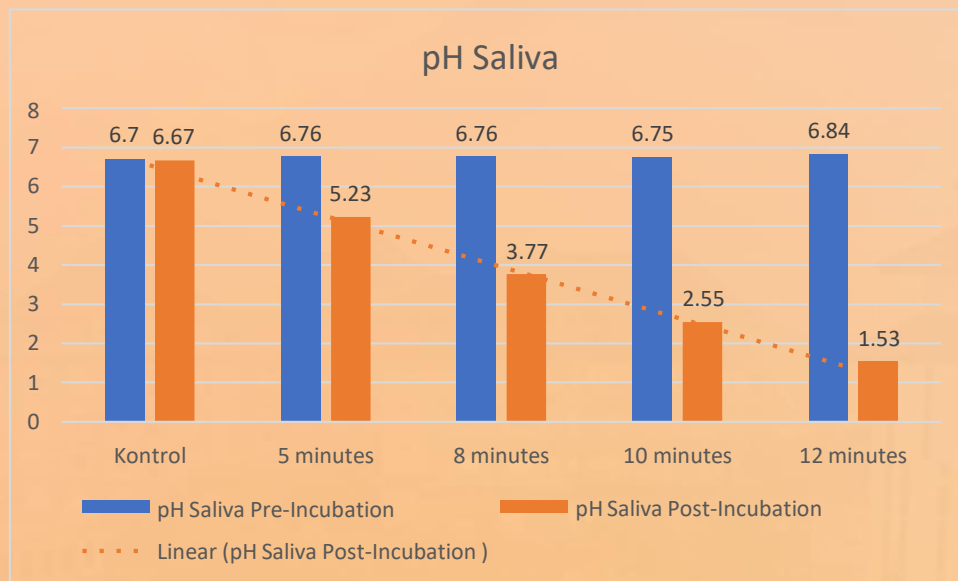


Figure 1. pH of artificial saliva in each group

Discussion

In this study, it was found that there was a decrease in the pH of artificial saliva exposed to *Streptococcus mutans* bacterial suspensions and given a coffee candy solution. From previous studies, it is stated that there are several factors that cause changes in salivary pH, including the average speed of salivary flow, oral microorganisms, and salivary buffer capacity. In addition, there are factors that affect the formation of acid in saliva, including the type and level of carbohydrates contained in food, the type and number of bacteria in the oral cavity[13].

Hard candy is a candy that has a hard texture, clear appearance and consists of the basic components of sucrose and glucose syrup and other ingredients to give a better taste. Candy that uses pure sucrose is easily crystallized. Hard candy products are widely found because they are easy to get at a fairly affordable price, besides that there are various flavors of hard candy, one of which is coffee-flavored hard candy. Coffee candy contains key ingredients such as sucrose and coffee extract[14].

Sweet and sticky foods contain carbohydrates which are the main source of energy for the metabolism of oral bacteria. Such conditions are directly involved in lowering salivary pH. The types of carbohydrates that are most suitable for acid production by bacteria in dental plaque are simple sugars, such as sucrose, glucose, fructose, maltose, and others. These sugars have small molecules that easily diffuse into plaque and will quickly be broken down by bacteria into acids. Acidic conditions in the oral fluid can cause demineralization of the hard tissues of the teeth[15].

In addition to coffee candy which contains main ingredients such as sucrose and glucose syrup, there is coffee itself also contains carbohydrates as much as 50%[16]. Sucrose in carbohydrates plays a role for the taste and quality of coffee [17]. Research conducted by Imran et al (2016) showed a significant influence between coffee consumption in the form of beverages with a decrease in salivary pH [9]. Then research conducted by Paroza and Deynilsa

(2021) showed results that consuming coffee with arabica coffee and robusta coffee types can also cause a decrease in salivary pH[17].

The acidity (pH) of saliva is the most important part of increasing tooth integrity, where a decrease in pH can lead to tooth demineralization[14]. The results of this study showed that the administration of coffee candy solution had a significant lowering effect on the pH of artificial saliva induced by *Streptococcus mutans* in vitro. This suggests that there is a carbohydrate metabolism process carried out by enzymes in *Streptococcus mutans* bacteria. The decrease in salivary pH after consuming candy is reinforced by research conducted by Soeryani et al (2020) which states that there is a decrease in salivary pH after consuming sugar candy.[26] The greatest decrease in salivary pH occurred in treatment group 4, which had been added coffee candy solution and allowed to stand for 12 minutes.

A limitation of our study was that it only used artificial saliva and only measured salivary pH. Because physiologically there are several factors that can affect the degree of acidity of saliva, including the speed of salivary flow rate in the oral cavity. So further research is still needed to perfect this discovery.

Conclusion

Based on the results of our study, it can be concluded that coffee candy solution affects the decrease in pH of artificial saliva exposed to *Streptococcus mutans* in vitro. The longer the salivary incubation, the lower the pH of the saliva. The lowest pH drop was artificial saliva incubated for 12 minutes.

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3D Bioprinting of Nanocomposite Scaffolds Tissue Engineering Applied in Dentistry

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Abstract

Background: Current dental treatments have limitations with the inability or uncontrolled regeneration of dental tissue. Failures in dental tissue regeneration occur when the scaffolds have insufficient physical and mechanical properties to act as an extracellular matrix and interact with surrounding cells to differentiate into specific tissues. Tissue engineering is a promising approach to resolving this problem by developing biomimetic materials to mimic the structure, composition, and function of native tissue. 3D bioprinting technology offers the ability to produce precise, individualized 3D grafts through a specific computer-aided design using smart biomaterials, thus enabling tissue-specific design. The utilization of polymers and nanoparticles in bioink development could increase the functionality of the printed scaffold.

Purpose: This review aims to review the current understanding of 3D bioprinting for tissue engineering and its potential applications in dentistry.

Methods: An advanced literature search was conducted on PubMed and Scopus databases for literature published in 2014-2023 on the determined keywords. Review articles and topics irrelevant to dental tissue engineering were excluded. Inclusion criteria were original research articles that covered 3D bioprinted nanoparticles, hydrogels, and cells as scaffolds in dental tissue engineering examined with in vitro or in vivo cellular assays.

Result: The literature search found an initial 166 articles and resulted in a final 9 articles after article appraisal based on inclusion and exclusion criteria.


Conclusion: The 3D bioprinting technology enables prominent physico-mechanical properties to ensure cellular viability and osteogenic differentiation to enhance bone tissue engineering for potential regenerative dentistry.

Keywords: *3D bioprinting, scaffold, nanoparticle, tissue engineering, dentistry*

INTRODUCTION

Tissue engineering is an engineering approach that seeks to produce synthetic tissue and organs through the integration of living cells, biocompatible materials, and appropriate factors, including biological, chemical, and/or physical elements.^{1,2} The primary objective of this field of research is to develop a curative approach with the aim of restoring and substituting malfunctioning tissues or organs resulting from diseases, genetic anomalies, congenital disorders, or traumatic incidents.³ There are three distinct methodologies that are employed in the field of tissue engineering to either replace or induce the growth of specific tissues. There are three main approaches that have been explored in the field of tissue engineering: (1) the utilization of only cells; (2) the application of biocompatible biomaterials; and (3) the integration of both cells and biomaterials in combination.^{4,5} The integration of cells and biomaterials is accomplished by means of many procedures, broadly categorized as either top-down or bottom-up, in order to create scaffolds.⁴

The top-down strategy entails the utilization of a restricted number of cell types, which are then seeded and cultivated within scaffolds possessing comparable sizes and morphologies to the desired tissues, which makes the clinical application of TE very difficult.⁶ Top-down techniques have been widely utilized for a significant duration. Nevertheless, these approaches frequently encounter challenges in effectively regulating cell distribution and fail to produce the desired extracellular matrix (ECM).⁷ In contrast, bottom-up strategies, also called development engineering (DE), include the integration of individual cells and biomaterial components to construct tissue structures. This recently proposed engineering strategy seeks to replicate the processes observed in developmental biology through the incorporation of progressive tissue



construction in conjunction with the proliferation of various cell types within modular scaffolds.^{8,9} The bottom-up strategy possesses the capacity to effectively achieve the projected achievements in clinical applications and is expected to counter previous technique limitations via better cell distribution, enhanced scaffold fabrication controllability, and replication of tissue development processes.^{9,10} Some techniques, such as self-assembly and soft lithography, are applied to develop this strategy.¹¹⁻¹³ Recently, the use of bioprinting as an advanced additive manufacturing technology has become popular and is gaining interest in bottom-up TE scaffold fabrication.

Three-dimensional bioprinting (3D bioprinting) has recently emerged as a promising technique for biofabrication.¹⁴ Biofabrication is the process of making biologically functional products in an automated way. It involves the structural organization of bioactive molecules, living cells, and cell aggregates (such as micro-tissues, biomaterials, or hybrid cell-material constructs) through bioassembly, followed by tissue maturation processes.¹⁵ It allows for precise control over the structure of tissue constructs, thanks to the automated deposition process, resulting in highly reproducible outcomes.¹⁶⁻¹⁸ The production of diverse geometries of three-dimensional tissue constructs required the use of biomaterials and/or living cells, referred to as bioink, which were coordinated with the movement of a motorized stage.^{14,16,19} Broadly speaking, contemporary 3D bioprinting methodologies can be categorized into two main types: indirect and direct fabrications. The indirect method employed in this study encompassed the initial fabrication of molds, subsequent casting with the appropriate positive biomaterial, and the subsequent selective removal of the molds. In contrast, direct 3D bioprinting methods employ a sequential approach, either point-by-point or layer-by-layer, to fabricate three-dimensional structures.²⁰⁻²⁴ This technique enables the deposition of multiple cell types and/or biomaterials, thereby facilitating the creation of tissue constructs that exhibit enhanced reproducibility and heterogeneity.¹⁶ Based on

the techniques, 3D bioprinting is nowadays classified as laser-assisted bioprinting (LaBP), inkjet bioprinting/droplet bioprinting, and extrusion-based bioprinting.^{14,25–27}

Early stages of bioprinting development showed their potential uses in regenerative medicine.²⁸ The flexibility it offers has accelerated the growth of tissue engineering applications. The advent of 3D bioprinting technology presents a significant opportunity for innovation, with the ability to introduce novel solutions that could have substantial implications across various domains, including the field of dentistry. This review aims to explore recent advances in 3D bioprinting and its potential applications for developing nanocomposite scaffolds related to dentistry. To achieve this objective, various literature in regard to the topic of synthesizing nanocomposite scaffolds using 3D bioprinting, which uses bioink, to synthesize various potential scaffolds for dentistry are explored.

REVIEW

The PubMed and Scopus databases were searched for articles using the various search strategies and selection criteria described above. The initial database search shows 166 articles, which will be reviewed for compliance with the selection criteria based on their title and abstract. Afterward, the articles would be fully screened in their full text. The final selection shows 9 articles that are suitable for review. The articles relate to 3D bioprinted nanoparticles, hydrogels, and cells as scaffolds in dental tissue engineering examined with in vitro or in vivo cellular assays.

1. A bioprinted nanocomposite scaffold of growth factor-loaded nanoparticles, stem cells, and hydrogels

The complex structure of tissue makes it difficult to fabricate an ideal scaffold to ensure proper tissue regeneration. A study used a triad of tissue engineering principles in the 3D bioprinting design by incorporating growth signals into the nanoparticles to promote cell growth.

Connective tissue growth factor (CTGF) and transforming growth factor- β 3 (TGF- β 3) were conjugated to polydopamine (PDA) nanoparticles' surfaces using NHS/EDC grafting. Bone marrow mesenchymal stem cells (BMSCs) were used to regenerate tissues, while gelatin, hyaluronic acid, and sodium alginate were used to create hydrogels. The PDA nanoparticles ensure prolonged release of growth factor until day 35, with a prominent cell viability of 99% on day 7. The 3D bioprinted scaffold shows prominent differentiation capabilities, as shown by the high concentration of collagen types I, II, and aggrecan.²⁹

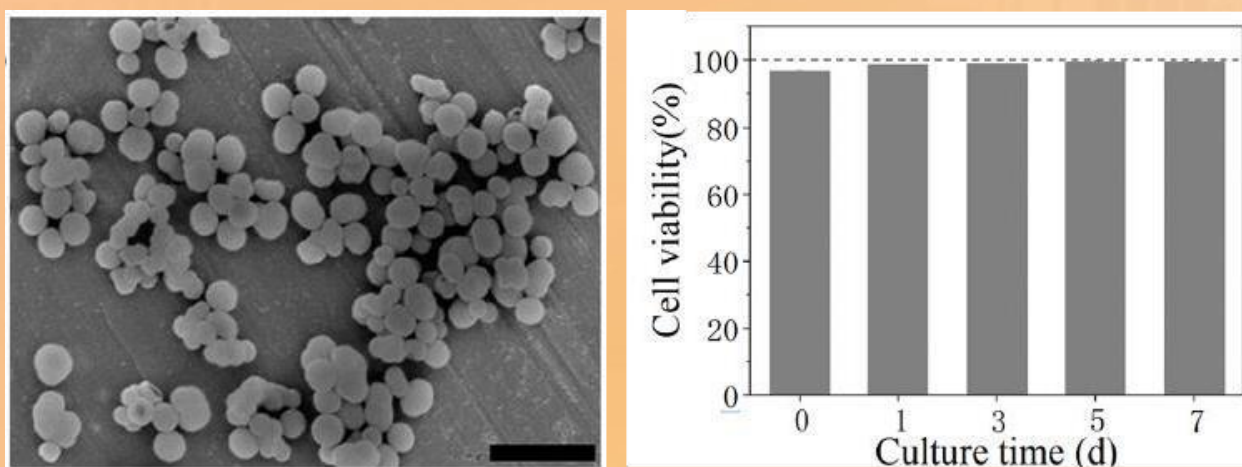


Figure 1. SEM images of PDA nanoparticles and cell viability assay of the 3D bioprinted scaffold²⁹

2. Multifunctional bioinks with bioactive nanoparticles

Bioink was created utilizing amine-functionalized copper (Cu)-doped mesoporous bioactive glass nanoparticles (ACuMBGNs) with alginate dialdehyde and gelatin as a hydrogel. The formulation enables covalent chemistry to enable the cell-adhesive properties of the inks. The inks were printed with cells encapsulated inside the hydrogels, and cellular assays were conducted. The 3D bioprinted scaffold was found to have high MG63 cell viability and osteogenic behavior.

Osteogenesis and angiogenesis were measured with ALP, RUNX2, BMP2, VWF, VEGF, and HIF expressions produced by the printed cells.³⁰

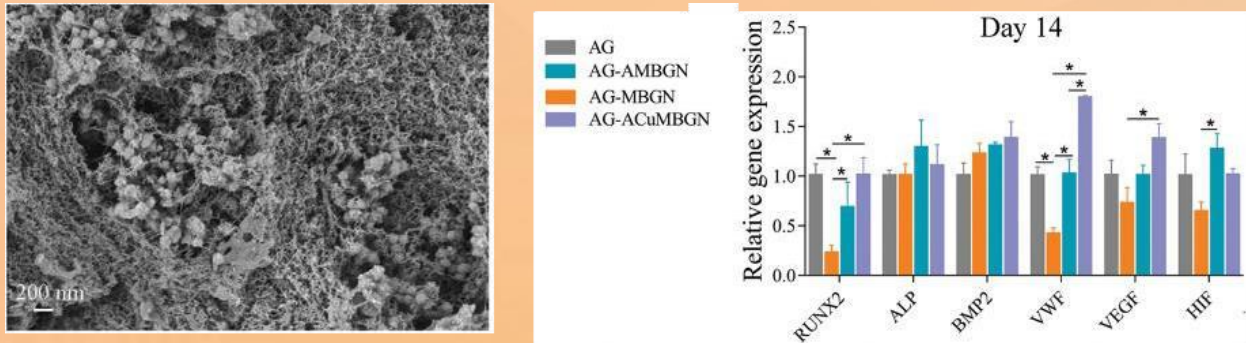


Figure 2. SEM images of ACuMBGNs, and osteogenesis, also angiogenesis expression, induced the 3D bioprinted scaffold³⁰

3. *Bio-plotted hydrogel scaffold with core and sheath for bone tissue regeneration*

The study by Seok et al. (2021) The research effectively produced bio-scaffolds through the implementation of a core/sheath plotting (CSP) technique, which involved the integration of sodium alginate (SA) and hydroxyapatite (HA) nanoparticles. The incorporation of higher concentrations of HA particles and SA hydrogel resulted in the improvement of the mechanical characteristics and supported the growth of osteoblast-like cells in terms of viability, proliferation, and osteogenic differentiation within the scaffold. In addition, the printability of the bioinks was confirmed. The scaffold design that has been proposed exhibits potential for the regeneration of bone tissue and needs additional investigation is warranted to explore the management of diverse bio-plotting (BP) circumstances, including the selection of base materials, cell types, printing settings, and strand characteristics, with the aim of enhancing scaffold manufacturing for the purpose of tissue regeneration.³¹

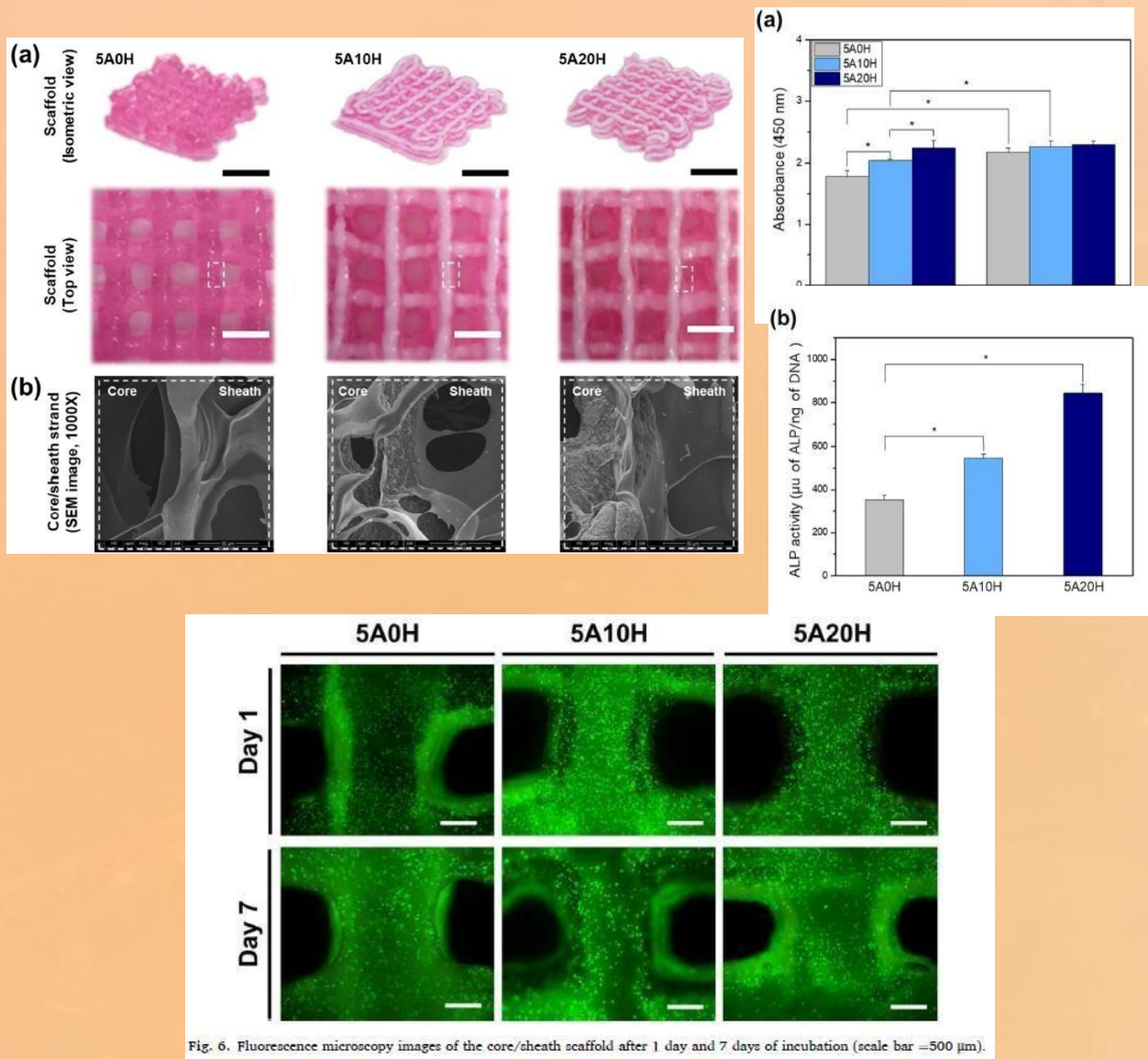


Fig. 6. Fluorescence microscopy images of the core/sheath scaffold after 1 day and 7 days of incubation (scale bar = 500 μ m).

