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Bargouth, Natalia

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Undergraduate



# Can Tissue Regeneration in Gingival Recession Help Prevent Oral Health Diseases in Developing Countries?

Natalia Bargouth

University of California,  
Merced

## Author Notes

Questions and comments can be addressed to [nbarghouth@ucmerced.edu](mailto:nbarghouth@ucmerced.edu)



## Abstract

In developing countries and low income areas, there is poor oral health care and education. Many individuals in low income and developing countries do not have the proper education and oral health care in order to obtain a healthy mouth (Kloppsteck, et. al., 2016). For example, in Central America and developing countries, it is cheaper for inhabitants to drink soda rather than water. Also, they do not have the proper education about brushing and flossing their teeth; therefore, they develop several cavities and oral health diseases, such as gingivitis. Many of them do not have tooth brushes, tooth paste, or floss in order to maintain proper oral health care. Because of poor oral health education, they develop several periodontal diseases. Also, through the lack of dental education in developing countries, these cavities lead to teeth loss and several periodontal diseases. The teeth then become deteriorated and infected, which causes several health implications and when the pulp of the tooth and the nerves are infected, that can lead to neurological implications.



In low income areas and developing countries, individuals value the look of their mouth more than the health of their mouth. For example, if their teeth are straight and white, they do not feel as if they have bad teeth. Nonetheless, because there is not proper oral health education in developing countries in Central America, their average tooth count is about 27 teeth in the mouth compared to the normal average or 32 teeth per mouth (Dowsett, et. al., 2002). On average, those in the Central America and developing countries have fewer teeth due to poor oral health education and the development of severe cavities that cause the tooth to have to be extracted.

Because of poor health education and improper health care, several harmful oral pathogens can generate inside an individual's mouth; therefore, causing several oral health and periodontal diseases. *Porphyromonas gingivalis* is one of the harmful oral bacteria pathogens in the mouth that causes periodontal diseases, bad breath, gingival recession, and tooth loss due to the disruption of the attachment to the bone, which usually targets those of older ages, around the age of 65 (Griffen, et. al., 1998). *P. gingivalis* causes all of these oral health implications and gingival recession by a peptidase removing signal peptides that trim the fibril proteins in the gums; therefore, leading to the recession of the gums and exposure to the roots of the teeth (Kloppsteck, et. al., 2016). *P. gingivalis* was proven to be a periodontal pathogen because the pathogen is greater in those with periodontal diseases (periodontitis) than those with healthy oral health (Griffen, et. al., 1998).

Another way that individuals develop receding gums and exposure to the teeth's roots is through brushing hard, which occurs due to the lack of proper oral health education. Nonetheless, in order to minimize gum recession and to prevent *P. gingivalis* and other oral health pathogens from developing in the mouth, individuals must have proper oral health education. Gingival recession is common in those individuals in low income and developing countries because they



do not have the proper oral health care and education like those in developed countries.

Individuals in developing countries can develop receding gums from brushing hard and/or not brushing or flossing their teeth in general. When individuals do not brush or floss their teeth regularly, cavities generate in the teeth. If cavities are not filled and taken care of, that can lead to the cavities ability to reach the nerves in the tooth, which can then cause severe pain and neurological implications.

The pathogen, *P. gingivalis*, causes bad breath in the mouth because of the pathogen's ability to cause gingival recession. When there is gingival recession, it causes exposure to sensitive parts of the teeth, which then cause deterioration of the tooth and more complex periodontal implications and diseases to occur within the mouth (Kloppsteck, et. al., 2016). The deterioration and exposure of the tooth's root is the cause of the bad breath that is occurring in the mouths of those with receding gums (Kloppsteck, et. al., 2016). Gingival recession increases an individual's risk of root caries (exposure of the tooth's roots) and discomfort of the gums, which is why many patients with gingival recession obtain several oral health implications, and pain and sensitivity of the teeth when eating or drinking (Merijohn, 2016). With gingival recession there is massive bone loss and gingival inflammation, which occurs due to the increased exposure of tooth, therefore, causing an increase in *P. gingivalis* (Armitage, 2014).

By increasing the bacterial pathogen, *P. gingivalis*, this will then cause an increase in periodontal diseases due to the pathogen's ability to break down gingival fibers and signal peptides (Kloppsteck, et. al., 2016). A way to revert gingival recession could be through tissue regeneration. Tissue regeneration is simply a process that is engineered to regenerate and reform lost tissue. In a recent study from the *The Journal of the American Dental Association*, it was proven that some treatments for gingival recession can be from different techniques from tissue



regeneration by connective tissue grafting (CTG) and guided tissue regeneration (GTR) to help regenerate the lost attachment of the teeth (Kassab, et. al., 2002). These are common methods that are utilized in order to treat the exposure of the roots of the teeth. Through the connective tissue grafting procedure, skin and tissue is cut and stitched over the exposed areas of the roots of the tooth in order to allow the gums to regrow and regenerate in these areas (Kassab, et. al., 2002). Through the guided tissue regeneration procedure, it is a dental surgical procedure that allows barrier membranes to direct the growth of the new bones of the tooth (Kassab, et. al., 2002). These different techniques allow individuals and researchers to have a better comprehension about the different approaches that can be taken in order to regenerate the tissues in the gums. Some implications that can occur with these surgical methods are that an individual can react differently to the regeneration of the gums, which can cause the inflammation to become infected.

Through mucogingival periodontal plastic surgery, these tissue regeneration methods are successful because they augment the keratinized tissue of the gingiva in the receding gums, and it obtains partial to complete root coverage (Kassab, et. al., 2002). These mucogingival periodontal plastic surgeries essentially correct the positioning of the gingiva (gums) by correcting the alveolar mucosa and deformities of the gingiva (Kassab, et. al., 2002). Through different techniques, such as grafting, performed through the periodontal plastic surgery, researchers were able to obtain full recovery of the gums and parts of the tooth that were decayed (Kassab, et. al., 2002). Researchers were also able to find treatments for tissue regeneration and the loss of bone from the bacteria *P. gingivalis* by mechanical hindrance through membrane techniques, the prevention of soft connective tissues and other cells such as fibroblasts cannot enter the defected bones and slower migrating cells can enter and repopulate in