Figure 3. Core/sheath scaffold SA/HA nanoparticles and their biological properties³¹

4. Nanocomposite bioink composed of alginate, cellulose nanofibrils, and polydopamine nanoparticles for bone tissue engineering

A study related to bioink development was conducted by Im et al. (2022). The research conducted here involved the development of nanocomposite hydrogel-based bioinks for the purposes of 3D bioprinting and bone tissue engineering. These bioinks were formulated using alginate, tempo-oxidized cellulose nanofibrils (TOCNF), and polydopamine nanoparticles

(PDANPs). The results of rheological experiments and printability tests demonstrated that bioinks including 1.5% alginate and 1.5% TOCNF, with or without the addition of 0.5% PDANP, exhibited favorable characteristics for 3D printing. Furthermore, *in vitro*, investigations of 3D-printed osteoblast-laden scaffolds revealed that the bioink containing 0.5% PDANP stimulated substantial osteogenesis. TOCNFs and PDANPs improved alginate bioink mechanical characteristics, printability, and biological activity. This bioink can print mesenchymal stem cells, osteoprogenitor cells, and artificial bone tissues and scaffolds for bone tissue regeneration.³²

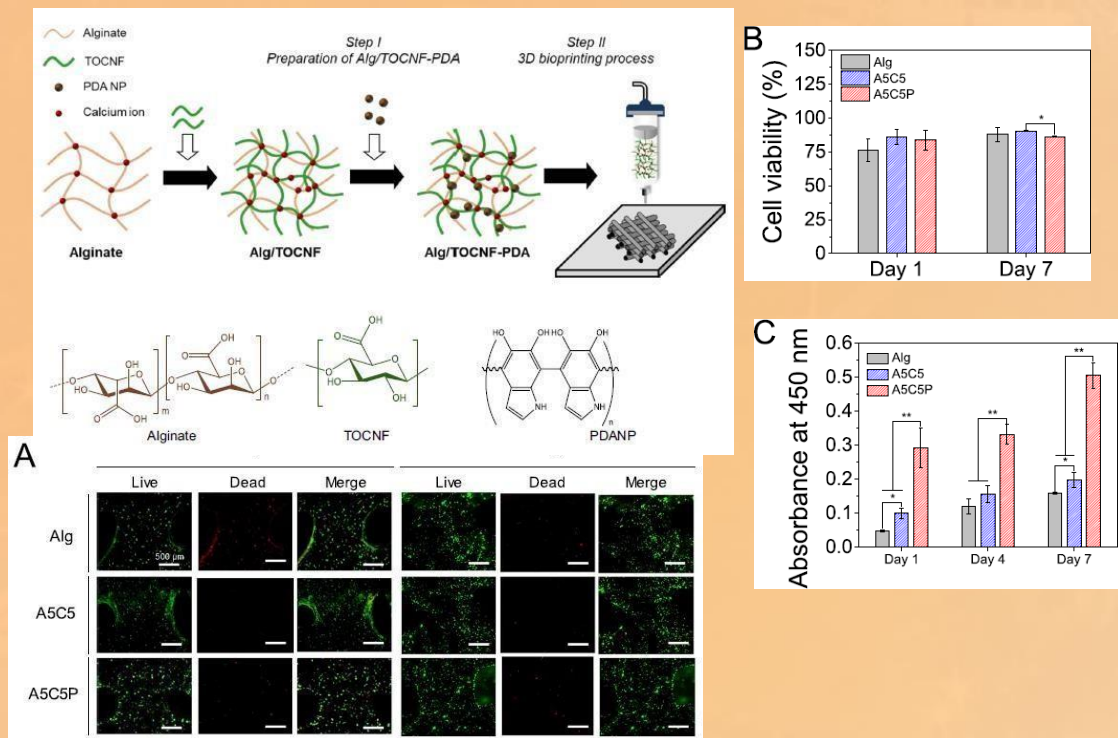


Figure 4. Bioink preparation of alginate, TOCNFs, and PDANPs for 3D bioprinting and its biological performance³²

5. Nanocellulose/Chitosan-Based Bioink for 3D printing

The study by Maturavongsadit et al. (2021) formulated a bioink using nanocellulose and chitosan for the purpose of 3D bioprinting bone tissue engineering structures. The optimization of the bioink involved the manipulation of the concentrations of glycerophosphate, hydroxyethyl cellulose, and cellulose nanocrystals (CNCs) in order to enhance the speed of gelation kinetics and maintain the structural integrity of the printed material. The inclusion of CNCs in chitosan scaffolds was found to enhance osteogenesis in MC3T3-E1 cells. This enhancement was demonstrated by an increase in alkaline phosphatase activity, calcium mineralization, and the creation of extracellular matrix. The utilization of CS-CNC scaffolds exhibited a notable enhancement in the process of osteogenic differentiation, therefore indicating their promising capability in facilitating the regeneration of bone defects.³³

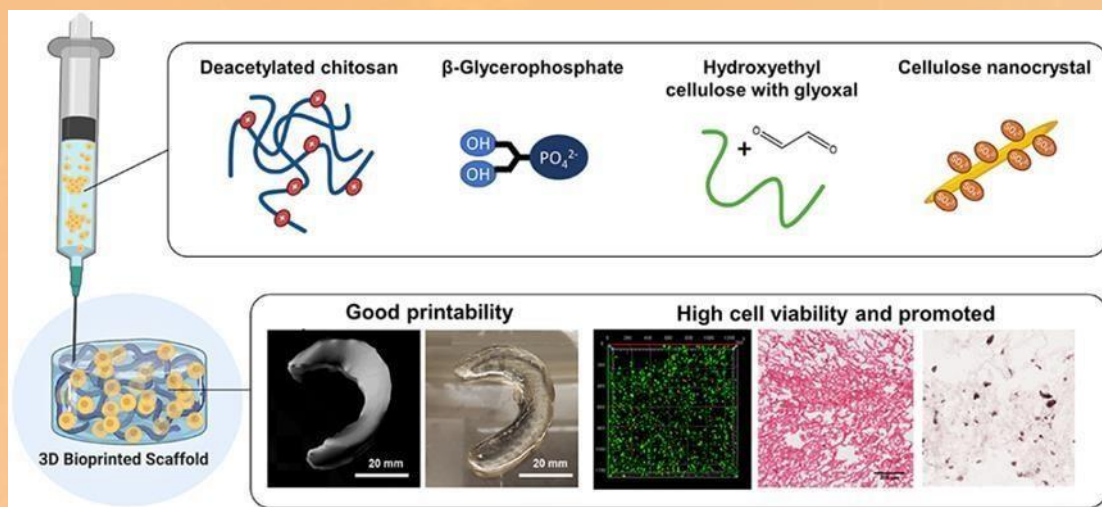


Figure 5. Nanocellulose/chitosan-based bioinks for 3D bioprinting³³

6. Multifunctional strontium-gelatin nanocomposite bioinks

The research conducted by Alcala-Orozco et al. (2020) involved the formulation of a nanocomposite bioink for 3D bioprinting called Sr-GelMA, which consisted of gelatinmethacryloyl hydrogel combined with strontium-carbonate nanoparticles. The Sr-GelMA hydrogels exhibited improved printability in comparison to GelMA alone, as seen by their heightened viscosity profiles. The Sr-GelMA scaffolds that were bioprinted demonstrated remarkable preservation of shape and maintained a continuous network of bioink filaments and pores, even during extended periods of culture of human mesenchymal stromal cells (hMSCs). The presence of Sr nanoparticles enhanced cell viability and osteogenic differentiation in hMSCs. Bioinks and bioprinted constructions using the multi-functional composite system of Sr-GelMA can potentially be used clinically for bone regeneration due to their improved physical and biological performance.³⁴

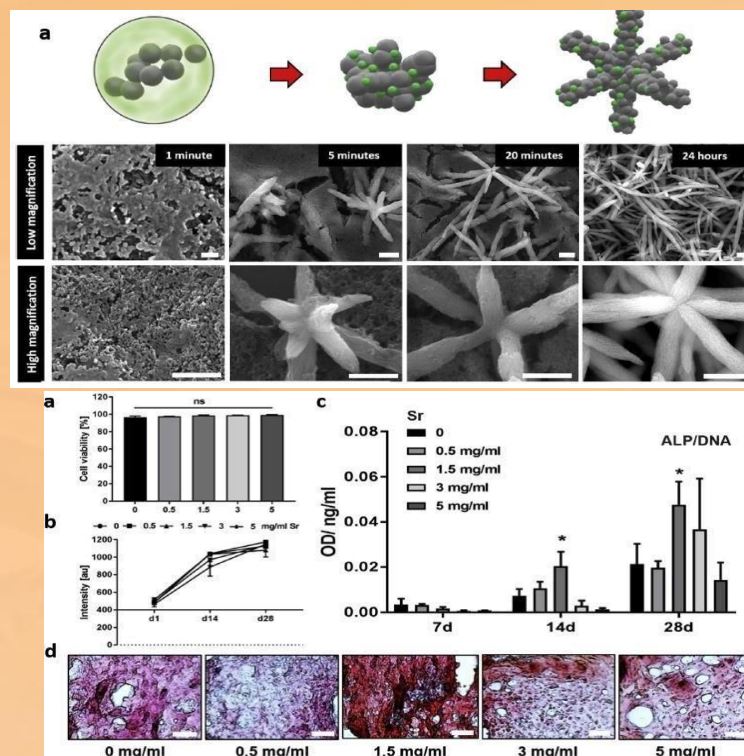
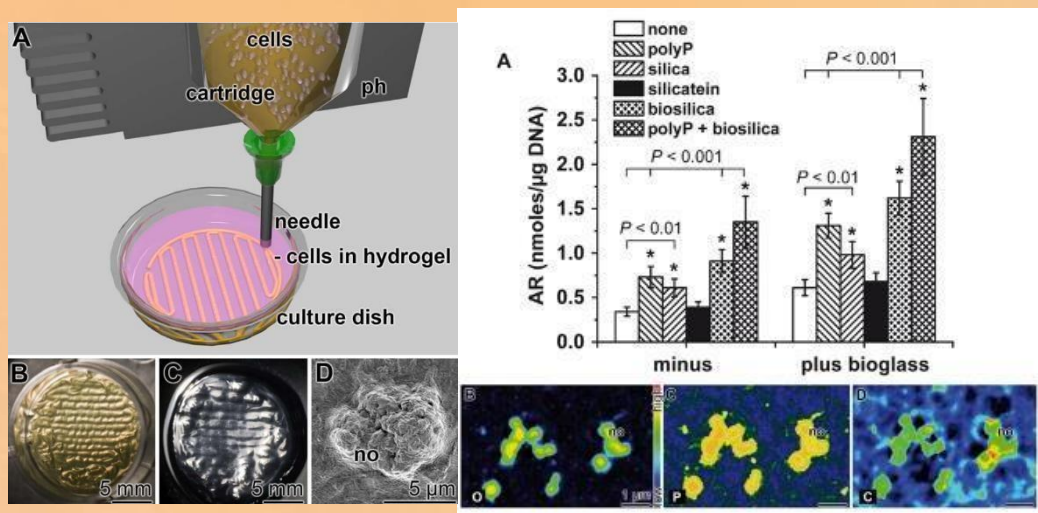


Figure 6. Multifunctional Sr-GelMA nanocomposite scaffold³⁴

7. 3D bioprinting of biodegradable alginate/gelatine hydrogel scaffold combined bioglass nanoparticles with SaOS-2 cell suspension

Bioprinting of SaOS-2 cells in alginate/gelatin can produce a patterned layer in a perpendicular orientation on the cylinder. The cylinder has functioned as an outgrowth of cells, initiating vascularization. The alginate/gelatine hydrogel was supplemented with a polyP Ca²⁺ complex, silica, or biosilica with SaOS-2 cells and bioprinted using computer-designed scaffolds. The results showed that bioglass nanoparticles (55 nm) didn't affect the growth of encapsulated cells. The incorporation of silica, biosilica, or polyP Ca²⁺ did not influence the growth and proliferation of cells.³⁵

Using 5 mg/ml of bioglass nanoparticles in the gelatin to stimulate entrapped proliferation and mineralization of SaOS-2 cells. Adding supplementary silica to alginate/gelatine hydrogel can embed SaOS-2 cells between matrices. On the other side, adding polyP and biosilica stimulates morphogenetically active cytokines, e.g., BMP-2, to embed and differentiate. Poly-P and biosilica have functions to induce BMP-2 in SaOS-2 cells, which have major extracellular fibrillar structural molecular collagen type I and showed osteogenic



potential.³⁵

Figure 7. 3D cell bioprinting and formation of minerals onto SaOS-2 cells³⁵

8. Nanoparticle bone morphogenetic protein-2-loaded mesoporous strontium substitution calcium silicate/recycled fish gelatin 3D cell-laden scaffold (FGSrB) on human Whartonjelly mesenchymal stem cells (WJMSC)

FGSr and FGSrB scaffolds had pores of 500 by 500 micrometers. The addition of a BMP-2-loaded scaffold has a good impact on osteoconduction and enhances bone tissue regeneration and cellular response. Loaded BMP-2 did not interrupt the original structure of FGSr. Adding BMP-2 to the scaffold has an irregular contour structure and many inorganic aggregates distributed on the surface of the scaffold. The result revealed that the level of appetite aggregations increased when SrCs were modified with FG and BMP-2. The amount of apatite on bioceramic surfaces has facilitated subsequent bone tissue formation, including cell attachment, proliferation, and mineralization.³⁶

That scaffold also showed that the slow and sustained release of BMP-2 from the FGSrB scaffold can be applied to clinical orthopaedic materials in the future. The FGSrB scaffold has scattered cells on the covered surface of the scaffold rather than FGSr only. It showed that BMP-2 could increase the proliferation of bone tissue regeneration and healing. The FGSrB has a higher level of Col I, ALP, OPN, and OC of the WJMSC-laden scaffold in osteogenic differentiation medium than the FGSr. The FGSrB scaffold effectively acts as a carrier of BMP-2, controlling the release rate for proliferation and osteogenesis differentiation in WJMS. The incorporation of BMP-2 and Sr-ion could improve several signaling pathways in WJMSC.³⁶

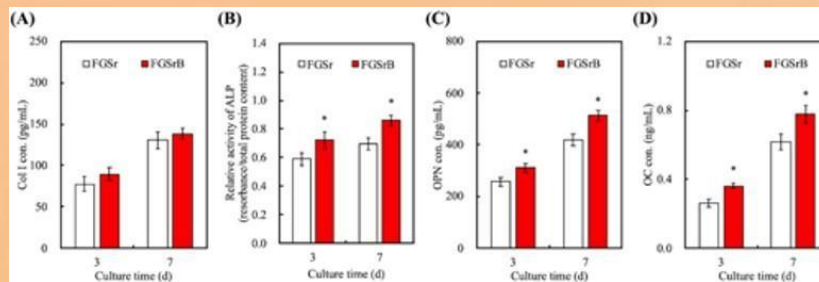
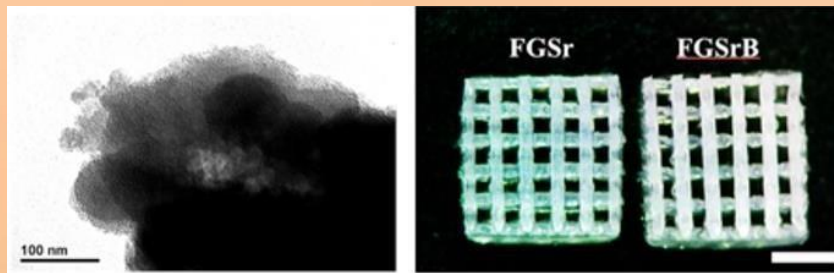


Figure 8. TEM micrographs of mesoporous SrCS nanomaterial and profile of (A) Col I, (B) ALP, (C) OPN, and (D) OC³⁶

9. 3D bioprinting using alginate hydrogel-encapsulated human bone marrow-derived mesenchymal stem cells (hBM-MSCs) combined calcium peroxide nanoparticles (CPO NPs) and BMP2 NPs

CPONPs were fabricated with hydrolysis-precipitation methods. Scaffold containing CPO 3% has sufficient oxygen gas for 20 days, increased mechanical strength after 20 days, and good stability. CPO nanoparticles have good viability for embedded hBM-MSCs. Live/dead staining showed a 22% improvement in viability in CPO 3%. The incorporation of BMP2 NPs into the scaffold can upregulate of runt-related transcription factor 2, collagen type I alpha 1, and osteocalcin. It concluded that this scaffold can improve host tissue healing.³⁷

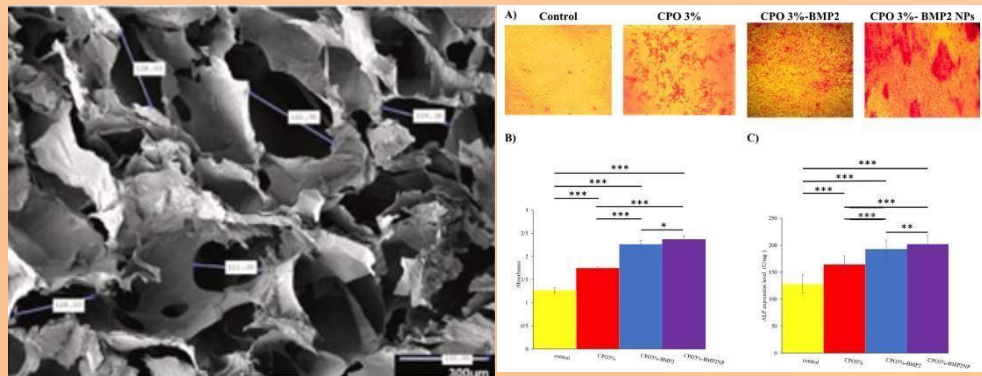



Figure 9. SEM images of scaffold and osteogenic characterization of hBM-MSCs encapsulated in the 3D scaffold; (A) microscopic images of samples stained with Alizarin red; (B) Alizarin red-stained sample quantified data; (C) ALP activity³⁷

DISCUSSION

The challenges and drawbacks of tissue engineering induce various approaches to be applied to improve the effectiveness and efficacy of the therapy. Tissue engineering applications in dentistry often involve complex networks and relations between cells, materials, and microbes in the tissue that often involve small and delicate areas that are prone to infection.^{38,39} A scaffold that is bioactive and multifunctional is often needed to induce regeneration, prevent infection, and deliver drugs with ideal physicochemical properties. A method to print the scaffold using a bioink consisting of polymers, nanoparticles, and cells is one of the most promising approaches to reaching the ideal scaffold for tissue engineering purposes.^{40,41}

The components inside the bioink play important roles in the scaffold's efficacy. The design and fabrication of bioink are very challenging as they involve various factors. The ideal bioink has prominent printability, stability, biocompatibility, biodegradability, and mechanical properties with the capability to interact and bind cells. Bioink materials should enable cells' proliferation and differentiation to create cell-laden bioinks to enable dental tissue regeneration.⁴² These properties could be optimized using various materials and various manipulation approaches.



Nanoparticles were often added to the system to act as fillers for the hydrogel in order to improve its physicochemical properties. The addition of nanoparticles could enhance surface area and optimize the size and shape to promote hydrogels' printability.⁴² Despite their main role, nanoparticles have new roles in bioink that could be adjusted and optimized with various properties needed. Some of the studies reported methods to fabricate biofunctional nanoparticles to improve cell adhesion, cell viability, and proliferation. This could be done by loading conjugating biomolecules onto the nanoparticles. A study reported their findings on CTGF and TGF- β 3-loaded nanoparticles that could improve growth factor release and cell viability.²⁹ Functionalization of the nanoparticles could also be utilized to introduce functional groups or ions onto the surface to create a cell-laden bioink with antimicrobial properties.³⁰ This shows that the conventional view of nanoparticles as fillers is changing to the fabrication of multifunctional nanocomposite to create scaffolds with more efficacy.

Hydrogels are one of the most important components of bioinks in 3D bioprinting. Hydrogels are networks with three-dimensional crosslinked polymer chains that can retain water and swell without dissolution.⁴³ Hydrogels have properties that resemble extracellular matrix and could enable cell viability and binding. Hydrogels could also be customized to match specific target application areas.⁴⁰ Polymers are often used to fabricate hydrogels. Biopolymers should have low toxicity properties, prominent bioactivity, induce cellular activity and viability, be biocompatible, have high hydrophilicity, and induce tissue regeneration.⁴¹ Hydrogel fabrication in bioinks is challenging as it should enable a homogeneous distribution of cells inside the bioink to create a prominent 3D bioprinted scaffold.⁴³ Improper fabrication of hydrogels could also enable various unwanted effects related to polymerization residues that could lead to cellular and tissue

damage. The long-term release of the residues is related to the degradation of the polymer over time.⁴⁴

Various polymers have been used as materials to fabricate bioinks. Collagen is known as one of the most common ink materials because it is biocompatible and has low immunogenicity. Gelatin is also often used as it has amino acid functional groups that could enable prominent cells' binding and encapsulation. Alginate is also often used for its excellent gelation, low toxicity, and low cost. Chitosan is also used as its polycationic properties could support cell viability, proliferation, and differentiation.^{45,46} These show that polymeric materials chosen for bioinks should have excellent mechanical properties, controlled biodegradation, and nontoxic, and have prominent abilities to support cellular activities.

Fabrication of adequate bioinks is needed to enable good tissue regeneration. Bioinks have been used to regenerate various tissues, such as bone, cartilage, and skin.⁴⁶ Each of the tissues has specific needs that should be addressed with a specific design. A literature search conducted found that 3D bioprinting is currently uncommon in the field of dentistry, despite the huge clinical needs and demands. Oral tissues provide an abundant source of cells to be utilized for tissue regeneration. Mesenchymal stem cells (MSCs) are often used as the cell source for regeneration because of their potency to differentiate and their good immunomodulatory properties. MSCs are abundant in oral tissues in the periodontal ligaments, dental pulp, apical papilla, exfoliated deciduous teeth, or gingiva.^{47,48} Bioinks fabrication on the principle of 3D bioprinting could be used to address various problems in dental regenerative medicines, such as dental pulp regeneration, dentin regeneration, periodontal ligament regeneration, alveolar bone regeneration, and whole tooth engineering.⁴⁹ The technology has the potential not only for hard tissue regeneration but also oral soft tissue regeneration, which shows promising potential to be generated using the bioinks to regenerate oral

mucosa and gingiva to reduce the need for live tissue grafts.⁵⁰ These show the urgency and need for more research in the future to fabricate bioinks for 3D bioprinting scaffolds for dental applications.

This review concluded that the fabrication of 3D bioprinting using synthetic or natural polymers as scaffolds that can be reinforced with nanoparticles and combined stem cells could be a great candidate for bone regeneration. So far, 3D bioprinting has been widely used in regenerative medicine in general. Therefore, the development of 3D bioprinting has the potential to be applied to clinical regenerative dentistry in the future.

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"Braille-Based Dental Health Education in Improving Dental and Oral Hygiene for The Visually Impaired Individuals"

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Background: Blind People are at risk of having poorer oral hygiene compared to people who have normal vision due to lack of knowledge and education about oral health in blind people. Blind people need dental health education with the right method and according to their limitations. Braille-based dental health education is an educational method with tactile reading and writing media commonly used by blind people. **Objective :** To determine the effect of Braille-based dental health education in improving oral hygiene of blind people. **Methods :** Collection of references from articles and literature regarding the effect and effectiveness of braille-based dental health education in enhancing oral hygiene for blind people was obtained from several academic databases, namely Google Scholar, Pub Med, Research Gate, and Elsevier that were published in the last 10 years. **Results :** Based on literature studies that have been carried out, most of the results show that Braille-based dental health education is influential and effective in improving oral hygiene of people with visual impairments. **Conclusion :** Braille-Based dental health education can increase knowledge about dental health which has good impact on the ability to maintain oral hygiene for blind people. It can be concluded from almost all research conducted that there is an influence of Braille-based dental and oral health education in improving dental and oral hygiene in visually impaired people, and the results will be more optimal if Braille-based dental and oral health education is combined with the ATP method (audio, tactile, performance).

Keywords : Braille, Dental Health Education, Oral Hygiene, Visually Impaired

INTRODUCTION

In 2020, the International Agency for the Prevention of Blindness (IAPB) reported that 1.1 billion people in the world suffer from visual impairment, consisting of 43 million people experiencing blindness, 295 million people experiencing moderate to severe visual impairment, and 258 million people experiencing mild visual impairment (1). Indonesia is fourth out of five countries with the highest number of people experiencing visual impairment after China, India, Pakistan, then last is the United States (2).

Visually impaired people are at risk of having poorer oral health when compared to people who have normal vision (3). The research findings by Liu et al., in Northeast China showed that the prevalence of dental caries and the incidence of dental calculus among the blind were higher than in the general population (4). Research conducted by Goud et al in 2021 on visually impaired people found that the prevalence of dental caries was 49.3%, periodontal disease was 87.4%, and poor oral hygiene status was found in 24.7% of blind and deaf people in China, India, Pakistan, then the United States in the last place (2).

Education on dental and oral health plays an important role in forming actions to maintain dental and oral hygiene such as brushing teeth and so on (5)(6). Dental and oral health education is one activity that can promote dental and oral health awareness and maintain dental and oral health. (7). Disability-related populations are never given enough dental and oral health education. This is due to the fact that teaching disabled groups about dental and oral hygiene is not their top concern but teaching disabled people about managing their disability is (8).

Visually impaired people need appropriate educational methods to gain knowledge due to their limitations (9). Dental health education methods for the visually impaired include music-based tooth brushing techniques, tooth brushing education using a jaw model, lectures, and braille-based dental and oral health education. (10). Braille-based oral health education is one of the appropriate methods for visually impaired person (9). The aim of writing this literature review is to determine the influence of braille-based dental and oral health education in improving dental and oral hygiene for visually impaired people .

Collection of references from articles and literature regarding the effect and effectiveness of braille-based dental health education in enhancing oral hygiene for Visually impaired people was obtained from several academic databases including Google Scholar, Pub Med, Research Gate, and Elsevier that were published in the last 10 years.

REVIEW

Vision that is not working properly leads to People who are blind or visually impaired may have challenges that prohibit them from connecting with others, learning new things, experiencing diversity, and recognizing their surroundings. (11). Visually impaired people have limitations in terms of tactical and visual experiences compared to someone who have normal vision. When it comes to learning about the environment, visually impaired people rely more on tactile (feeling) and auditory (hearing) information than average people do. In addition, support from parents and teachers to use clear and repeated instructions regarding a concept for visually impaired people plays an important role (12).

Braille is a reading and writing method used by Visually impaired people throughout the world, composed of a collection of raised dots (cells) in the form of a certain formation (12). Braille consists of 6 dots or holes that can be read by gently and slowly touching the writing that appears or stands out on the paper. Braille has 63 characters, consisting of letters, numbers, punctuation, repetition marks, capital letters. For ease of description, the three dots on the left are numbered 1, 2 and 3 from top to bottom, and the three dots on the right are numbered 4, 5 and 6. One or more of the six dots are varied in their position in the

domino frame so that they form in 63 kinds of combinations which are enough to describe the alphabet, numbers, punctuation, mathematics, music, etc (13).

Braille-based dental and oral health education is a learning method in dental and oral health education using braille specifically for the blind or someone with visual impairments.(9). Dental and oral health education using braille can be provided in the form of booklets, whiteboards, and pamphlets containing braille-based dental and oral health guidelines (14)(15)(16).

Education on dental health in the form of booklets and pamphlets containing various materials. The material provided consists of the importance of oral health, tooth function, how to brush teeth properly and correctly, different dental and oral hygiene tools, diet or food suggestions such as reducing sugar consumption, and bad habits that have a bad impact on oral health (8)(17). Other material can also be provided in the form of oral health instructions consisting of brushing teeth twice a day morning and night with fluoride toothpaste and a soft-bristled toothbrush, rinsing mouth after eating, reducing sugar consumption, increasing consumption of fibrous foods such as fruit and vegetables, and routine dental check-ups every six months to maintain good oral hygiene (18). Material regarding dental related problems as early symptoms of gum disease and periodontal problems may be provided. A detailed explanation of dental caries is also given (10).

Research conducted by Istadi et al (2020) on 18 blind students aged 7-21 years at Special school for the vision impaired (SLB-A) TPA and SLB Negeri Jember aims to analyze the effect of braille-based oral health education on the level of dental and oral hygiene of visually impaired people. The research method used was pre-experimental with a one group pretest-posttest design. Subjects were given education using a braille-based oral health guidebook. Subjects were asked to maintain oral hygiene by brushing their teeth twice a day for 21 days. On the evaluation on the first day, oral hygiene was measured using the OHI-S Green and Vermillion indexes before being given treatment and toothbrush training, the second evaluation was carried out on day 10, and the third evaluation was carried out on day 21. In the results of educational research for 21 days can reduce the OHIS index of the three age categories, namely in the age category 5 -11 years decreased by 0.66, age 12 - 16 years by 1.74, and age 17-21 years by 1.00. The highest score reduction was found in the 12-16 year age category, because at the time of the study subjects in the 12-16 year age category had the highest self-confidence compared to other subjects. Education for 21 days can reduce the OHI-S index gradually from evaluation one to evaluation two and further decreases in evaluation three with a p-value of 0.001 (19).

These results are in line with research conducted by Rosalina and Sopianah (2019). This research states that counseling on how to brush your teeth using braille has an effect on the knowledge and oral hygiene of Visually impaired people in Special School in Tasikmalaya City. This type of research uses a quasi experimental design, with a two group pre and post test design with control research design. The sampling technique used was purposive sampling, Visually impaired people in Special School (SLB) Tasikmalaya City. The sample in this study consisted of 12 people divided into 2 groups, 6 people in the treatment group and 6 people in the control group. The treatment group was given counseling on how to brush their teeth using braille, while the control group was given counseling without braille or using the lecture method. The results of knowledge and oral and dental hygiene before and after between the two groups were then compared. Measurement of the level of dental and oral hygiene in this study used the OHI-S Green and Vermillion index. The results of statistical tests on dental and oral hygiene for Visually impaired people before and after being given education on how to brush their teeth using braille showed that the average OHI-S before being given counseling in the treatment group was 3.2 and decreased after being given the education, to 1.8. The Wilcoxon test results obtained a value of $p=0.025$ ($p<0.05$). So it

can be concluded that education on how to brush your teeth using Braille is effective in improving oral and dental hygiene for Visually impaired people at Special School (SLB) Kota Tasik Malaya (20).

Another study by Tavargeri and Kudtarkar (2018) aimed to assess knowledge, attitudes and awareness of dental and oral health using a questionnaire in braille and correlate the effect on dental and oral hygiene practices after attending dental and oral health education using braille. A total of 100 blind children aged 8 – 14 years were randomly selected from two schools for the blind. The research was conducted for eight weeks. At the start of the study, the oral hygiene index (OHI-S) was recorded. Children were given oral hygiene instructions verbally and in braille individually on day 1, day 15 and day 30. After 2 months, the oral hygiene index (OHI-S) was re-recorded to estimate the effectiveness of oral health education using braille. OHI-S scores before and after intervention showed highly statistically significant results ($p=0.001$). The ability of visually impaired people to translate verbal instructions is very accurate. This study included both verbal and braille instructions, and the individualized approach to blind children may have been a success factor in promoting oral health practices. Thus blind children showed acceptable improvement in following oral health education written in braille with repetition and reinforcement of the instructions (17).

Similar results were also found in research conducted by Sabilillah, et al (2016) at Tamansari State Special School which aimed to analyze the effect of Dental Braille Education on oral hygiene in blind children. This research was pre-experimental with a group pre-posttest design, then an index plaque examination was carried out before the intervention. The intervention given to the sample was in the form of an assessment of the degree of oral hygiene using an index plaque and Dental Braille Education (Braille-based oral health education) in the form of a booklet. The sample for this research used purposive sampling, 12 visually impaired children at the Tamansari State SLB. The results of the analysis of the difference in changes in oral hygiene from posttest to pretest showed that there was a significant change with $p=0.02$ ($p>0.005$) (9).

Khurana et al (2018) conducted research on the effectiveness of a dental and oral health education program using braille text in a group of blind children. The aim of this study was to evaluate the impact of oral hygiene instructions in the form of braille text and verbal instructions on the oral health status of blind children. The method used was a non-randomized before-after comparison trial without a control group, conducted on 165 children aged 7 - 19 years who were lived in one of the schools for the blind in Delhi. The child's oral health status was evaluated by recording the plaque index (PI) and gingival index (GI) scores at intervals of one, three and five months. Regular strengthening of dental and oral health education is carried out with the help of braille instructions. The results obtained in this study were that among completely blind children, the mean difference in PI and GI from baseline to the last evaluation was found to be 0.56 and 0.28. Meanwhile, among partially blind children, it was found to be 0.58 and 0.25 respectively. All values are statistically significant ($p < 0.05$) (8).

Another study was conducted by Bhor et al (2016) regarding the influence of dental health education in the form of braille and OHT (oral health talk) on the knowledge, practice and status of oral hygiene among blind female students aged 12 – 17 years in Pune City. The aim of this study was to assess the effect of dental health education in the form of braille and in combination with OHT on the knowledge, practice and oral hygiene status of blind female students aged 12-17 years in the city of Pune. This comparative study was conducted among 74 blind school girls aged 12 – 17 years, who had been trained to read braille. There are two groups, group A, 37 people received oral health education in braille and group B, 37 people received oral health education using a combination of braille and OHT at initial, two and four week intervals. Assessment of oral hygiene status was carried out using the OHI-S, at baseline and at the end of 6 weeks. Intragroup and intergroup evaluation of the OHI-S mean scores was not statistically

significant ($p > 0.05$) after six weeks, but there was a significant difference in the mean debris index (DI) scores in group B compared with group A (21).

Another study was conducted by Tiwari et al., (2019) to assess the hygiene status, knowledge and oral health practices of blind children before and after delivering three different forms of dental and oral health education. This research is a non-randomized interventional study conducted on 90 blind children aged 12 – 15 years using the lottery method and divided into 3 groups (30 children each). Group 1: ATP (audio, tactile, performance), group 2: braille, group 3: combination of ATP and braille. Oral hygiene status was recorded and compared using plaque and gingival indices after intervals of 21 days, 1, 6, and 9 months. The results of this study found that group 3 had the highest percentage of reduction in plaque (55%) and gingival (52%) scores compared to group 1 and group 2. It can be concluded that the combination of ATP and braille is an effective way to improve the oral hygiene status of visually impaired children (15).

Research conducted by Deshpande, Rajpurhoit and Kokka, (2017) states that a combination of oral health education using braille and ATP is the most effective medium for teaching oral hygiene methods to blind children. The purpose of this study was to assess and compare the oral hygiene of visually impaired people before and after oral health education intervention using braille and ATP techniques. This study was a randomized control trial of 60 blind adolescents divided into three groups of 20 each. Group one used braille, group two ATP, and group three a combination of braille and ATP. Pre and post oral hygiene index scores were measured using the Sillness and Loe (1967) plaque index score, after education the index was calculated and recorded for statistical analysis. At the beginning of the study among 20 participants in group one, there were 15 participants with moderate plaque index score category and only five participants with good plaque index score category. After intervention with braille, there was an increase in plaque index, where 9 participants scored good and 11 participants scored moderate on plaque index ($p = 0.001$). Group two initially had only one participant with a poor category, while 13 participants were in the moderate category and 5 participants got a good category. After the intervention with the ATP technique, 18 participants were categorized as good and only one candidate scored moderate on the plaque index ($p = 0.001$). Group three, where oral health education was provided using braille and ATP techniques, obtained statistically significant results when pre and post-intervention scores were compared. Four students scored excellent, 15 students were in the good category, and only one scored moderate ($p = 0.001$). When the number of participants who improved their oral hygiene after the intervention was compared between the three groups, it was statistically evident that the combination of braille and ATP techniques worked very well. Both braille and ATP are effective methods for oral health education, but the combination of the two techniques proved to be more effective (18).

Similar to the research of Gautam et al., (2020) which states that blind children can maintain good oral hygiene levels when taught using a combination of braille and ATP techniques. This study aims to assess and compare the dental and oral hygiene status of blind students before and after oral health education interventions using special methods. This study was a randomized control trial of 180 visually impaired students who were then divided into 3 groups. Each group included 60 students randomly selected from a blind school. Oral health education was provided by braille method in group 1, ATP method in group 2, and combination of braille and ATP in group 3. PI and GI scores were calculated and evaluated at baseline and after 3 months. Highly statistically significant differences were seen for intra-group comparisons of pre and post PI and GI ($P < 0.01$) with lower means after education compared to before in the three groups (16).

DISCUSSION

Research by Istadi et al (2020), Rosalina et al (2019), and Tavargeri and Kudtarkar (2018) reported that dental health education and braille-based education on how to brush teeth had an effect in increasing the level of dental and oral hygiene for visually impaired people. All three studies measured the level of dental and oral hygiene using the same index, the Green and Vermillion OHI-S index and found statistically significant changes in OHI-S scores before and after education (17) (20) (19).

In contrast to the results of other studies, research by Bhor et al., (2016) found that the results of oral hygiene assessments after dental health education using braille or a combination of braille and OHT were not statistically significant. Both methods were not statistically significant but there was a significant difference in the mean debris index (DI) score for the combined method compared to using braille alone. The differences in this study may be due to the fact that oral prophylaxis was not carried out and toothbrushing was not supervised so that the calculus index (CI) was not statistically significant. In addition, assistance from guardians was not considered, which may have had an impact on the oral hygiene status of the visually impaired group (21).

Research by Tiwari et al., (2019), Deshpande et al., (2017) and Gautam et al., (2020) compared the effectiveness of three dental health education methods, braille, ATP, and a combination of braille and ATP. These three studies reported that all three methods showed satisfactory results in improving knowledge, practice and status of oral hygiene. However, it was found that the combination of braille and ATP was the most effective method compared to braille alone or ATP alone. This is because in addition to tactile demonstrations, braille text is included thereby honing memory better for the information learned due to repetition (15). The combination of different senses and the use of media adapted to Visually impaired people is also why the combination of ATP and braille is the most effective method for visually impaired people (16).

In order to improve dental and oral hygiene, complete oral prophylaxis should also be carried out after the intervention. In Deshpande et al's study, complete oral prophylaxis was carried out, so that some participants had quite good scores on the plaque index. Tiwari et al., (2019) research also carried out comprehensive oral prophylaxis and caries treatment after completion of the study (15).

Several review results from the journals discussed above regarding the use of braille in dental and oral health education show an improvement in the dental and oral hygiene of blind children after being given Braille-based educational interventions. The results of research by Istadi, Probosari and Sulistiyani, (2020) which analyzed the effect of braille-based dental and oral health education on the level of dental and oral hygiene of Visually impaired people showed that education given for 10 days did not reduce the OHI-S index but education for 21 days did. decrease the OHI-S index. This means that braille-based oral health guidebooks have an impact on improving dental and oral hygiene. Research conducted by Sabilillah et al., (2016) also showed that there were significant changes from the results of the analysis of the difference in oral hygiene changes from post-test to pre-test after being given Dental Braille Education in the form of braille booklets (9) (19).

Istadi et al and Sabilillah et al's studies have similarities in duration of dental health education, that both studies were conducted for 21 days, and significant differences were found in dental and oral hygiene scores after education was carried out for 21 days. The research was carried out for 21 days in accordance with Foster's 46 theory in Maher et al (2014), which states that changes in health behavior can be measured after 21 days (9).

It can be concluded from almost all research conducted that there is an influence of Braille-based dental and oral health education in improving dental and oral hygiene in visually impaired people, and the

results will be more optimal if Braille-based dental and oral health education is combined with the ATPmethod (audio, tactile, performance).

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Management of the flat ridge using closed mouth functional impression technique and Cu-Sil Denture

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Abstract

Background: Loss of teeth can cause difficulty eating, thereby reducing nutritional intake, which will result in a decrease in general health status. Therefore, it is necessary to rehabilitate oral function with the use of dentures that are retentive and stable. Resorption of the maxilla and mandible can result in a decrease in the alveolar ridge. This usually reduces the stability and retentiveness of the denture. These conditions can be overcome by using good impression techniques to replicate the mucosal surface. One technique that can be used is the close mouth impression technique. Rapid alveolar bone resorption can also be prevented by retaining natural teeth as long as possible in the oral cavity using Cu-sil denture. **Purpose:** The purpose of this case report is to describe the patient's flat ridge rehabilitation process using a denture with a closed mouth impression technique combined with a Cu-sil type denture to maintain the remaining ridge height. **Method:** Evaluation of cases from clinical examination, study model and radiographic photographs determines the condition of the remaining teeth. Extraction was carried out on the teeth that could not be preserved and left remain teeth 44 and 45. The second functional impression was carried out using the close mouth technique with a light body elastomeric impression material. Then fabricating dentures are made from acrylic by making holes or gaskets on teeth 44 and 45. **Result:** in the third control H+7, relining was performed to increase denture stability and retentivity. The patient can then wear his denture comfortably.

Conclusion: Cu-sil denture fabricated with close mouth impression technique is a method to rehabilitate the oral function of edentulous flat ridge patients. Periodic control is needed to check whether there is resorption and requires relining.

Introduction

Losing teeth can cause difficulty eating, reduced nutritional intake which results in a decrease in general health status. Therefore, it is necessary to rehabilitate the function of the oral cavity by using dentures that are retentive and stable.(1) Every denture manufacture has its own challenges. Maxillary and mandibular resorption can result in reduction of the alveolar ridge. Bone resorption is usually more rapid in the mandible. This usually reduces the stability and durability of the denture. Patient will experience discomfort and can even cause pain while using this denture.(2)

Alveolar bone resorption often occurs in the first year after tooth extraction. Denture fabrication must be done as well as possible so that it can function neuromuscularly in the oral cavity. To overcome this condition, a modification of the impression technique can be made to get accurate results.(3) The impression technique that is well known for cases like this is the close mouth technique. This method allows functional movement of the patient during the impression, creating a negative pressure that acts as a seal on the border of the denture.(1)

To prevent residual alveolar ridge resorption, we need to preserve the remaining teeth as much as possible. Treatment options in cases like this are by making Cu-sil dentures. Cu-sil dentures make it possible to preserve teeth in good condition by making gaskets or holes allowing natural suction from under the denture. (4)

Case

An 45 years old male came to Universitas Brawijaya Hospital. The patient complained that many of his teeth had been lost since 2 years ago, thus disrupting his masticatory and aesthetic functions. Patient want to be treated and made dentures that are comfortable to wear. History of tooth loss due to cavities and brittleness. The patient has never used dentures. Subjective and objective examinations are carried out to establish the diagnosis, the prognosis, and the treatment plan. Extra oral examination showed no abnormalities. Intra oral examination edentulous ridge at 18,17,16,14,13,12,11,21,22,23,24,25,28,31,32,36,37,38,41,42,46,47,48; radix of 15,26,27; profunda caries on tooth 43, edentulous flat ridge in posterior lower jaw, shallow vestibule in posterior lower jaw with the height of ridge less than 1 mm.

Case Management

The treatment plan for this patient was complete denture of maxillary arch and complete denture with Cu-sil method at mandibular arch. Close mouth technique impression was done in this case because the patient had mandibular flat ridge. Extraction is performed as mouth preparation on teeth 15, 26, 27, 43. In mandibular teeth 44 and 45 were remain. Anatomical impression was done with alginate to obtain a diagnostic model, using the mucostatic impression technique. After making individual tray and border molding, working model was fabricated with functional mucocompressive impression. Acrylic made was attached at the base of the bite rim to processed maxillo mandibular relation record.

The second functional impression was done with close mouth method using elastomer light body. Material was placed on the surface of fixated bite rim as a tray then inserted intra oral. Instructed the patient to bite the bite rim during impression and manipulated intra oral muscle, close the mouth then grimaced, sucking and swallowing to create the vestibulum border. The result could be seen in Figure 1.

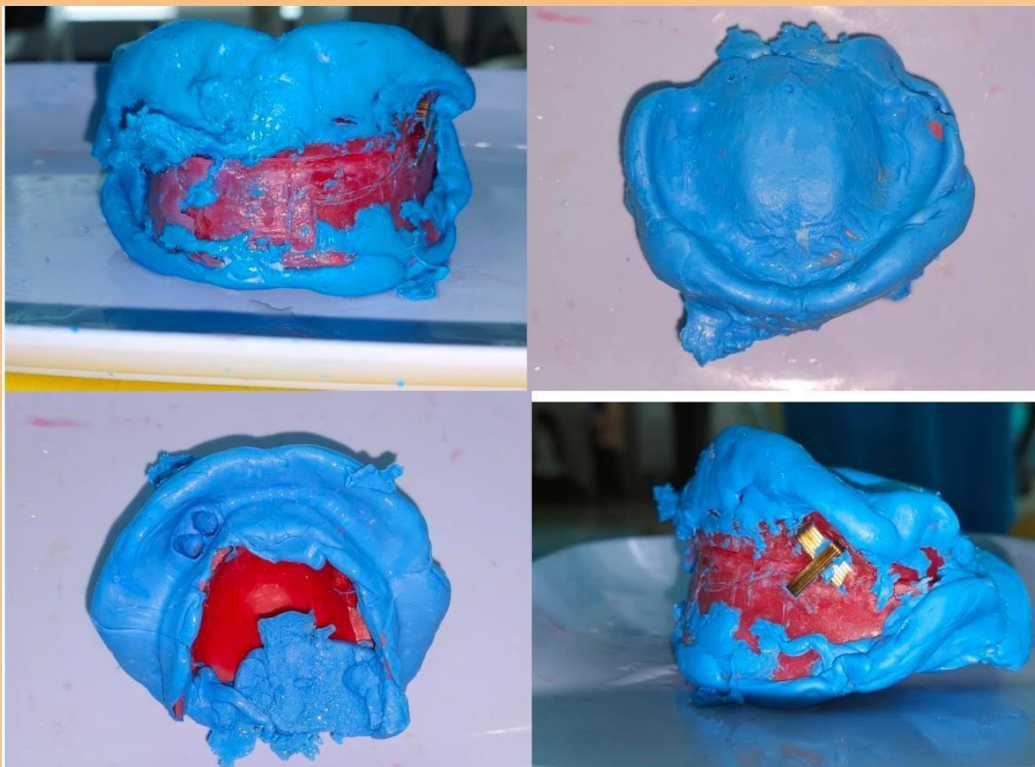


Figure 1. Closed Mouth Impression Technique Results

The next step was to fill the impression with gypsum to get the second working model, and mounting in articulator. Then arranged denture teeth. Arrangement of teeth in the neutral zone, during occlusion according to the Curve Spee from the sagittal direction and according

to the Curve of Monson from the transverse direction. After trial insertion, wax contouring then acrylic packing and polishing.



Figure 2. Try in procedure

After processing, try in acrylic dentures in patient, make occlusal records to correct occlusion. Insertion final dentures was done after selective grinding and final polishing



Figure 3. Final denture insertion

The instructions given to the patient on the first day that the dentures must be worn for 24 hours, except when eating it needs to be removed. Patients are asked to control H+1. On the second day the patient was instructed to use dentures to eat soft food, drink and talk. At bedtime the dentures are removed and cleaned. The next control is carried out in the next 3 days. In the first and second controls, the patient felt comfortable with his dentures and had no complaints. In the third control (H+7) the patient felt uncomfortable with his RA and RB dentures. The patient feels that the denture is unstable. On examination, the maxillary denture was found to be less stable and less retentive, the mandibular denture was retentive but less stable. Then relining was done on the RA and RB dentures.

Discussion

Complete denture fabrication in clinically compromised conditions is a challenging task for the dentist. In this clinical report, we present management of a patient with severely resorbed edentulous ridge (flat ridge) which usually will make difficulty in making dentures because it is hard to obtain retention and stabilization. The success of complete denture relies on the fulfilment of the three basic properties of retention, stability, and support. Flat ridge

offers little possibility of retention and stability. The muscle attachments are located near the crest of the residual ridge so there is more dislocating effect to vertical and horizontal movement. Management of the flat ridge is a complex and difficult task especially in mandible because of smaller denture bearing area than maxillary ridge and other anatomical limitations. (5–7)

The closed mouth impression technique can produce a more retentive denture base for flat ridge because it records peripheral seal and bearing area of the denture with patient's functional. The function of closed mouth impression technique is to obtain optimal muscle trimming and impression with patient's functional pressure and movement. In addition, to obtain the extension of the denture base to movable and unmovable tissue boundaries during function.(2,8) Closed mouth functional impression technique has an advantage such as the possibility of over and underextension is minimal because border molding is carried out by the patient and impression is done in occlusion position, thereby obtaining extension of the denture base to movable and unmovable tissue during function(optimal border molding) and record the ridge in functional pressure. (9,10)

In addition to modification of the impression technique, this patient's treatment also uses the Cu-sil method to maintain teeth 44 and 45. The use of Cu-sil dentures is beneficial for patients who want to use dentures but want to keep the remaining teeth. Also in edentulous cases but the remaining teeth cannot be clasped or the remaining single teeth. Cu-sil dentures can be used as transitional dentures by minimizing the extraction of teeth that are still in good condition. This method is contraindicated in cases of too many remaining teeth and severe undercuts.(11) Cu-sil denture can provide stimulation that maintains the height of the alveolar bone, increases retention and increases the patient's vertical dimension. This treatment does not require any special treatment steps for the teeth to be maintained, and does not require additional patient visits. If, for example, there are additional teeth missing, the denture can still be modified to accommodate additional tooth elements. (12–14)

Loss of teeth, especially the mandible, can accelerate alveolar bone resorption. This can cause difficulties in gaining retention and stability. Therefore, if there are some teeth left in good condition, they can be preserved using the Cu-sil denture method. This method is useful for maintaining the alveolar ridge bone. The retention and stability are also better than ordinary full dentures because they can withstand lateral movement of the denture by holding the tooth neck firmly. The limitations of this method are that it requires repeated relining if plasticity is lost, as well as the potential for plaque accumulation in the cervical area of the tooth.(15,16)

Conclusion

Maxillary and mandibular resorption due to tooth loss can result in reduction of the alveolar ridge. To overcome this condition, retentive and stable dentures are needed.

Cu-sil denture fabricated with close mouth impression technique is a method to rehabilitate the oral function of edentulous flat ridge patients. Periodic control is needed to check whether there is resorption and requires relining.

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Management Of Mandibular Anterior Mobile Teeth With Edentulous Bilateral Free End : A Case Report

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Abstracts

Background. As a person ages, many things happen, including loose teeth and loss of teeth. This mobility and loss of teeth can also be caused by other factors such as trauma and periodontal disease. Management of mobility and loss of teeth can be overcome by using splints and dental prostheses. **Purpose:** The aim of this case report was to stabilize the mandibular anterior mobile teeth along with the fabrication of edentulous free end posterior tooth prostheses on both sides of the mandible. **Case :** A 75 years old male patient came to the Dental Specialist Center with the main complaint of loose front teeth in the lower jaw and many missing teeth, especially on the back of the lower jaw on both sides. The patient had difficulty eating because the teeth were loose and many were missing. **Case Management :** This case is a combination of two disciplines, prosthodontics and periodontics. The treatment plan for this case is the construction of a metal frame denture on the posterior mandible and the installation of fiber reinforced composite splint/ FRC on the mandibular anterior teeth. **Conclusion:** Treatment of edentulous posterior free end teeth with mobility of the anterior teeth using a combination of frame denture and FRC can be an alternative treatment that requires skills from two disciplines, prosthodontics and periodontics. The patient is also satisfied with the results of the treatment, because the remaining anterior teeth can be more stable and the patient can chew food as usual.

Keywords : mobile teeth, edentulous teeth, fiber reinforced composite splint, frame denture

Introduction

Periodontitis is the most common and harmful disease among all periodontal diseases. It affects the soft tissue, hard tissue and tooth-supporting structures leading to tooth mobility (1). Tooth mobility is considered as the extent of horizontal and vertical tooth displacement created by examiners force. Assessment of tooth mobility is considered as an integral part of periodontal assessment because it is one of the important signs in the diagnosis of periodontal diseases (2) (3).

Tooth loss is a physical defect that is related to the functional, social and mental state of an individual, and aesthetics concerns as well. Furthermore tooth loss can create an unstable

occlusion. Posterior tooth loss accompanied by advanced occlusion further reduces the number of occlusion pairs present to function.

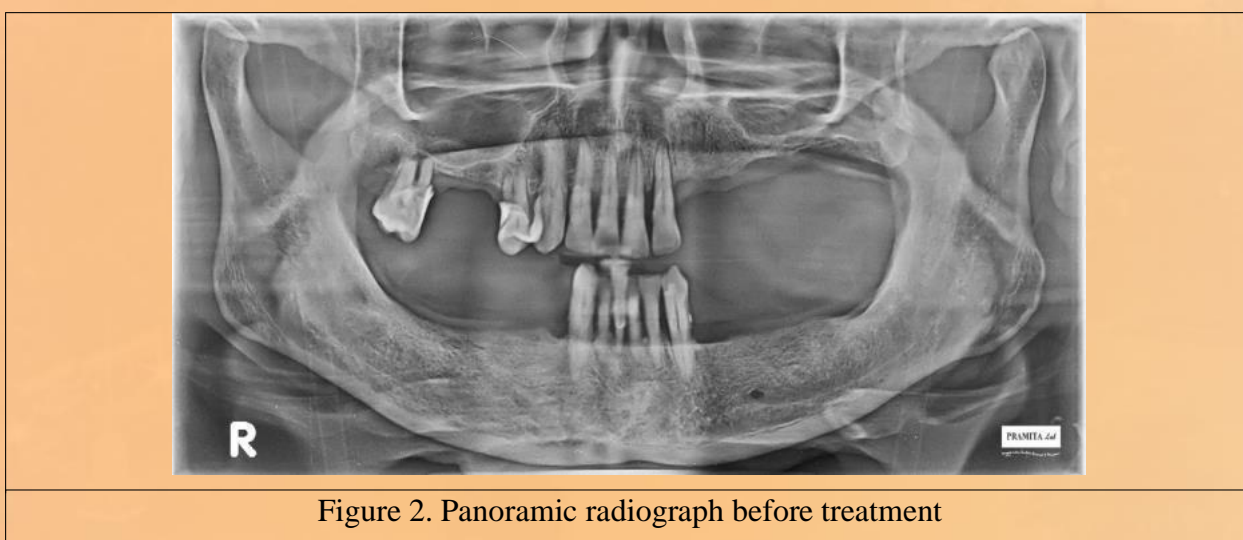
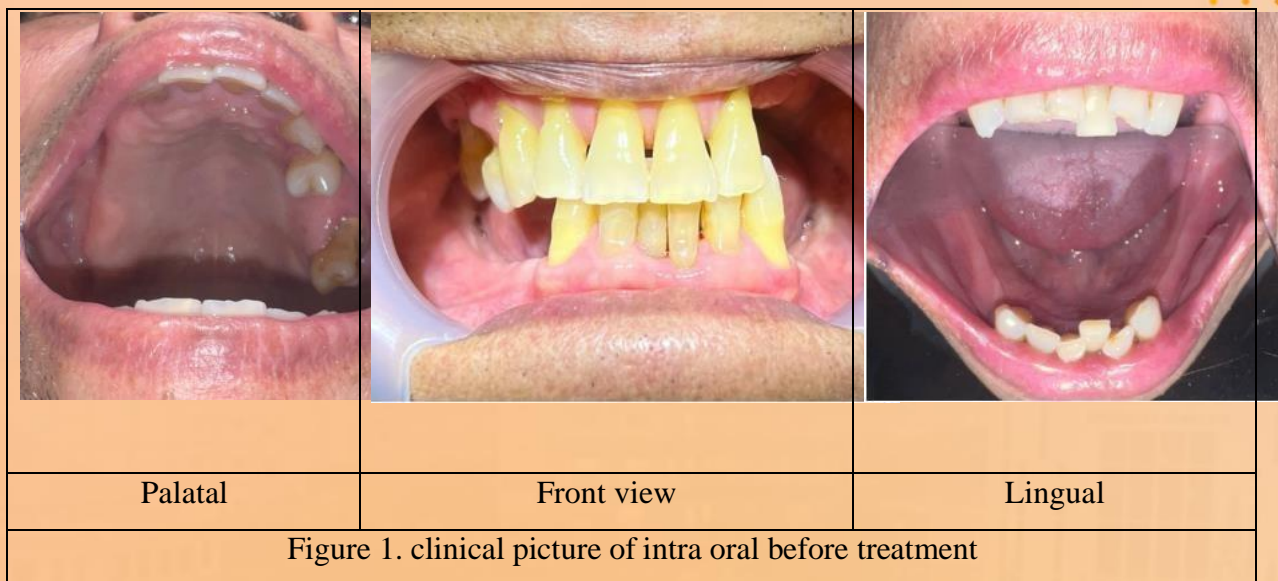
Patients with missing teeth need to replace missing teeth and surrounding tissue structures to improve patient's appearance, masticatory efficiency, prevent tooth movement (extrusion/ shifting), and improve phonetics. The indications for the treatment of removable partial dentures are wide and varied, including in patients with limited financial ability, and could act as temporary dentures (4).

Partial dentures are such device which serves to restore some missing natural teeth with primary support soft tissue under the base plate and support additions are the remaining natural teeth. Periodontal prostheses are defined as a restorative efforts and prostheses are indicated as a comprehensive treatment for a severe periodontal disease. The making partial dentures must pay attention to several things, namely that they must be durable, able to maintain and protect the existing teeth and surrounding tissue, not harm the patient and have a harmonious construction and design (5).

The initial teeth treatment for periodontitis with mobility is splinting. Splinting is a treatment that aims to stabilize or reduce the degree of tooth mobility, while a splint is a tool or material that serves to stabilize and tighten loose teeth (6).

Case

A 75 year old male patient came to RSIGM-SA (Sultan Agung Islamic Dental Hospital) with chief complaint was tooth mobility on his anterior lower teeth with loss of many teeth on both sides posterior teeth since \pm 2 years ago. The patient finds it difficult, especially when eating. The patient's general medical history was in good health without any history systemic diseases and/or conditions. There was no history of drug allergies and was not taking any medication. The results of the general condition of the patient, BP: 163/83 mmHg, pulse: 68x/minutes, RR: 18x/minutes. On extra oral examination, no abnormalities were found. On intra oral examination, OHI : 2.56 (moderat) , GI : 1.17 (moderat), tooth mobility GII : 31, 32, 41 and 42, edentulous area 14, 15, 16, 17, 23, 24, 25, 26, 27, 28, 34, 35, 36, 37, 38, 44, 45, 46, 47, 48. The clinical picture of intra oral before treatment as seen on Fig. 1, and panoramic radiograph on fig. 2.



The treatment plan of this case was to make a frame denture for lower and upper jaw and splint of the anterior teeth using Fiber Reinforced Composite splint.

Case management

The first step of this case management was to inform the patient about the treatment option and request to sign the informed consent. The initial therapy of this patient was scaling and root planing on the remaining teeth. Seven days later, the results of the initial treatment were evaluated and the patient was referred to a prosthodontist to have metal frame dentures made for the upper and lower jaws. The patient is reminded to come back after the denture is installed. Several months later the patient was wearing a dental prosthesis, as in the following picture (fig. 3).



Figure 3. The dental prosthesis is installed in the patient's mouth

The patient's treatment continued with the installation of a splint on the labial surface of the mandibular anterior teeth. Before installing the splint, prophylactic measures are carried out by using a pumice and brush on the labial surface of the teeth, then measuring the required fiber length using dental floss. The fiber cut according to the required length (from 33 – 43). Fiber is placed on a glass plate. The labial part of teeth to be splinted was applied with 37% etching for 10 seconds, then rinsed dry and then isolated with a cotton roll. Bonding was applied with a microbrush, gently air-dried and curing for 20 seconds each tooth. Fiber in a closed container is applied composite with the help of plastic filling instrument. Flowable composite resin is applied in a thin layer on the labial of the tooth to be treated. Then the fiber was applied and gently pressed against each tooth. Make sure the fiber is not in the occlusion area. The fibers were pressed into the interproximal space, then curing for 10 seconds on each tooth. Then the entire fiber splint was covered with a thin layer of composite (0.5 mm). Then curing for 40 seconds. Excess resin is removed with a composite finishing bur. The last step was checking the occlusion using articulating paper with the denture is on and polishing the entire splint with a polishing bur. The splint was installed as on fig.4.



Figure 4. The Fiber Reinforced Composite Splint was installed on patient's mouth

After the splint was installed, the patient is given education to maintain oral hygiene, especially the splint, using a soft toothbrush, and not to eat hard foods. Control is carried out seven days later and if there are complaints.

Discussion

Loss attachment of periodontal tissue in patients can result in increased tooth mobility. Many factors are there which cause tooth mobility like inflammatory condition of periodontal tissue, PDL widening, alveolar bone loss, trauma from occlusion, loss attachment. Other factors such as accidental trauma, periapical endodontic lesion, high filling, orthodontic treatment. From a clinical point of view, this condition may be recorded as loss of clinical attachment in relation to the cemento-enamel junction (CEJ) and associated with an inflammatory reaction in the gingiva clinically detectable as erythema, swelling, and bleeding on probing (BoP). Additional signs may include formation of periodontal pockets, recessions of the gingival margins, involvement of furcation areas, and, eventually, radiographic alveolar bone loss. Finally, patient reported complaints such as increased mobility, tooth migration, and tilting may also be part of the diagnostic process. Mobility also depends on the number and distribution of remaining teeth in the jaw (7)(8).

The loss of posterior chewing function results in the patient tending to use anterior teeth to replace its function. This results in instability of the occlusion leading to tooth mobility and the patient tends to advance the chin and change the occlusions to compensate for this (9) (10). The capability to mark occlusal instability and to achieve occlusal stability should be very well understood. The way to plan treatment ends is to have stable results that do not give birth or preserve damage to the stomatognathic system (10) (11). Advanced bone loss in periodontally compromised patients often increases the mobility of teeth, which can indicate the splinting of the residual teeth. As a side effect, it measures and reduces the risk of traumatic dynamic occlusion. Teeth can be splinted with fixed or removable devices, as temporary or permanent therapy strategy. Therefore, fibers are frequently chosen, which can be fabricated from different materials such as polyethylene or glass (12).

The treatment in this case was to install a metal framework prosthesis on both the upper and lower jaw. Installation of a removable metal framework prosthesis on the lower jaw is primarily aimed to stabilize the remaining anterior teeth that were loose. The metal framework denture was purposed to reduce lateral forces and masticatory force distribution throughout the teeth as well

(13).


The choice of FRC splint in this case is because the anterior teeth of the lower jaw are crowded, so by using this fiber, it can be attached to the tooth surface well. Fiber Reinforced Comosite is a new invention, modern, effective, high aesthetic value, provides comfort for patients and is easy to clean. Fiber with FRC material can be used for palatal or lingual splinting, labial splinting or occlusal splinting (14) (15).

Conclusion

The treatment of edentulous posterior free end teeth with mobility of the anterior teeth using a combination of frame denture and FRC can be an alternative treatment that requires skills from two disciplines, prosthodontics and periodontics. The patient is also satisfied with the results of the treatment, because the remaining anterior teeth can be more stable and the patient can chew food as usual.

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ORAL LICHEN PLANUS AND BAD HABITS: A CASE REPORT

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Abstract

Introduction: Oral Lichen Planus (OLP) is a chronic inflammatory disease mediated by CD8+ T- cells on the oral mucosal surface. Although the immune-mediated reaction is recognized in OLP pathogenesis, an exact etiology is yet unknown. Some of the predisposing factors for OLP is stress, smoking and alcohol consumption. The goal of OLP treatment is to eliminate erythema, ulceration, and relieve symptoms. Corticosteroids are the first-line therapy, either topically or systemically.

Case: A 21-year-old male patient came with a chief complaint of white lesions on the right and left buccal mucosa six months ago and long white lesions on the upper right and left gingival since a month ago. The patient had a history of consuming alcohol for 6 years and smoking 5 sticks per day in the last 7 years. The patient worried that lesions might lead to a malignancy.

Discussion: Establishing a diagnosis with clinical criteria is effective up to 97%. The most widely accepted treatment for lesions of OLP involved topical or systemic corticosteroids to modulate the patient's immune response. The patient was treated topically with corticosteroid and continued with systemic corticosteroid because there was no significant improvement on the lesion and no contraindication for systemic corticosteroid.

Conclusion: Diagnosis of oral lichen planus can be confirmed by an adequate anamnesis and clinical examination. Stress, smoking and alcohol consumption are reported to be one of the predispositions for OLP, and risk factors for the transformation of OLP lesions in OSCC. So patient compliance to avoid these bad habits and follow-up is needed.

Keywords: oral lichen planus, smoking, alcohol, corticosteroid

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Introduction

Oral lichen planus is a chronic inflammatory mucocutaneous disorder, affecting stratified squamous epithelial, with a prevalence of 0.02 to 1,2 %, with a higher prevalence in women than men with ratio 4:1. OLP has most often reported in middle-aged patients 30-60 years of age.¹ Etiology of the disease is unknown, it is believed that the disease is caused by a specific mechanism mediated by CD 8 + cytotoxic T cell that triggers apoptosis of the basal cells in oral epithelium, and non-specific mechanism through cell degranulation of mast cell and activity of metalloproteinase matrix², with some predisposition factors that aggravate such as genetic background, dental materials, drugs, infectious agents, autoimmunity, bowel disease, food allergies, psychological stress, bad habits, such as consuming alcohol and smoking, trauma, diabetes, hypertension, and malignant neoplasm.³

Clinical characteristic features of OLP include a well-defined looping and intersection white line or striae with minimal erythema. The lesion is usually distributed bilaterally on buccal mucosa, gingiva, and tongue. There are six types of OLP known as reticular, atrophic, erosive, popular, plaque and bullous. When OLP affects gingiva, it often presents as desquamative gingivitis. The prevalence of the reticular type will diminish with the increased duration of the disease. The plaque type lesion has been reported more affecting in cigarette smokers, and the lesion persistence unaffected by tobacco discontinuation.⁴ Some studies showed the malignant transformation of OLP with frequency between 0 and 3.5% and erythematous and erosive lesions show the highest index. Clinical diagnosis of OLP can be determined based on pathognomonic clinical features on the oral mucosa and histopathological history of the tissue.⁵

The aim of this study is to report a case of oral lichen planus that is related to bad habits, smoking and consuming alcohol, and aggravated by psychological stress. Education to stop the bad habits of the patient is needed to prevent exacerbations and transformation OLP becoming a malignancy.

Case Report

A 21-year-old male visited Universitas Brawijaya Hospital with a chief complaint of white features on the right and left inner cheeks in the past six months and long white lesions on the upper right and left gingival since a month ago. Patient said there was no history of pain or burning sensation on the lesions. The patient had a history of consuming alcohol for 6 years and smoking 5 sticks per day in the last 7 years. The patient has been stressed out about his school for the past week. The patient had Sinus Tachycardia but no other health history. The patient consumes enough nutrients for a day. The patient always consumes coffee before his exercise regime every day and worried that lesions might lead to a malignancy.

Extraoral examination showed a symmetrized face, and no pain during palpation on lymph nodes. At intraoral examination revealed white lesions with an erythematous border, irregular, bilateral, non-scrapable and a Wickham's striae on the right and left buccal mucosa. Another white lesion found

on the upper right posterior gingival margin \pm 25 mm long, non-scrapable, irregular, and plaque- typed. On the left posterior gingival margin revealed a \pm 7 mm long white lesion, plaque-typed, non-scrapable, and irregular. Based on the clinical presentation the diagnosis of this case is plaque-typed with reticular oral lichen planus and its differentiated diagnosis is oral leukoplakia. A complete blood check was taken. The patient educated to avoid consuming alcohol, smoking and controlling his stress. He was prescribed topical corticosteroid 0,1% to be used 3 times a day for a week.



Figure 1 Clinical Presentation of OLP during the First Visit; A. Upper Gingival Right Posterior; B. Upper Gingival Left Posterior; C. Right Buccal Mucosa; D. Left Buccal Mucosa

During the second visit, a week after the first visit, the patient applied the ointment 3 times a day and there was no allergic reaction. The patient said he was stressed out about school. The patient no longer consumes alcohol and smoke. A complete blood check showed a degradation of lymphocytes, 22% (normal count: 25 - 40%). Intraoral examination showed less erythema on the buccal mucosa lesion, but there were no significant changes on other lesions. The patient was told to continue the regime and control 2 weeks after.

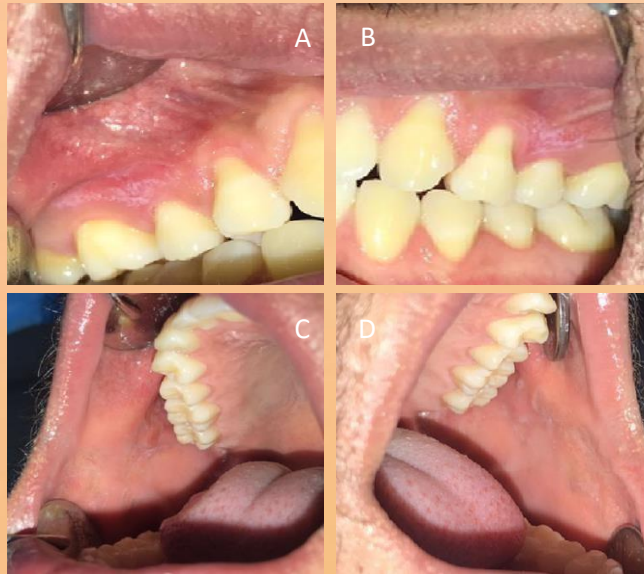


Figure 2 Clinical Presentation of OLP during the Second Visit; A. Upper Gingival Right Posterior; B. Upper Gingival Left Posterior; C. Right Buccal Mucosa; D. Left Buccal Mucosa

During the third visit, three weeks after the first visit, the patient smeared the ointment 3 times a day and there was no allergic reaction. He is still stressed about school. Intraoral examinations showed no significant changes on the lesion, striae on buccal mucosa bilateral and plaque lesion on the upper posterior gingiva bilateral still clearly visible. We decided to change the regime into systemic steroid (sanexon) 8 mg, 2 tablets in the morning, 2 tablets in the afternoon, and 1 tablet in the evening for 5 days, topical corticosteroid 0,1% to be used 3 times a day, and aloclair mouthwash to be used 3 times a day. Patient was told to come again after the regime was completed.

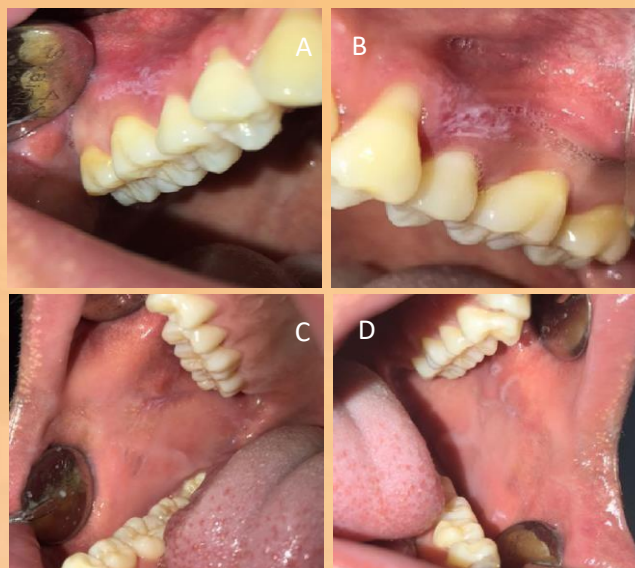


Figure 3 Clinical Presentation of OLP during the Third Visit; A. Upper Gingival Right Posterior; B. Upper Gingival Left Posterior; C. Right Buccal Mucosa; D. Left Buccal Mucosa

The fourth visit, 8 weeks after the first visit. Patient finished the regimen according to the operator's instruction and there was no allergic reaction. Patients felt the lesions get better. The patient no longer had stress because his exam week was over. Patient no longer smokes but consumed alcohol 2 weeks before. Intraoral examination showed a significant improvement on the buccal mucosa lesions. White lesions on the right upper posterior decrease to ± 5 mm long and on the leftupper posterior ± 7 mm long. The patient was educated to stop consuming alcohol, smoke and to controlhis stress because it can exacerbate the incidence of OLP. Systemic corticosteroids started to be tapered off. The patient stilldoing regular control up until now.

Figure4 Clinical Presentation of OLP during the Forth Visit; A.




*Upper Gingival Right Posterior; B. Upper Gingival Left Posterior;
C. Right Buccal Mucosa; D. LeftBuccal Mucosa*

Discussion

The diagnosis of oral lichen planus is obtained based on the clinical appearance of the lesions, history taking and histopathological examination. On clinical examination, an interlacing white keratotic striae with erythematous borders giving a net-like appearance was seen on the right and left buccal mucosa. Clinically shown a white plaque form lesion, irregular, elongated on the right upper back gingivalmargin along ± 25 mm, and white plaque form lesion elongated on the leftupperback gingival margin along ± 7 mm, cannot be scraped and is not painful. Plaque-type OLP has a clinical appearance resembling leukoplakia. However, the presence of white striae and histologic examination will help establish the diagnosis of OLP. Plaque-type OLP can be in the form of a smooth elevation to an irregular shape and is commonly found in smokers. It can also be in the form of white papules with a size of 0.5-1mm surrounded by white striae.⁶

Various clinical classifications of oral lichen planus have been proposed. Six clinical forms of oral lichen planus are recognized. Reticular, the most common of oral lichen planus, is



characterized by the net-like appearance of lacy white lines, oral variants of Wickham's striae. Papular, with white papules. Plaque-like appearance as a white elevated lesion which may resemble leukoplakia. Both of these lesions are usually asymptomatic. Erosive/ulcerative, the second most common form of oral lichen planus, is characterized by oral ulcers presenting with persistent, irregular areas of redness, ulcerations and erosions covered with a yellow slough. This can occur in one or more areas of the mouth. In 25% of people with erosive oral lichen planus, the gums are involved, described as desquamative gingivitis (a condition not unique to lichen planus). This may be the initial or only sign of the condition. Atrophic or erythema, appearing as areas. Atrophic oral lichen planus may also manifest as desquamative gingivitis. Bullous, appearing as fluid-filled vesicles that project from the surface.¹

OLP diagnosis is first obtained based on the clinical appearance of the lesions, and subsequently confirmed by a biopsy and a histopathological study. The majority of authors agree that a biopsy is necessary, given that it allows us to confirm the clinical diagnosis and make the differential diagnosis with other lesions. The clinical criteria include the bilateral presence of symmetrical lesions and white reticular lesions. The lesions may be atrophic, erosive, bullous or manifest in the form of plaque, appearing along with reticular lesions in a given area of the oral cavity. If both criteria are met, it is considered a typical Oral Lichen Planus.⁷ In this patient, both criteria are met, so we can confirm the diagnosis plaque-like type OLP with reticular lesion. Establishing a diagnosis with clinical criteria is effective up to 97%.⁶ Based on the histopathological features a diagnosis of lichen planus showed the basal cell layer of epithelium was lost at places with juxta-epithelial inflammatory reaction. The underlying connective tissue stroma was dense with severe chronic inflammatory cell infiltrate chiefly lymphocytes.⁷ The Patient did not have a histopathological examination because the clinical examination already showed a typical picture of Oral lichen planus.

The exact etiology of this disease is not yet known, but stress, drugs, dental fillings, genetic factors, immunity, and hyper-sensitivity reactions can contribute to its pathogenesis.⁸ OLP has been reported to be associated with different medical conditions such as diabetes, hepatitis C infection, and liver disease.⁹ Alcohol consumption and tobacco use have been reported to cause exacerbations in OLP patients.¹⁰ OLP exacerbations are associated with mechanical trauma from heat and irritation from cigarette smoke, which triggers the recurrence of lesions.¹⁰ In this case, the patient had a history of consuming alcohol for 6 years and smoking 5 sticks each day in the last 7 years. The relationship between smoking and the occurrence of OLP is not fully understood. Gorsky et al report that more patients with reticular OLP smoked than those with atrophic and erosive OLP.¹¹ It is hypothesized that the heat and irritation of smoking may increase the risk of symptomatic OLP lesions, and the risk of malignant transformation. The effect of alcohol consumption on OLP is still debated and requires further research. It is suspected that long-term alcohol consumption can suppress the immune system, including that plays a role in the pathogenesis of OLP.¹⁰ Proven risk factors for the

transformation of OLP lesions in OSCC are reported to be smoking, alcohol, erythematous lesions and their location in tongue margins. However, the risk of OLP malignant transformation in Oral Squamous cellular Carcinoma (OSCC) remains debated, and the mechanism of OLP carcinogenesis is still unresolved. Several prospective and retrospective studies argued about this issue, reporting rates varying from 0–9 %.¹⁴

Some studies indicate that patients with stressful life events and the onset and progression of OLP. Shandu et al report an association between stress and OLP lesions. The results suggest a high level of anxiety in patients with OLP as compared to the controls. Around 63.2% of patients suffered from borderline or morbid anxiety.¹⁵ Patient in this case admits that he is currently preparing for the final examination of his studies. The patient feels stressed because it takes more time and energy. To measure the severity of depression, anxiety and stress, it is suggested to use the DASS-42 (Depression, Anxiety and Stress Scales) test. Prolonged stress conditions lead to adrenal fatigue, resulting in HPA axis dysregulation, decreased cortisol levels leading to increased production of proinflammatory cytokines, and excessive activation of the immune and inflammatory systems, leading to autoimmune diseases and malignancies.¹⁴

Oral Lichen Planus (OLP) is a chronic inflammatory disease mediated by CD8+ T-cells on the oral mucosal surface. Chiang et al stated that both antigen-specific and non-specific mechanisms are involved in the pathogenesis of OLP. Antigen-specific mechanisms contain antigen presentation by keratinocytes and Langerhans cells to CD4+ helper and CD8+ cytotoxic T lymphocytes to activate these two types of T cells. The activated helper T cells can secrete interleukin (IL)-2 and interferon (IFN)- γ which in turn activate the cytotoxic T lymphocytes and sponsor their proliferation. The activated cytotoxic T lymphocytes can activate the apoptosis of basal keratinocytes and result in the liquefaction degeneration of basal epithelial cells typically found in OLP lesions. Non-specific mechanisms include mast cell degranulation and release of tumor necrosis factor (TNF)- α and chymase. The TNF- α can help the T cells to migrate from the capillaries into the adjacent extracellular matrix. Chymase can activate the matrix metalloproteinase (MMP)-9 which later abolishes the basement membrane and leads to the migration of CD8+ cytotoxic T lymphocytes into the epithelium of OLP lesions. The intraepithelial cytotoxic T lymphocytes can further result in the apoptosis of basal and parabasal epithelial cells. The above verdicts propose that OLP is a T-lymphocyte-mediated chronic inflammatory oral mucosal disease.⁴ Symptoms vary from mucosal sensitivity to continuous debilitating pain. OLP lesions usually persist for many years with periods of exacerbation and quiescence. Patients are often unaware of quiescent OLP that presents typically as faint white striations, papules or plaques. There are no complaints of pain on this patient, but the patient feels uncomfortable with his lesion. The patient worried that lesions might lead to a malignancy. The clinical picture of OLP in some patients can vary with asymptomatic onset so that patients do not pay attention to the condition of their oral

cavity. Some patients feel rough on the oral mucosa, are sensitive to spicy and hot food, pain and ulceration occur.

Corticosteroids are the first-line pharmacological treatment of OLP through the action of anti-inflammatory effects and anti-immunological properties that can suppress the function of T lymphocytes. Several mechanisms are involved in the suppression of inflammation by corticosteroids, including reduction of leukocyte exudation and plasma constituents, thereby reducing edema, maintenance of cellular membrane integrity by preventing excessive cell swelling, inhibition of lysozyme release from granulocytes, inhibition of phagocytosis, and maintaining stabilization of intracellular lysozyme membrane.¹⁴ Patient was prescribed triamcinolone 0,1 % for topical application to be used 3 times a day. On the third visit, there was no specific change on the lesion and no contraindication for systemic corticosteroid, and the author decided to treat with systemic corticosteroid (sanexon) 8 mg, 2 tablets in the morning, 2 tablets in the afternoon, and 1 tablet in the evening for 5 days, topical corticosteroid 0,1% to be used 3 times a day, and aloclair mouthwash to be used 3 times a day. On the fourth visit, the patient showed a significant change on the lesion, the systemic corticosteroid started to be tapered off. Abrupt cessation of chronic glucocorticoid therapy can be dangerous as there is a risk of HPA axis suppression. Withdrawal of glucocorticoid therapy needs tapering over the period.¹⁵ Patient still doing regular control up until now. Corticosteroids have side effects of increasing glucose blood (hyperglycemia) through gluconeogenesis. Hyperglycemia occurs depending on the duration of administration, dose and type of corticosteroid used. In addition, on each control better do a blood sugar level check, blood pressure and weight.¹⁴ The following flowchart illustrates a simple systematic protocol in effective treatment.

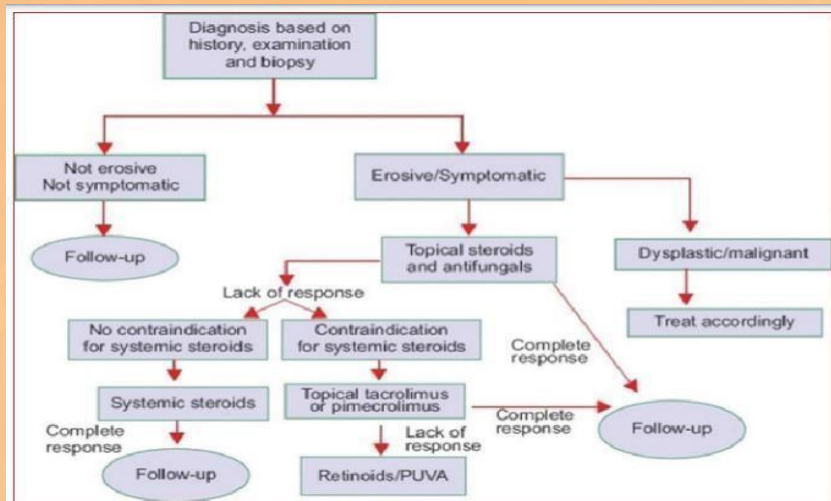


Figure 5. Illustration of a systemic protocol in effective treatment.¹

Conclusion

OLP diagnosis is first obtained based on the clinical appearance of the lesions, history and subsequently confirmed by a biopsy and a histopathological study. Establishing a diagnosis with clinical criteria is effective up to 97%. Corticosteroids are the gold standard treatment for OLP, involving topical or systemic corticosteroids. Bad habits of smoking and alcohol consumption use have been reported to cause exacerbations in OLP patients. Moreover, it's proven as a risk factor for the transformation of OLP lesions in OSCC. So, the patient's compliance to avoid these bad habits and routine control to consider the possible risks.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

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Surgical Management of Syndromic Cleft Lip in Adulthood: a Case Report of Cleft Lip Repair Under Local Anesthesia in Indonesia

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Background: Cleft lip and/or cleft palate (CL/P) is one of the most prevalent congenital anomalies that can manifest in association with other abnormalities (referred to as syndromic CL/P) or as a standalone condition (non-syndromic – NSCL/P). In developing countries, untreated adults with syndromic CL/P are still prevalent due to a limitation in public awareness and healthcare facilities. Surgical corrections for syndromic cleft lip patients under general anesthesia are also well-known to cause respiratory complications, making management a challenge. **Purpose:** Explores the use of local anesthesia as a safer alternative for cleft lip repair in syndromic cases, particularly on a 26-year-old male suspected of having Crouzon syndrome with cleft lip. **Methods:** We performed cleft lip repair under local anesthesia on the patient who displayed clinical manifestations of Crouzon syndrome including craniosynostosis, sunken midface, dental crowding, broad nasal bridge and a complete unilateral cleft lip on the right side using Millard modification technique. **Results:** Cleft lip repair performed under local anesthesia in this case proved safe and effective. The surgery went well without any major drawbacks that may have happened if performed under general anesthesia. **Conclusion:** Treatment of syndromic cleft lip and/or cleft palate (CL/P) pose significant challenges, particularly in developing countries where awareness and healthcare access are limited. Syndromic CL/P cases underline the critical need for a comprehensive, multidisciplinary approach. Local anesthesia should be used whenever possible, as it is a safer and cheaper alternative to general anesthesia.

Keywords: cleft lip and palate; adult; local anesthesia; syndrome

Background

Craniofacial development is an intricate process that involves complex molecular signals and transcription factors. Embryogenesis, a process that happens during the 4th to 12th weeks of life, is one of the development phases that shapes the craniofacial features of a fetus. Disruptions that happen during this phase could result in failure of facial prominence fusion, resulting in congenital anomalies. One of the most common forms of these anomalies is cleft lip with or without cleft palate (CL/P)¹.

Globally, the average occurrence of CL/P in newborns is estimated to be 1 in 700. However, this number varies significantly across different regions and populations. In Asian countries such as Indonesia, where the prevalence of cleft lip and palate is as much as 2,4%. Despite years of research and clinical advancements, the cause of cleft lip and palate still remains relatively unknown. However, there is evidence that implicates hereditary and environmental factors as two points that play a role in the occurrence of this condition^{2,3}.

The classification of cleft lip and palate, as described in the International Perinatal Database of Typical Oral Clefts, is divided into syndromic CL/P and nonsyndromic CL/P (NSCL/P). Syndromic CL/P presents a unique relationship between congenital anomalies and the specific types of clefts, which is still a subject of ongoing research. Despite the intriguing complexities of syndromic cases, the majority of research efforts in this field have been predominantly focused on NSCL/P, particularly emphasized on identifying the genetic factors associated with this condition⁴. Syndromic CL/P remains a field of research relatively uncharted, with a scarcity of comprehensive studies addressing various aspects, from diagnosis to treatment strategies. Anesthesia is a part of cleft repair surgery that needs exploration, particularly due to the difficult nature of its management in syndromic CL/P patients. Airway management proves to be the main challenging aspect for any surgery performed under general anesthesia in cases of syndromic CL/P. According to several studies, securing the airway with intubation proves to be a challenging process which heightens the risk of perioperative complications⁵.

The explanation above underlines the urgent need for more research and studies regarding syndromic CL/P, that spans from genetic investigations to clinical interventions. In this case report, we focus more on the latter, exploring the use of local anesthesia as an alternative during cleft lip repair for a patient suspected with Crouzon syndrome.

Case

A 26-year old male patient diagnosed with an incomplete unilateral cleft lip (labioschisis incomplete dextra) on the right side was admitted to the Oral and Maxillofacial Surgery department of RSUD Kanjuruhan Kota Kepanjen, Malang, Indonesia for a Cleft Lip Repair Surgery charity event. He has never undergone surgery to treat his condition, and went to the hospital in order to receive his first cleft repair surgery. The patient was unable to walk and needed assistance to get to the clinic. He presented clinical manifestations such as craniosynostosis, sunken midface, dental crowding, and a broad nasal bridge, despite never having gone to the doctor to diagnose his condition. We suspected the patient with a Crouzon syndrome diagnosis, although further genetic testing is needed to pinpoint the exact diagnosis. The patient didn't present any signs of a mental disability. When asked, the patient revealed that he has a heavy smoking habit.



Figure 1a and 1b. An extraoral view of the patient.

Case Management

1. Screening

The patient first underwent screening in order to find out his chief complaints and medical history. According to the screening process, the patient didn't have an initial record of surgery. The patient wasn't under any medication, and didn't have any history of allergy. He has had a debilitating condition since birth that did not hinder him mentally, however no further detail was elaborated about this condition.

2. Diagnosis

Based on the patient's concerns and the physical examination, the patient was diagnosed with an unilateral incomplete cleft lip. Due to limitations during the screening step, a complete diagnosis of the syndrome could not be made. The patient was suspected with Crouzon syndrome due to some clinical signs he exhibited, namely craniosynostosis, sunken midface, dental crowding, and a broad nasal bridge. Further clinical testing is needed in order to determine the exact syndrome.

3. Treatment Planning

The patient was informed about his treatment plan, which is cleft lip repair surgery (labioplasty). With airway management being a main consideration, local anesthesia was considered for the patient who was suspected with Crouzon syndrome.

4. Local Anesthesia

Since the patient was cooperative and didn't exhibit any mental drawbacks, we chose to go ahead with the surgery under local anesthesia. The operative area (cleft-sides of the lip, non cleft-sides, ala of nose) was injected with local anesthesia containing 2% lidocaine and 1:80.000 epinephrine.



Figure 2. Areas that were targeted for anesthesia.

5. Cleft Repair Surgery with Millard Technique

The surgeon chose to do the surgery with Millard modification technique. Millard technique has an advantage of restoring the lip points to an anatomical point. Minimal bleeding happened during the surgery due to the administration of lidocaine and epinephrine in the patient as a local anesthesia. The surgery went well without any complications and the patient was transferred to the hospital room after the surgery to be observed the next day post-surgery.

6. Follow-Up 1 Day Post-Surgery

During 1 day post-surgery evaluation, the patient consumes analgesic to relieve post-surgery pain and antibiotics. Swelling and redness was found in the area of surgery. The suturing was still present and strongly attached.

7. Follow-Up 7 Days Post-Surgery

During 7 days post-surgery evaluation, the swelling has mostly gone away. The suture was removed, and the healing result was good. The patient didn't have any allergies to any medicine prescribed. The patient was satisfied with the result.



Figure 3. Extraoral condition of 7 days post-surgery follow-up

Discussion

Cleft lip repair is a field that needs continuous improvement, in order to produce better results. In recent years, for example, attention has been drawn to minimize secondary deformities, instead of solely focusing on improving the overall esthetics of the nasolabial complex. This can

be achieved according to Millard's principle, which describes each patient's unique characteristics as a puzzle, in which we need to find the missing pieces and carefully place them so that the final picture is complete, normal, and happy in function and appearance⁶. With this principle, surgeons may each have a different approach in managing different patients according to their preference. In this case, we chose to operate on the patient using the Millard technique.

Local anesthesia was used in the management of this case. The primary reason for this was because of airway management considerations. In syndromic patients, airway management is known to be one of the most life-threatening in medicine due to their malformed physical characteristics⁷. Preoperative considerations are usually employed to avoid airway management complications that may arise later during postoperative care, such as laryngospasm, aspiration, and airway edema⁸. One of those considerations is to use local anesthesia, a simple but effective approach^{7,8}. Local anesthesia has been used successfully in adult cleft lip repair before. Aside from being minimally invasive, patients in previous studies felt little to no pain save for the first injection of local anesthesia. This shows promise for local anesthesia use in cleft lip repair surgery, particularly in cooperative patients such as adults. We believe local anesthesia could be used whenever possible, considering safety and cost-related reasons especially in developing countries.

When choosing to employ local anesthesia, the presence of intellectual disabilities also needs to be observed. Anesthetizing an intellectually disabled patient makes the perioperative process complicated, which detracts from the main reason local anesthesia was chosen for this case¹⁰. In this case, the patient didn't exhibit any intellectual disabilities. Therefore, local anesthesia was deemed to be a safe and painless alternative.

In this case, age is another consideration that needs to be evaluated. Cleft repair surgeries in adult patients is considered uncommon, and the tissue handling is quite different than pediatric; the cleft gap in adults is wider, and the tissues are bulkier and stiffer which may necessitate extensive soft-tissue dissection. This could explain the complexity of the procedure and the prolonged operation time. Having an untreated cleft lip as an adult has many implications, such as illiteracy, limited access to healthcare, or a low socioeconomic status. These three reasons are usually connected for adult presentation of cleft lip. In developing countries, there are also factors such as ignorance, cultural beliefs, limited access to medical facilities, and high cost of surgical treatment could also increase the rates of finding untreated adults with cleft lip¹¹. Therefore, there is a need for public education initiatives concerning CL/P, aimed at clarifying the condition, its

origins, and available treatments. Increasing public awareness about CL/P could possibly contribute to reducing adult cleft lip cases, especially in developing countries. Additionally, adult cleft lip could be reduced with the presence of charity events as it enables early and accessible intervention of diagnosis and treatment of CL/P.

Cleft lip comes with problems performed with the oral and nasal cavities. The present oronasal communication makes it hard for affected individuals to eat and breathe normally¹². Aside from functional effects, the psychosocial status of cleft lip patients are also affected. Several studies report that individuals with cleft lip and/or palate (CLP) face social rejection, especially in education, employment, marriage, and community^{13,14,15}. This stigma linked to CL/P inflicts considerable emotional and social distress upon parents or individuals affected themselves, therefore spotlighting the need to treat cleft lip cases no matter the age.

This case management was not without faults. Due to limitations of time and resources, we could not pinpoint the exact diagnosis of the patient's suspected syndrome. Future studies could be more collaborative, involving doctors from different fields in order to get more insights for the case report.

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Enhancing Oral Health Awareness among the Deaf Community through Dental Health Education in Bengkala Village, Bali.

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Abstract

In many communities, inadequate awareness about proper oral hygiene practices is often associated with poor oral health conditions, largely due to a lack of knowledge on the subject. This issue is particularly prominent among the deaf community, who face challenges in both speech and hearing abilities. The primary objective of this community outreach initiative is to improve oral health awareness among the deaf residents of Bengkala Village in Bali. The activities were conducted at the Village Hall and involved 36 deaf individuals and were divided into 2 sessions with the assistance of an interpreter. During session 1, dental health education was provided, while session 2 included dental check-ups and basic dental care procedures. The education is provided by a seasoned dental professional. The material is presented through images and videos, displayed on a screen. The educational method employs a two-way approach, combining material delivery with interactive discussions. The activities proceeded smoothly, and the community exhibited enthusiasm in rectifying their incorrect oral health behaviors and adopting the appropriate practices. This pioneering dental health education endeavor, the first of its kind for the deaf community in Bengkala Village in Bali, effectively heightened the community's awareness regarding the importance of maintaining good oral health.

Keywords: Awareness, deaf community, dental health education.

Introduction

Dental health problems in the community have not received much attention until now. Toothache complaints are frequently overlooked and considered normal. As a result, cavities are allowed to worsen until they become severe and painful. This pain leads to children missing school and adults missing work. Oral health has a significant impact on an individual's productivity. According to a study by Ogeswaran & Venugopal (2023), night shift workers are twice as likely to miss work due to toothaches compared to day shift workers. Another repercussion of toothaches includes eating disorders, reduced happiness, decreased work motivation, disrupted sleep, and increased expenses for dental treatments. Dental health problems often arise from a lack of public awareness regarding oral hygiene. This is due to insufficient knowledge about dental health both within the community and among those who are speech and hearing-impaired in the village of Bengkala.

Bengkala is a village located in the Kubutambahan District of Buleleng Regency, Bali. The Buleleng Regency Government Center is situated 17 km away from the village, and it is approximately 91 km from the Provincial Government Center of Bali in Denpasar. The drive to Bengkala village takes around 3 hours from Denpasar. The village's geographical terrain is hilly, with elevations ranging from 300 to 400 meters above sea level. The climate is hot, with an average air temperature ranging between 30° - 32° Celsius.

According to village data from the year 2022, Bengkala Village has a population of 137 people. Approximately 41.6% of the population does not have formal employment. What sets this village apart is its unique characteristic of having 42 residents (30.7%) who are referred to as "kolok," presumably due to their heritage. "Kolok" is a local term used to describe individuals who are both deaf and mute. The kolok population in this village is 15 times larger than the global average (Sunata, 2019), earning it recognition as the village with the world's largest kolok population. The socio-economic conditions of the community range from moderate to lower, with a significant portion of the kolok community experiencing lower socio-economic status. Many of them are involved in various informal work and face unemployment challenges.

The physical limitations experienced by the kolok community are intertwined with their communication challenges, which in turn create difficulties in understanding dental health information. As a result, they have a restricted ability to fully comprehend and incorporate dental health information into their daily lives.

Similar to other villages in Bali, the kolok community in Bengkala Village also experiences untreated dental cavities and complains about toothaches. In Bali, 41.1% of the population acknowledges having cavities and toothaches, and 14% of these cases are left untreated until they become swollen (Ministry of Health, 2019). This indicates a lack of awareness regarding dental health. Therefore, this community group needs to receive dental health education to provide them with the necessary knowledge to maintain good dental hygiene.

The Ministry of Health of the Republic of Indonesia (2004) has produced the Guidelines for Community Dental Health Efforts, but it appears that its implementation has not yielded the desired results, resulting in an unsatisfactory state of community dental health. The public's knowledge about dental health and their motivation to visit dental professionals remains insufficient. Hence, raising public awareness about maintaining dental health becomes essential. The purpose of this community engagement is to enhance public awareness about the importance of dental health maintenance.

Materials and Methods

This event was attended by 41 adults who have been deaf and mute since birth. The community service took place at the Bengkala Village Hall on February 25, 2023, and was divided into two sessions: Session 1 - Dental health education, and Session 2 - Dental check-ups and basic treatments. Dental check-ups and basic treatments were conducted to raise awareness among the community about their less-than-optimal dental health and to help them understand that cavities need to be treated and maintained to prevent further decay.

Session 1: Dental health education was conducted through direct face-to-face interaction. The communication method employed was two-way communication, which involved delivering lectures interspersed with discussions and demonstrations to engage the audience. Visual aids such as dental model, toothbrush, and toothpaste were utilized. Communication media included PowerPoint slides and animated videos illustrating proper tooth brushing techniques, presented on a screen. The educational content was delivered by an experienced dentist, with the active involvement of a local interpreter who facilitated communication. This interpreter played a crucial role as a communication link between the educator and the kolok community due to the unique sign language used in Bengkala Village, different from the sign language typically used by deaf and mute at large. The topics covered included: a) understanding healthy teeth and dental caries; b) the consequences of neglecting dental health; c) methods for maintaining dental health; d) proper tooth brushing techniques; e) the importance of regular dental check-ups.

Session 2: Dental check-ups and basic treatments. The basic treatment offered is known as atraumatic restorative treatment (ART). Comprehensive dental health examinations were conducted on all participants who had previously given informed consent. Dental treatment was provided only to participants identified as requiring ART. For more complex treatments, the community members were referred to the nearest Community Health Center (Puskesmas Kubutambahan). The tools and materials used included complete dental diagnostic equipment, plastic fillings, agate spatulas, paper pads, glass ionomer cement (GIC), dentin conditioner, and vaseline.

This community service initiative involved 12 dentists and 7 dental clerkship students. The majority of the team participated in dental check-ups and simple treatments.

Result

Pendidikan kesehatan gigi untuk meningkatkan kesadaran bagi masyarakat kolok di Desa Bengkala tidak diikuti oleh semua masyarakat. Namun demikian kegiatan tersebut telah

berjalan lancar. Sebagian besar masyarakat kolok dapat berpartisipasi, yaitu sebanyak 36 orang dari total 42 orang. Dengan demikian tingkat capaian kehadiran masyarakat adalah 85,7%.

Dental health education to raise awareness among the kolok community in Bengkala Village was not attended by all community members. Nevertheless, the activity proceeded smoothly. The majority of the Kolok community were able to participate, with 36 out of a total of 42 individuals taking part. As a result, the attendance rate of the community reached 85.7%.

The community appeared enthusiastic about the material being presented, despite their limitations. Active discussions took place between the community members and the presenting dentist. They were proactive in asking questions, which kept their engagement and interest in the material. Most of the content covered was new to them, diverging from their previous understanding. For instance, they learned that dental health is of utmost importance, dental care should commence as teeth develop, untreated or improperly managed toothaches can worsen and potentially trigger serious systemic illnesses in the body.



Image 1. Dental health education for the kolok community

After the completion of the first session, the second session followed, which included oral health examinations and atraumatic restorative treatment (ART). Community members who were to undergo dental check-ups were asked to provide informed consent. All attendees were willing to have their oral health examined, resulting in an examination coverage rate of 85.7% among the total kolok population. The results of the oral health examinations for the kolok community showed that every individual had dental caries (100% caries prevalence) and poor oral hygiene. ART was performed on 16 individuals. One person was immediately referred to the community health center due to complaining of toothache and swelling on the right cheek. The rest were referred to the community health center for appropriate dental health treatment.

During the examination, the community members were enthusiastic and curious to learn about the state of their oral health. One participant expressed satisfaction after having a cavity

in their front tooth filled, showing a thumbs-up sign and smiling. Following the dental examinations, the importance of maintaining dental health was reiterated to the community, emphasizing the need for further dental check-ups at the community health center and routine dental visits every six months to a dentist.



Image 2. A. Dental examination. B. Dental health instruments and materials.

Discussion

Oral health issues in Indonesia continue to be a challenge that requires collective effort. Oral health within the community is still not a priority. Dental problems in society have often been neglected. Regular visits to dentists for dental care have not yet become the norm.

The limitations faced by the kolok community in Bengkala Village have hindered their ability to access information about oral health. They lack adequate knowledge to maintain their dental well-being. However, this lack of knowledge is not exclusive to the kolok community, as it's also found among the general population, where some individuals still possess insufficient dental health knowledge. For instance, according to the research by Abadi and Suparno (2019), parents lack proper knowledge about dental caries. Knowledge about children's dental health is linked to preventive behaviors against dental caries incidents. Sufficient knowledge tends to have a positive impact on dental prevention behaviors (Rahmawati et al., 2021).

There is a connection between knowledge and motivation concerning dental health and behavior related to dental health maintenance. Knowledge and motivation have an impact on dental health maintenance behaviors. Motivation stems from an individual's drive influenced by their knowledge and perceptions (Pay et al., 2021). Erroneous perceptions about dental health can lead to incorrect behaviors (Rahina, 2022).

In this community, each individual examined, dental caries were found untreated. Despite experiencing toothaches frequently, the kolok community in Bengkala Village often postpones

dental treatment and resorts to self-medication. Surenthar et al. (2021) discovered that a significant portion of their study respondents engaged in self-medication practices for toothaches. Additionally, dental healthcare is considered costly, leading people to delay treatment until the issue becomes severe or simply endure it (Rahina, 2022). Naturally, untreated dental caries will continue to deteriorate and eventually lead to their destruction.

Their inability to maintain dental health is supported by their condition of being deaf and mute. Their limitations in speech and hearing contribute to their insufficient knowledge about oral health. They only became aware of the importance of oral health and the need to prevent cavities after receiving education. Until then, they did not consider oral health to be significant. They followed practices they observed in their daily lives from those around them, such as parents, friends, and neighbors. Chen et al. (2021) demonstrated an improvement in dental health knowledge among deaf-mute secondary school students after receiving dental health education in their research.

According to Budiarti (2021), maintaining dental health is crucial, and instilling this habit in children from an early age involves brushing their teeth after breakfast and before going to bed. However, this practice has not yet become a culture in Bali. People usually visit dentists only when they experience toothaches, and brushing teeth often coincides with taking a bath (Rahina, 2022). That oral health behavior habits are typically adopted from parents, especially mothers, during childhood. Children brush their teeth while bathing, as they observe their parents doing the same (Rahina et al., 2019). This pattern is also seen among the kolok community in Bengkala Village. Nevertheless, observing the enthusiasm of the community after the community service, it's evident that their awareness of dental health has improved, with the expectation that their behavior will change as well, towards more positive dental health practices.

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Education on the Consequences of Tooth Loss for Parents at TK Muslimat NU 07 Malang

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Abstract

Dental and oral health plays a very important role in supporting the health of the human body. Teeth are one of the important components in the mouth that play a role in the process of chewing and speaking, if teeth are damaged it can affect the health of other limbs, reduce quality of life and inhibit daily activities. Adult tooth loss is a serious damage condition because in adults teeth cannot grow back to damage other parts of the body. This can occur due to the lack of public education about dental function and the importance of maintaining healthy teeth and mouth, so it is important to educate the public about the importance of maintaining healthy teeth and mouth, especially for adults whose teeth are in the condition of loose or missing teeth. So the use of dentures is very important for those who have lost teeth. Therefore, we conduct counseling aimed at educating parents TK Muslimat NU 07 Malang Related to the causes, impact of tooth loss, and the importance of making dentures. The effectiveness of this activity is seen from the comparison of the Pre-Test and Post-Test scores. The results of this counseling showed that age and occupation did not affect the results of the Pre-Post Test conducted and there was an increase in knowledge. From the test results there was an average increase before and after education from 61.06 to 80.91 and statistically a significant difference was obtained ($p = 0.000$). Of the 66 respondents, there

were 53 people whose post test scores had increased and it is hoped that after this activity the respondents can educate their families or other communities.

Keywords : Dental and oral health, Tooth Loss, Education.

A. Introduction

Teeth are one of the organs of the body that form a unity with other limbs. Damage to teeth can affect the health of other limbs so that it will interfere with activities (Hartanto & Putri, 2020). In adulthood, teeth can experience various problems. One of them is tooth loss. Tooth loss is the most severe condition of tooth decay. In adulthood, teeth that have fallen out can no longer grow back. Tooth loss is a condition in which one or more teeth in the oral cavity come off their sockets. The cause of tooth loss is often caused by disease factors such as caries and disease Periodontal. Other factors such as trauma, attitudes and characteristics towards dental health services, socio- demographic factors and lifestyle also contribute to tooth loss (Wahyuni, Nurilawaty, Widiyastuti, & Purnama, 2021).

In the age range of 35-44 years, as many as 17.5% of Indonesians experience tooth loss. Meanwhile, in the age range of 45-54 as many as 23.6% of Indonesians lose teeth due to loss and extraction. In the age range of 55-64, as many as 29.0% of Indonesians experience tooth loss alone or extracted. From these results, it can be seen that the older a person gets, the number of teeth lost due to self-loss and extraction is higher (Kemenkes RI, 2018). Of course this is a big problem because teeth are an important part of the digestive process. Dental and oral health problems in people who have lost teeth are all problems that can have negative implications for overall health, which ultimately affects cognitive abilities, nutritional status, and quality of life of the elderly (Halim, Elias, Astoeti, & Anggraini, 2021).

Changes that occur as a result of tooth loss can affect chewing efficiency, indirectly affect general health and affect a person's overall quality of life. Tooth loss can also have emotional and functional effects and can affect aesthetics. Another consequence is that it can affect most people's discomfort and emotions. Tooth loss for too long will cause pathological movement of the remaining teeth, alveolar bone loss in the area of tooth loss, decreased chewing function to speech disorders and can also affect the temporomandibular joint. The use of dentures to replace the

function of missing natural teeth, among others, plays an important role in the masticatory system. This system is a functional unit consisting of the dentition, temporomandibular joint (TMJ), the muscles supporting the masticatory either directly or indirectly, as well as the blood vessels and nerves that support the entire supporting tissue of the masticatory system (Mangundap, Wowor, & Mintjelungan, 2019).

Dentures can be broadly divided into two types, namely fixed dentures and removable dentures. Removable dentures (which can be removed by the patient themselves) are divided into two parts, namely complete dentures and partial dentures. Fixed dentures that are cemented to the patient's teeth permanently (Sondang, Rosma, & Simaremare, 2023). Dentures are tools that function as replacement teeth for people who experience tooth loss. Denture treatment can restore the patient's functional and aesthetic activities (Adjani & Sarwono, 2023). To replace the function of the missing tooth, a person can use dentures made by the dentist. Treatment with the use of dentures as a replacement for missing teeth is very important because it can improve aesthetics, restore the chewing mechanism, restore speech function, maintain or maintain tissues around the mouth, jaw relations, and improve the quality of life of a person (Abdelbagi, Ismail, Awadalkreem, & Alhajj, 2021).

Counseling can be done using the media. Extension media is an important factor in the knowledge transfer process for target communities. Media selection must be done appropriately to ensure information can be received effectively (Apriliani, Arief, Nurruhwati, Dewanti, & Herawati, 2023). Public knowledge about the benefits of using dentures is one of the factors that can affect the use of dentures. Knowledge is a very important domain for the formation of one's behavior. This knowledge is obtained in various ways (Imam Rofiki & Siti Roziah Ria Famuji, 2020).

B. Method

Education was carried out on the parents of TK Muslimat NU 07 Malang students located in Kedungkandang District on May 13, 2023 with the aim of increasing the understanding of Parents of TK Muslimat NU 07 Malang about the causes, and impacts of tooth loss and increasing understanding of the importance of making dentures. The activity was carried out by providing

education to 66 parents of TK Muslimat NU 07 Malang. Before the education was carried out, all participants filled out the Pre-Test with multiple-choice questions to find out the initial understanding of oral and dental health. After the education, all participants were evaluated using Post-Test with multiple-choice questions and continued with the distribution of flyers containing related to the education provided.

C. Result

In education on the impact of tooth loss and the importance of making dentures on the parents of TK Muslimat NU 07 Malang, several tests were carried out as follows:

a. Characteristics of Respondents

The results of data collection on 66 respondents provided the following characteristic information:

Table 1. Respondent Characteristics

Characteristics	Frequency
Age, mean \pm SD	37,07 \pm 8,12
<30	11 (16,7%)
31-40	34 (51,5%)
41-50	18 (27,3%)
>60	3 (4,5%)
Occupation	
At home with children	50 (75,8%)
Employed in private sector	8 (12,1%)
Self-employed	8 (12,1%)

From the results of data collection, it was found that respondents were on average aged 37.06 \pm 8.12 years with the category of 31-40 years dominating the most (51.5%). Judging from the type of occupation, the majority of respondents are parents that stay at home with children (75.8%) while the other 12.1% are employed in private sector and self-employed.

b. Normality Test

This activity is an extension activity that is carried out interactively. From these activities obtained pre and post knowledge data which is then carried out compared to paired t test if normal or Wilcoxon if abnormal. The results of normality testing with Kolmogorov-Smirnov ($n > 50$) areas follows:

Table 2. Kolmogorov-Smirnov Normality Test

Variable	Sig Kolmogorov-Smirnov	Results
Pre-test	0,000	Not normally distributed
Post-test	0,001	Not normally distributed

The results of the pretest normality test and post-test knowledge were obtained $p < 0.05$ which shows the data is not normally distributed. So that the pre-post knowledge difference test uses the Wilcoxon test.

c. Knowledge Difference Test Before and After Treatment

To find out whether there is an effectiveness of the extension activities on increasing knowledge understood by respondents, the Wilcoxon test (abnormal data) is carried out. The results obtained are as follows.

Table 3. Wilcoxon Test Results

Variable	Pre	Post	p value
Knowledge	61,06 ± 14,04	80,91 ± 13,89	0,000**

** $p < 0,01$

From the test results, there was an increase average of average score test before and after education from 61.06 to 80.91 and statistically a significant difference was obtained ($p = 0.000$). Of the 66 respondents, there were 53 people who received increased post-test results.



Figure 1. Counseling to Parents of TK Muslimat NU 07 Malang

d. Age Relationship Test and Pre-Post Test

To determine the relationship between age and pre-test and post-test results, a Pearson correlation (one of the normal distributions: age) is used with the following results.

Table 4. Pearson Correlation Test Results

Variable		Correlation	Results
Age	Pre test	$p = 0,996$ ($r = 0,001$)	No correlation
	Post Test	$p = 0,644$ ($r = -0,58$)	No correlation

The correlation between pre-test and age was obtained $p = 0.996$ ($p > 0.05$) while post test with age obtained $p = 0.664$ ($p > 0.05$) which showed both were not related to age.

e. Employment Relationship Test and Pre-Post Test

To determine the relationship between occupation and pre-test and post-test results, Kruskal Wallis used with the following results:

Table 5. Kruskal Wallis Test Results

		N	Mean	Std. Deviation	Std. Error	P value
pre test	At home with children	50	60.60	13.76	1.94643	0,593

	Employed in private sector	8	68.75	11.26	3.98098	
	Self-employed	8	56.25	16.85	5.95744	
post test	At home with children	50	81.20	14.79	2.09255	
	Employed in private	8	80.00	11.95	4.22577	0.128
	Self-employed	8	80.00	10.69	3.77964	



Figure 2 Pre-Test Activities

The relationship between the pre-test and the occupation was obtained $p = 0.593$ ($p > 0.05$) while the relationship between the post-test and the occupation was obtained $p = 0.128$ ($p > 0.05$) which showed no relationship between the pre-post test results and the occupation.

D. Discussion

The dental and oral health status of a person or community is influenced by four important factors, namely heredity, environment (physical and socio-cultural), behavior, and health services (Blum Theory) (Rasni, Khoman, & Pangemanan, 2020). With high knowledge of health, people are able to maintain and protect themselves from all forms of health threats. Teeth are a unit with other limbs so that damage to teeth can affect the health of other limbs, which will interfere with daily activities (Sondang et al., 2023). Based on the data that has been analyzed, there is an increase of parent's knowledge about the consequences of losing teeth and the importance of using dentures. This shows the success of the education that has been implemented.

There are several factors related to a person's level of knowledge, namely age, education, occupation, interests, experience, culture and information. In this education there is no relationship between age and work with the level of knowledge. Even though there were several age categories of the participants, it turned out that age was not a barrier to information sources in gaining knowledge. Communities with different categories make it possible to have the same activity and exposure (Pratiwi & Anggiani, 2020). In addition, there is information from family, reading articles, newspapers or information from co-workers so that knowledge is not only obtained from formal education but from his own experience and social environment. The workplace environment can make a person gain knowledge and also experience gained indirectly or directly. Housewives were previously thought to spend a lot of time just at home and access to information was limited so that the information possessed by mothers was lacking, but now there are many media that can be used anytime and anywhere to access information and can be obtained from the media that mothers have or from anywhere. especially at this time information is very easy to access through the media that you have (Nursa'iidah & Rokhaidah, 2022).

Education is a planned effort to spread messages, instill confidence in being able to do a suggestion that can increase knowledge. This educational activity needs to continue to be developed regularly as one of the supporters of the success of efforts to improve community dental and oral health. Moreover, the education participants were parents of Muslimat NU kindergarten students. It is hoped that this knowledge will be applied to students from childhood and will continue to be embedded into adulthood (Pratiwi & Anggiani, 2020).

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Early Protection of Caries Events in Students of Elementary School Lesanpuro 2, Kedungkandang District, Malang City

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Abstract

Background: Efforts to maintain dental and oral health should be done as early as possible so that dental caries can be prevented so as not to cause infection problems in children in the future. A tooth infection requires medical treatment because the infection can spread to other parts of the body such as the jaw, neck or head and cause other health problems. Parents and schools are one of the closest environments for children to train a child's motor skills, including brushing their teeth. The ability to brush teeth properly and early protective measures are quite important factors for maintaining teeth and mouth. **Objective:** The purpose of this activity is to reduce the prevalence of caries in elementary school students as early protection against the incidence of dental caries as source of infection in students of Elementary School Lesanpuro 2 Malang City. **Method:** The design of this activity uses analytic observational with a cross-sectional approach. The sample used was grade 1 and 2 students at Elementary School Lesanpuro 2 with a total of 60 students. **Results:** From the results of measuring knowledge, it was found that the average increase before and after being given education was from 86.92 to 97.75 and statistically there was a significant difference ($p=0.000$). **Conclusion:** Early protection interventions with dental and oral health education, brushing teeth together and topical application of fluoride can increase knowledge about caries and its prevention because there is an increase in knowledge about caries prevention after the intervention was carried out on students at Elementary School Lesanpuro 2. **Keywords:** Early Protection, Caries, Education, Topical Application Fluoride

Introduction

Parents often ignore their children's dental health because they assume that deciduous teeth are only temporary and will be replaced by permanent teeth. They do not consider any dental treatment even in the presence of caries. This situation is what causes the high rate of untreated tooth decay, resulting in premature extraction of deciduous teeth so that many children lose their teeth prematurely. Deciduous teeth are very important in children and losing these teeth prematurely will cause various complications such as pain and discomfort, causing damage to the permanent tooth follicles underneath by disrupting their development process. Therefore, in this research, preventive measures against caries are needed, especially in children with a high risk of caries. Prevention of dental caries in children is very important to maintain and maintain deciduous teeth.

Promotion of children's oral hygiene can help parents prevent dental caries in their children. Parents can also routinely take their children to the dentist every six months. Apart from that, brushing your teeth after eating using toothpaste that contains fluoride, using dental floss, avoiding consuming sugar and sticky foods, replacing snacks with fruit and nuts, and applying caries prevention agents such as fissure sealant and fluoride gel by a dentist.

Material and Method

Method

This research method is analytical observational research with a cross sectional approach where data and research are carried out simultaneously at one time when data collection is carried out. The research location was at Elementary School Lesanpuro 2. This research was conducted with the target group being children aged 6-8 years (grade 1 and grade 2) who attended Elementary School Lesanpuro 2, Kedungkandang District, Malang City. Interventions used in solving problems include dental examinations, education, counseling, shared toothbrushing, and topical fluoride application.

Research Population

The population in this study were all students in grades 1 and 2 at Elementary School Lesanpuro 2, Malang City, which was also the inclusion criteria in this study. The exclusion criteria in this study were students other than students in grades 1 and 2 of Lesanpuro 2 Public Elementary School, Malang City.

Research Variable

The independent variable in this study was education on oral and dental care procedures. The dependent variable in this study was the oral health behavior of elementary school students at Elementary School Lesanpuro 2, Malang City, which was reviewed from the pre-test and post-test.

Research Data Collection

The type of data used in this research is primary data obtained from research instruments, namely pre-test and post-test questionnaires to determine changes in behavioral understanding as well as OHI-S and DMF-T forms to determine the dental hygiene status of research samples. Demographic data from the research sample was obtained from the elementary school in the form of name, age and gender

Data Processing

Data processing in this research went through the editing stage where the researcher checked the questionnaire to determine the completeness of the data so that incomplete data could be retrieved. Next, scoring is carried out on all the data taken by the researcher and then entered into the tabulation process so that the data can be analyzed and presented properly.

Data analysis took the form of a normality test using Kolmogorov Smirnov because the sample was >50 , then analysis was carried out using the Wilcoxon Test and Mc Nemar

Result

A. Respondent Characteristics

The results of collecting OHI-S and DMFT assessment data on 60 students from dental health status examination cards at Lesanpuro 2 State Elementary School provide the following characteristic information:

Respondent Characteristics Table

Characteristics	Value
Height (cm), mean \pm DI	114,03 \pm 22,18
Weight (kg), mean \pm DI	20,27 \pm 5,42
Nutritional Status, f (%)	
Malnutrition/ thinness	2 (3,3)
Good nutrition/normal	51 (85,0)
Over nutrition/ overweight	2 (3,3)
Obesity	3 (5,0)
OHI-S	0,51 \pm 0,45
DMF-T	0,37 \pm 0,88
dmf-t	7,48 \pm 3,78

B. Normality Test

The activities of the Unit Kesehatan Gigi Sekolah (UKGS) at Elementary School Lesanpuro 2 include providing education about the course of caries and efforts to maintain healthy teeth and mouth to students. And from this activity, pre and post knowledge data was obtained which was then compared using the paired t test if it was normal or Wilcoxon if it was not normal. The resultsof normality testing with Kolmogorov-Smirnov ($n > 50$) are as follows:

Kolmogorov-Smirnov Normality Test Table

Variable	Sig <i>Kolmogorov-Smirnov</i>	Result
Pretest Knowledge	0.000	Abnormal
Posttest Knowledge	0.000	Abnormal

C. Test The Difference Of Knowledge Before and After Treatment

To find out whether there is effectiveness in providing education about the course of caries and efforts to maintain dental and oral health to students in increasing knowledge, the Wilcoxon testwas carried out (non-normal data). The results obtained are as follows:

Table of Wilcoxon Test Results

Variable	Pre	Post	P Value
Knowledge	86,92 \pm 27,48	97,75 \pm 13,08	0,000**

** p < 0,01

D. Test Of Different Teeth Brushing Behavior

After providing education about the course of caries and efforts to maintain healthy teeth and mouth to students, students were then given a 21-day calendar control card to see how their children's tooth brushing behavior was, whether there was any improvement or decline. The test used to see differences in behavior is Mc Nemar with the following results:

Table of Differences in Student Toothbrushing Behavior Week 1 and Week 2

Respondent	Brushing Teeth Week 1	Brushing Teeth Week 2		P Value
		No	Yes	
Student	No	0	0	0,125
	Yes	4	37	
Parent	No	0	0	0,004
	Yes	9	32	

Table of Differences in Student Toothbrushing Behavior Week 1 and Week 3

Respondent	Brushing Teeth Week 1	Brushing Teeth Week 3		P Value
		No	Yes	
Student	No	0	0	0,000
	Yes	17	24	
Parent	No	0	0	0,000
	Yes	22	19	

Table of Differences in Toothbrushing Behavior of Week 2 and Week 3 Students

Respondent	Brushing Teeth Week 1	Brushing Teeth Week 3		P Value
		No	Yes	
Student	No	4	0	0,000
	Yes	13	24	
Parent	No	9	0	0,000
	Yes	13	19	

Discussion

The activity involved students at Elementary School Lesanpuro 2, Kedungkandang District, Malang City, especially students in grades 1 and 2. Before the dental and oral examination was carried out, counseling was carried out first. Participants were 60 students and female students each completing the pretest and posttest. The pretest was given before education and tooth brushing together. The posttest is given after the education is implemented. The pretest and posttest questions are instruments used as monitors to determine the level of knowledge about caries and its prevention.

Caries is a disease of hard tooth tissue caused by the activity of microorganisms in fermented carbohydrates and can occur because there is a combination of four causal factors, namely, host, microorganisms, substrate and time. Caries can be prevented by modifying the factors that cause it, one of which is by removing plaque. Brush our teeth twice a day with fluoride toothpaste for at least two minutes each time you brush. This recommendation is from the American Dental Association. When we brush, we help take food and plaque off your teeth. Plaque is a sticky white film that forms on teeth. Plaque has bacteria in it. After we eat a meal or snack that has sugar, the bacteria in plaque make acids that attack tooth enamel. Enamel is the hard outer coating that covers our teeth. Over time, the acid breaks down tooth enamel. That can lead to cavities. And plaque that stays on teeth hardens into tartar. When there's tartar on our teeth, it's harder to keep them clean. Tartar buildup on the gums also leads to inflammation that causes gum disease. (Zhou, 2023). In this study, early caries protection was carried out in the form of dental and oral health education activities, brushing teeth together and Topical Fluoride Application. Overall, this early protection activity is expected to influence dental caries prevention measures in elementary school students which will be followed up by increasing children's knowledge between before and after being given the intervention.

Efforts to maintain dental and oral health should be carried out as early as possible so that dental caries can be prevented so that infections do not occur. Schools are one environment that can be used as a place to promote dental health. Techniques and methods that can be used in schools related to dental health promotion can be carried out by teachers through public lectures, electronic media, print media such as posters and using outdoor media through banners. The determinants of oral health, like oral health itself, are multifaceted. The driving determinants of oral health include genetic and biological factors, health behaviors, access to care, physical environment, and social environment (Surtimanag, 2020). The AAP, however, also recommends screening for risk factors related to social determinants of health during all patient encounters. It is important for dentist to understand that an approach to children's oral health must also address social determinants. These social determinants, such as poverty, racism, education, access to healthy foods, culture, and physical environment, as well as access to medical and dental care influence oral health status and oral health inequities in much the same way as they influence overall health and health inequity. Dentist can consider and address determinants of oral health at the child, family, and community level. With a robust understanding of how social determinants influence oral health, pediatricians can advocate for policy, system, and environmental changes

that create (David and Whelan, 2022). Elementary school age is an ideal time to make dental and oral health efforts because elementary school age is the beginning of the growth of permanent teeth and is a group at high risk of dental caries. Caries in deciduous teeth develops more easily because the enamel thickness is thinner than permanent teeth. Caries in deciduous teeth often attacks mandibular molars, maxillary molars and maxillary anterior teeth. During the mixed dentition period, dental caries often attacks the lower permanent molars compared to the upper jaw teeth.

The desire for preventive action that a person feels to take action, apart from being influenced by one's own abilities, can also be due to encouragement from the environment. In this study, actions to prevent dental caries can be supported by encouragement from parents and students' knowledge in maintaining dental and oral health.

The first intervention carried out in this study provided education on how to maintain good oral hygiene. Because the behavior changes made by children are expected to develop when children understand the principles of maintaining good oral hygiene. A very basic cause of children's laziness in brushing their teeth is a lack of awareness of themselves and their parents in getting children to brush their teeth properly, correctly and on time. Dental and oral health problems, if not treated, will cause pain in the teeth, resulting in children being lazy about doing activities, children not attending school and decreased appetite, resulting in growth and development problems in children.

Encouragement in the form of health education for children in grades 1, 2, 3 is important in establishing dental health prevention practices, considering that at this age physiologically school age children begin with the loss of the first milk teeth which ends at puberty and the permanent teeth begin to grow, except rear molars. If dental hygiene is not paid attention to, it is possible that the permanent teeth that are starting to grow will become damaged or become diseased, such as caries. The formation of healthy behavior in brushing teeth, which is encouraged by the acquisition of dental health knowledge at an early age, is expected to encourage healthy dental care habits into adulthood.

The dental health education material presented in this research includes knowledge about the causes of tooth decay, how to care for dental health, namely brushing your teeth, foods that can damage teeth. Dental and oral health education needs to be given to students to increase students' knowledge. The better the level of knowledge about dental and oral health, the less dental disease will occur in students. Knowledge of oral health is a fundamental prerequisite for healthy behavior, allowing individuals to take measures to protect overall health (Tadin et al., 2022). An individual's knowledge of something can change and develop according to their abilities, needs for experience, and the level of mobility of information about something in their environment

From the results of measuring knowledge, it was found that the average increase before and after being given education was from 86.92 to 97.75 and statistically there was a significant difference ($p=0.000$). This shows that by introducing children to the world of dental health and the problems in it at an early age, they have the knowledge modalities to be able to maintain dental health so that they can maintain dental health according to their abilities.

The habit of brushing teeth at the recommended times needs to be instilled in children from an early age. The aim of dental and oral health education for children is essentially to introduce children to the world of dental health and all dental issues, so that they are able to maintain healthy teeth, train children's limbs so that they can clean their teeth according to their abilities, and get good cooperation from if your child needs dental care (Sari, 2021).

The second intervention carried out was tooth brushing. Available guidelines, public organisations and bodies (including the National Health Service in the UK) emphasise the importance of parental supervised brushing (PSB) twice daily with fluoridated toothpaste, with one of the occasions being before bedtime, as well as controlling dietary sugars' intake especially at bedtime. Both control of free sugar intake, especially before bed, and twice daily brushing rely on the development and maintenance of healthy family routines. Apart from dental health, bedtime routines, as a recurrent family behaviour, have shown important associations with key child wellbeing and developmental areas including quality of sleep, school readiness, school performance, psychosocial development as well as family functioning and parental wellbeing (Kitsaras et al., 2021). Similar research from the 2010 French HBSC study (Health Behavior in School-aged Children) highlighted the strong relationships between tooth brushing frequency, health behaviors (mostly dietary), health and body perception, and environmental socio-economic factors (Grado, 2021).

In week 1, all of the 41 students who filled out the control cards brushed their teeth, but in the second week only 37 students were still consistent and 4 other students were inconsistent. The results of the Mc Nemar test obtained a value of $p = 0.125$ which shows that there is no statistical difference in behavior. Meanwhile, from the parental control card, it is known that in week 1 all parents brushed their teeth, but in week 2, there were 32 parents who were consistent and 9 parents who were inconsistent. Statistically, there was a significant difference in behavior ($p=0.004$) where the difference was due to a decrease in tooth brushing behavior. In week 1, all of the 41 students who filled out the control cards brushed their teeth, but in the third week only 24 students were still consistent and 17 other students were inconsistent. The results of the Mc Nemar test obtained a value of $p = 0.000$ which shows that there is a statistical difference in behavior where this difference is due to a decrease in tooth brushing behavior. Meanwhile, from the parental control card, it is known that in week 1 all parents brushed their teeth, but in week 3, only 19 parents were consistent and 22 other parents were inconsistent. Statistically, there was a significant difference in behavior ($p=0.000$), where this difference was due to a decrease in tooth brushing behavior. In week 2 and week 3 there were 4 students who still did not brush their teeth, while 24 students consistently brushed their teeth, but 13 students experienced a decrease in their tooth brushing behavior. The results of the Mc Nemar test obtained a value of $p = 0.000$ which shows that there is a statistical difference in behavior where this difference is due to a decrease in tooth brushing behavior. Meanwhile, from the parent control card, it was found that in weeks 2 and 3, 9 parents still did not brush their teeth, while 19 parents consistently brushed their teeth, but 13 parents experienced a decrease in tooth brushing behavior. Statistical results showed a significant difference in behavior ($p=0.000$) where this difference was due to a decrease in tooth brushing behavior.

Someone who has high motivation can convince someone to take a decision to take an action. So the greater the positive encouragement the child receives, the more confident the child will be in taking good action to prevent dental caries.

The third intervention is the Topical Application Fluoride. Topical application fluoride is one of the most effective ways to prevent caries. Fluoride mouth rinse and fluoride toothpaste, used alone or in combination, reduced root caries increment after 1 year. Among the professionally applied topical fluorides, an annually applied 38% silver diamine fluoride solution combined with oral health education is likely to be the most effective in preventing root caries. Among the reviewed self-applied topical fluoride methods, daily use of a 0.2% sodium fluoride mouth rinse was shown to be most effective, followed by 1100 ppm to 1500 ppm fluoride toothpaste plus 0.05% sodium fluoride mouth rinse, and 1100 ppm to 1500 ppm fluoride toothpaste (Zhang et al, 2020).

Fluoride works to inhibit the absorption of salivary proteins on the enamel surface, thereby inhibiting the formation of pellicle and plaque, as well as increasing the resistance of enamel remineralization to acids or inhibiting acid formation and decreasing pH. Fluoride has an antimicrobial effect that can prevent caries (McDonald et al, 2011). Fluorides play a central role in the prevention of dental caries and are also used therapeutically for the inactivation of incipient carious lesions. The effect of fluoride is mainly achieved when applied topically, which is further enhanced when accompanied by good oral hygiene.

Since the implementation of water fluoridation, there has been a decrease in the prevalence of dental caries. Fluoride-containing products, including toothpaste, rinses, solutions, gels, foams, and varnishes, are indicated according to age and risk of caries (Nassar and Brizuela, 2023)

NaF varnish has been proven to have a positive effect in preventing and controlling coronal and root caries. A study conducted on children and adults showed that the use of NaF varnish reduces the acidic environment caused by plaque, reverses premature decay, and can increase tooth enamel remineralization and reduce tooth sensitivity. The results of this study cannot be compared to all elderly patients in general due to differences in factors such as lifestyle, medications, immune function, etc. Silver diamine fluoride (SDF) with a concentration of 38% is the most effective method for preventing root caries because it has antibacterial properties and can increase remineralization and is also cheaper.

When 2% sodium fluoride is applied topically, it interacts with hydroxyapatite crystals from the enamel surface to form calcium fluoride (CaF_2). This formed calcium fluoride is the dominant product and thus interferes with further diffusion of fluoride. Therefore sodium fluoride is applied only once and further applications are pointless for this reason. The calcium fluoride formed then reacts with hydroxyapatite to form fluoridated hydroxyapatite. Thus the fluoride content on the enamel surface increases and in turn allows the tooth to resist cariogenic attack.

Cavities or caries are a dental and oral disease that is often complained about by people from children, adults to the elderly. Based on the results of Riset Kesehatan Dasar (RISKESDAS) in 2018, as many as 45.3% experienced dental caries and the caries index of elementary school students in the city of Malang was 5.75% according to Gayatri's research in 2018, where this score was categorized as high according to WHO, so that from this data, it can be seen that some people

do not pay enough attention to dental and oral health, including the proportion of people who brush their teeth correctly is only 2.8% and those who receive services from medical dental personnel are 10.2%. This requires special attention to reduce dental caries with community-based promotive and preventive programs for school students' tooth decay. This is very relevant by involving schools and parents at home to always provide assistance with students' oral and dental health.

Schools have a role in maintaining dental and child health. The role of the school apart from providing dental health education, the school is a strategic system, because it has the potential to achieve the goal of promoting dental health effectively and efficiently, because it has a large group, and by involving parents of students in maintaining dental and oral health from an early age. , then they will be able to provide role models and direct their children at home with student control cards, through schools in the form of providing education to teachers and students by providing surface protection, as one of the activities to prevent more severe caries.

Parental knowledge is very important in underlying the formation of behavior that supports oral hygiene in children. This knowledge can be obtained naturally or in a planned manner through the educational process. Children will easily adjust if there is interactive communication between the child and the parent or caregiver. Therefore, if the lifestyle that children live is a healthy lifestyle, then the behavior that will be implemented in maintaining healthy teeth and mouth is also a healthy lifestyle.

Several factors can cause a lack of attention to maintaining healthy teeth and mouth, such as a lack of knowledge regarding efforts to maintain healthy teeth and mouth. This condition requires comprehensive treatment. Both teachers, school officials and parents at home must work together to accompany students to maintain healthy teeth and mouth. Therefore, the school, in this case, namely teachers, needs to have the knowledge and attention to be able to help school-aged children to prevent other dental and oral diseases that may arise due to a lack of awareness of the importance of maintaining students' dental and oral health.

In terms of increasing awareness of maintaining children's oral and dental health, the role of parents and schools is very necessary. The role of parents is very important in children's dental health, considering that children often encounter caries or cavities. The role of parents is very necessary in guiding, providing understanding, reminding and providing facilities to children so that children can maintain the cleanliness of their teeth and mouth. The role of parents in increasing awareness of maintaining children's dental and oral health, schools also have a role in maintaining children's dental and oral health. The role of the school, apart from providing dental health education, is also to help students maintain the health of their teeth and mouth. There is urgent need of increasing awareness among parents regarding the importance of maintaining their child's oral health. The inability to see the doctor should at least encourage better home practice measures for future (Goswami et al., 2021). Based on this, researchers are interested in researching the influence of the role of parents and schools on the oral health behavior of elementary school students in Malang City.

The targets for this school community service are students aged 6-8 years (grade 1 and grade 2) because at that age children prefer to play rather than read or write (Tsalisatul et al, 2021).

Children's fine motor development can be stimulated by designing learning that attracts children's interest. Apart from that, the teacher or presenter must demonstrate it in an interesting way in front of the class and provide appropriate props so that children focus on the teacher's or presenter's explanation.

Prevention of dental caries in children is very important to maintain and maintain deciduous teeth. Promotion of children's oral hygiene can help parents prevent dental caries in their children. Parents can also routinely take their children to the dentist every six months. Apart from that, brushing your teeth after eating using toothpaste that contains fluoride, using dental floss, avoiding consuming sugar and sticky foods, replacing snacks with fruit and nuts, and applying caries prevention agents such as fissure sealant and fluoride gel by a dentist.

Conclusion

Early protective intervention with dental and oral health education, brushing teeth together and topical application of fluoride can increase knowledge about caries and its prevention because there is an increase in knowledge about caries prevention after the intervention was carried out on students at Elementary School Lesanpuro 2.

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Dental and Oral Health Education to Parents of Sang Timur Batu Kindergarten Students

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Abstract

Maintaining good oral health is crucial for improving overall health. The aim of this community service is to enhance parental knowledge of dental and oral health. It is essential to develop good oral hygiene habits in children and for parents to have adequate knowledge of oral health before children enter early mixed dentition.

Keywords: dental health education; community services; parenthood; dental home care; early childhood caries

Introduction

Different nations, both industrialised and developing, have been studied in the field of early childhood caries (ECC). ECC is still the most common chronic condition in children and has a significant impact on society. Research by Peltroche et al. has identified poor oral hygiene and

infrequent dental visits as the most common causes of elevated caries risk in children between the ages of 3 and 6. Adequate oral hygiene practices are crucial for the physical and mental health of children and for preventing oral illnesses.

Several risk factors have been identified that affect the occurrence of ECC, including sociodemographic factors, dietary factors, breastfeeding/bottle feeding practices, oral hygiene, oral bacteria flora, and other factors such as enamel hypoplasia. Parental attention, where parents neglect to assist their child in brushing twice daily or do not have time to brush, has been reported as one of the most common risk factors for ECC. It should be noted that even if primary teeth are replaced by permanent teeth, ECC should still be considered a risk factor for caries in permanent teeth. Several epidemiological studies suggest an increase in the prevalence of caries of permanent teeth in students, adolescents, and grownups with a history of ECC. (Lam *et al.*, 2022).

A review by Jahanshahi *et al* showed that dental public health has used a brief patient-centred counselling method termed motivational interviewing (MI) that concentrates on user skills to inspire parents to accept handling methods for ECC instead of directing those choices. MI will be efficient at any time, whether it is a baby or a child, and more than the number of interview sessions, the quality of the sessions will be considered. A follow-up for at least 3 years will be ideal (Jahanshahi *et al.*, 2022). Motivational interviews (MI) of parents have been found to be useful in reducing the occurrence of new carious lesions in children. Additionally, it led to a development in insight into oral health behaviours (Manek *et al.*, 2023).

Despite the challenges, it has been observed that effective interventions that provide information, a toolkit for maintaining good oral health., and in-person counselling sessions (at the community health centre or a clinic, which includes a home visit and dental referral) are able to significantly decrease tooth cavities in children. As a result, children are up to 1.5 times more likely to be caries-free.(George *et al.*, 2019)

As a part of community service, we aim to educate the parents of Sang Timur Batu Kindergarten students on dental and oral health. It is crucial to emphasize the importance of dental and oral health during early childhood, as it greatly impacts one's dental and oral health in the long run.

Material and Methods

On Saturday, July 29th, 2023, from 9:30 to 11:00 AM WIB, we conducted an educational session in the multipurpose room of Sang Timur Batu Kindergarten School. During the session, we used various educational aids such as PowerPoint presentations, dental models, and toothbrushes. We also utilized several tools including microphones, sound systems, laser pointers, laptops, LCD screens, and cameras for documentation purposes.

During the first half-hour of the session, a presentation was given in the form of slides about different parts of the mouth, such as teeth, and the diseases that are related to the dental and oral cavity. The importance of dental and oral health was also discussed, along with tips on maintaining healthy teeth and oral cavity. At the end of the presentation, a demonstration was given on how to properly brush teeth. The second half-hour of the session was reserved for a question-and-answer session and discussion with the parents of the students.



Figure 1. Some photos of Dental and Oral Health Education to Parents of Sang Timur Batu Kindergarten Students

Result

Approximately 100 parents of students from Sang Timur Batu Kindergarten attended a counselling session, which was also attended by the principal and teachers of the school. The instructor provided information on various topics related to dental health, and around 10 questions were asked by the participants. The questions included topics such as children's bad habits regarding dental health, the age at which primary teeth are replaced by adult teeth, how to deal with toothaches, why children's teeth erupt late when the right time is to take children for dental check-ups, and whether children's cavities need to be filled. Other questions related to the best time to brush children's teeth, and how to choose a good toothbrush and toothpaste for children, among other things.

During the Q&A session, the instructor provided clear and easy-to-understand answers to the participants. By the end of the session, the participants had gained a better understanding of dental and oral health and how to maintain it. The participants expressed their hope for future counselling sessions on dental and oral health at Sang Timur Batu Kindergarten School.

Discussion

During early childhood, parents play a crucial role in their children's learning. They are responsible for creating an environment that fosters positive and enriching learning opportunities, which are essential for the cognitive, social-emotional, and executive functioning skills development of their young ones. Research shows that engaging parents in early education is cost-effective, and early interventions designed to promote foundational skills can have a long-term impact (Gross et al., 2022). Moreover, parental or caregiver behaviours have a significant impact on a child's life, as well as regular dental care (Jahanshahi et al., 2022).

Dental education that is not provided in dental schools or colleges is often considered less valuable. The separation of dental education from other professions like medical education has a negative impact on dental care delivery. Despite having a large number of primary medical staff, along with nurse practitioners, primary care physicians, pharmacists, and primary care providers, who can provide preventive oral care, such as oral hygiene guidance, to patients in their workplace, they are unable to actively contribute to preventive oral care due to their limited knowledge about the oral cavity's essential structure and function, oral diseases, and how to take care of and promote oral health (Lee *et al.*, 2022).

ECC is a common dental problem that causes significant concerns due to its severe impact on children's quality of life and well-being, along with their families. Children suffering from ECC have to deal with various impairments in their daily lives, such as eating and sleeping difficulties (Correâ-Faria et al., 2020).

However, the evidence linking oral health behaviour, socioeconomic, and other common caries risk factors to permanent teeth caries development is inconsistent. To address this issue, policymakers and healthcare professionals need to focus on promoting oral health and implementing preventive approaches for children at a young age (Lam et al., 2022). Moreover, it is observed that improved oral health outcomes can be sustained over an extended period by reinforcing interventions through referrals or follow-up reminders. (George *et al.*, 2019)

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KNOWLEDGE OF STUDENTS IN SDN POLOWIJEN 3 MALANG REGARDING EARLY DETECTION OF CARIES

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ABSTRACT

Background: Dental caries in children can hinder the child's development process so that it can reduce the child's quality of life. Efforts to maintain dental and oral health should be done as early as possible. Dental and oral health promotion efforts can be carried out in schools by using print media such as posters. The level of knowledge is one of the general criteria that influences the attitude of maintaining one's dental health. Good knowledge can influence health behavior in improving health, especially dental and oral health. **Objective:** To determine the level of knowledge of Grade 3 and 4 students at SDN Polowijen 3 Malang City about early caries detection as a preventive measure. **Methods:** This research was conducted at SDN Polowijen 3 Malang City with a target of 55 students in grades 3 and 4. This dental and oral health education uses small lectures with powerpoint instruments, posters, and dental phantoms. **Results:** Knowledge of early detection of caries in students SDN Polowijen 3 Grade 3 increased to 10% and grade 4 increased 5,15%. **Conclusion:** Knowledge about early detection of caries in students of SDN Polowijen 3 Grades 3 and 4 increases.

Keywords: Knowledge, Early Detection, Dental Caries

INTRODUCTION

Dental caries can reduce a person's quality of life. Dental caries damage hard tissue which includes enamel, dentin and cementum. According to RISKESDAS 2018, as many as 57.6% of the Indonesian population have problems with dental and oral health, of which 88.8% suffer from dental caries. Dental caries can occur at any age. In children in the 5-9 year age group, the number of children who experienced similar tooth decay was 54.0%. Lack of awareness of the importance of caring for dental and oral health can result in productivity. Dental caries that occurs in children will hinder the child's development process, one of which is the child's intelligence level decreasing, which if it occurs continuously and over a long period of time will affect the child's

quality of life. Efforts to maintain oral health should be carried out as early as possible so that dental caries can be prevented from occurring in children. Schools are one environment that can be used as a place to promote dental health. Methods that can be used in schools related to dental health promotion can be done using electronic media, print media such as posters and using outdoor media through banners (Notoatmodjo, 2010). Elementary school age is an ideal time to carry out dental and oral health efforts because elementary school age is the beginning of the growth of permanent teeth and is a group at high risk of dental caries. The level of knowledge is one of the general criteria that influences the attitude of maintaining a person's or community's dental health. Good knowledge can influence health behavior in improving health, especially dental and oral health. On the other hand, insufficient knowledge regarding the importance of maintaining teeth and mouth can lead to an attitude of ignoring dental and oral hygiene (Rahtyanti, et al, 2018). The aim of this research is to determine students' knowledge in early detection of dental caries as an effort to prevent dental caries.

MATERIAL AND METHODS

This research was conducted at SDN Polowijen 3 Malang City in June 2023. The population in this study was 55 students divided into class 3 and class 4. This research was conducted on students whose average age was 10 years. The data collection technique in this research was pre-test and post-test which were carried out before and after providing dental and oral health educational material. The questionnaire instrument was used to determine students' knowledge after receiving material about dental and oral health and how to detect early dental caries.

RESULT

Based on the research conducted, the following results were obtained.

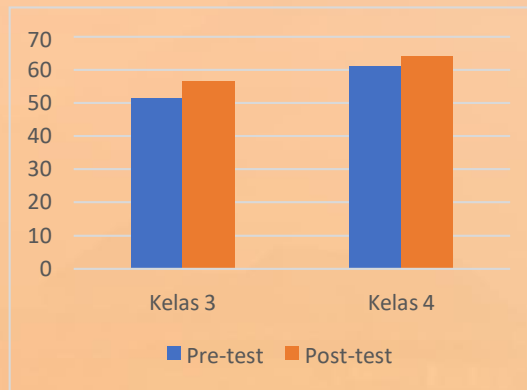


Figure 1. Graphic of Pre-test and Post test Score

The results obtained from the table above are the total score on the pre-test and post-test divided by the number of children. So the average pre-test score in class 3 was 51.30 and the post-test score was 56.68. In class 4, the average pre-test score was 60.98 and the post-test score was 64.09. Knowledge of early detection of caries in students SDN Polowijen 3 Grade 3 increased to 10% and grade 4 increased 5,15%.

DISCUSSION

Based on the results, the level of knowledge about early caries detection increased after providing educational material. According to Sungkar et al., (2010), it is explained that knowledge is an important factor that influences a person's attitudes and behavior. The increase in respondents' knowledge reflects that knowledge is influenced by the presence of media to make it easier for respondents to find out information about dental and oral health. In this study, the media used was a book on early detection of dental caries. After being given the book on early detection of dental caries as a learning medium, students' knowledge increased quite significantly, because the book on early detection of dental caries contains text and pictures so that when the target is reading they can also see interesting pictures. According to Notoatmodjo, 2012 knowledge is the result of "knowing" and this occurs after people sense a particular object. Fitriastutik (2010) in his research stated that booklets are a teaching aid or medium for conveying health messages in book form, either in the form of writing or pictures. Tools or teaching aids in dental health education really help the target in receiving information. Education through providing media in the form of books containing text and images, which are more detailed and clear, easy to understand and do not give rise to misperceptions can increase a person's knowledge (Fitriastuti, 2010).

This increase in knowledge by providing books on early detection of dental caries occurs because the book on early detection of dental caries is a graphic medium that contains text and images that are interesting and easy to understand with the aim of increasing children's knowledge about the signs of dental caries. Ratuela (2020) in her research stated that providing booklets containing information about how to detect dental caries in children is provided where the explanation is accompanied by attractive pictures so that the information can be captured easily. The booklet media given to respondents to take home allows respondents to recall the material that has been given (Ratuela, 2020). The increase in knowledge in this study was also influenced by the timing of the provision of books on early detection of dental caries. The choice of pretest and posttest time interval also influences the research results. The choice of this distance was due to the results of research conducted by Puspikawati, 2018. The distance between the pretest and posttest for 1 week was less effective, because the distance was too close. Based on Puspikawati's research results, 2018 recommends that the ideal time interval for carrying out the pretest and posttest is 15-30 days. The aim is to avoid subjects who still remember/have done the same thing during the pretest. The shorter the time interval between the initial test and the final test, the greater the influence of the retention factor. If the time distance is too close, the respondent will still remember the first answer (Puspikawati, 2018). The results of community service regarding education on early detection of dental caries for grade 3 and 4 students at SDN Polowijen 3 have proven effective in increasing student knowledge. This can be seen from the increase in the average knowledge of respondents, before being given education about early detection of dental caries and after education. The dental caries detection book contains information about dental caries, signs of dental caries, how to prevent dental caries and how to maintain children's dental and oral health. Before being given the book on early detection of dental caries, many respondents still did not know the signs of dental caries and how to maintain children's oral and dental health. Then, after being given education on early detection of dental caries, students experienced an increase in knowledge about the signs of dental caries and how to maintain children's oral and dental health. Efforts to prevent caries and maintain children's dental and oral health can be done from an early age.

CONCLUSION

Educational outreach using handbook and mini lectures can increase children's knowledge about early detection of dental caries.

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Dental Health Education in Periodontal Disease with Systemic Factor on Pregnant Woman and Elderly

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Abstract

Periodontal problem occurs on most of the Indonesian people including pregnant woman and elderly. Chronic inflammation in periodontal tissue may cause systemic complication such as pre-eclampsia in pregnant woman and worsen chronic diseases in elderly. A good oral hygiene is key to have a healthy periodontal tissue which can be achieved with a proper oral hygiene habit. The aim of this community service is to educate people to maintain oral hygiene in order to have a better periodontal health thus could improve one's quality of life.

Keywords: Periodontal Disease, Periodontitis, Dental Health Education, Pregnant Woman, Elderly

Introduction

Riset Kesehatan Dasar (Riskesdas, 2019) states periodontal problem occurs as high as 74,1% in Indonesia which means most of Indonesians have either gingivitis or periodontitis. Periodontal tissue consists of cementum, gingiva, alveolar bone, and ligament periodontal take a main role in oral health, to preserve a strong healthy tooth in their function for chewing food. To have a stable periodontal health, one's must have a good oral hygiene to minimize the plaque due to its role of being the etiology of periodontal problem.

It is essential for a person to have good oral condition in which is a gateway to the body. Problem occurs in a mouth can affect the whole body due to its function, diseases such as gingivitis and periodontitis can influence one's systemic condition especially in pregnant women and elderly. Gingivitis and periodontitis are a chronic inflammatory disease which is releasing a constant inflammatory agent that can affect homeostasis. Recent studies showed having periodontitis on a woman pregnancy can increase the risk of adverse pregnancy outcomes such as pre-eclampsia, low birth weight and preterm birth (Johnson et al, 2015). Meanwhile in elderly, periodontal disease can worsen another chronic disease such as

hypertension and diabetes mellitus which could lead to altered person's quality of life (Mauri-Obradors et al., 2017) (Clark, 2021).

Periodontal disease mostly caused by plaque and bacteria. In order to accomplish a healthy oral condition, an individual must have a good knowledge about oral health including ways to obtain a good oral hygiene so that the plaque and bacteria amount will be reduced. A proper oral hygiene habit is needed to prevent periodontal diseases (Duque et al., 2020).

As a health care professional, dentist required to do a community service for improving public oral health condition thus improve their systemic conditions. In this opportunity, we did dental screening and a public education about periodontal condition such as defining periodontal tissue, etiology of periodontal problem and its effect on systemic conditions especially on pregnant woman yet elderly with other chronic disease (diabetes and hypertension) also ways to prevent periodontal problem. Our target in this service were pregnant women and elderly (those above 50 years old) in Dusun Berek, Desa Sumber Ngepoh, Kecamatan Lawang, Kabupaten Malang, Jawa Timur.

Material and Methods

On Saturday, September 17th, 2023, from 08.00 to 12:00 AM WIB, we conducted an educational session in the village meeting hall of Desa Sumber Ngepoh. During the session, we used various educational aids such as pre and post dental health questioner, PowerPoint presentations, dental models, and toothbrushes. We also utilized several tools including microphones, sound systems, laser pointers, laptops, LCD screens, and cameras for documentation purposes.

Pre-test questioners were given before we do the dental health education session to measure the knowledge of the villagers. After finishing the questioners 4 of the team scoring the result, 2 others do the dental education health. First session was held from 08.30 till 09.55 with topic periodontal health related to pregnancy. The second session started at 10.05 with the same order as first session with the second topic which is periodontal health related to elderly with chronic disease as hypertension and diabetes mellitus. By the end of each session, there was a Question and Answer session. The opportunity was given to the floor to ask any question related to the topic, three question each session. Instructor was then giving the answer in clear and easy-understanding words.

The second day, same time from 08.00 to 12.00 AM WIB, We do a dental screening using some indexes such as Oral Hygiene Index, Community Periodontal Index of Treatment

Needs (CPITN), gingival index score dan gingival recession. The result used for referring the patient to nearest health care to provide proper treatment with better equipment.

Result

Pretest mean result for the first topic was 74.82 for the mean score and the post-test was 81.72. While for the second topic which is elderly the pretest mean score was 61.48 and the post-test score 75.5. Both groups showed an increased mean score which is implying the better understanding about the dental education of the audiences.



Figure 1. Dental Health Education to Pregnant Woman and Elderly of Desa Sumber Ngepoh

Discussion

Periodontal disease is one of the most common oral infections in Indonesia with over 70% population are infected (Kementrian Kesehatan RI, 2018). At early-stage periodontal problem is infecting the gingiva which called gingivitis. Untreated gingivitis could develop and destruct other periodontal tissue such as alveolar bone, thus called periodontitis. Periodontitis is a chronic inflammation disease which releasing constant amount of inflammatory agent that can affect systemic condition such as pregnancy, hypertension, and diabetes mellitus (Sima & Glogaumer, 2013). The main etiology of periodontal disease are plaque and bacteria (Newman, Takei & Klokkevold, 2014).

Periodontal pathogen and their product take the main role of a periodontal disease progress, constantly induce body to release inflammatory agent that can go thru the placenta barrier resulting in altered pregnant outcome (Johnson et al,2015). The adverse pregnant outcomes that could present are low-birth weight, preterm birth, and per-eclampsia (Nannan, Xiaoping & Ying, 2022). Similar to the effect toward pregnancy, periodontal disease can worsen elderly with other chronic disease such diabetes and hypertension. Diabetes and periodontal disease have a double-edge sword term. Periodontitis could worsen glucose level due to the influence of inflammatory agent while diabetes worsens the periodontitis condition (Newman, Takei & Klokkevold, 2014) (Lee et al, 2018). One's quality of life might be altered due to periodontal diseases (Musskopf et al, 2018).

Periodontitis can be prevented by doing professional dental cleaning (scaling root planing) to eradicate tartar that can be a place for dental plaque retention. Following with patients' self-care for maintaining the oral hygiene with daily cleaning of the teeth such as brushing twice daily along with the use of interdental cleaning tools (interdental brush or dental floss) and a non-therapeutic mouthwash if needed. As many people do not have this knowledge, dental professional has the responsibility to educate as many people about ways to maintain oral cavity health thus improving their quality of life.

Conclusion

Dental health education is important to be done in Indonesia as many people live in rural area have a minimal knowledge about oral health. In order to build a proper oral hygiene maintenance, one's must have the knowledge about the cause and the effect of a disease which in this case is periodontitis. During the pre-test audiences have no clue about the importance of having healthy periodontal tissue, after DHE session was ending they understand better and have the urge to do a regular checkup to dentist to get treated and have a good oral health including periodontal health.

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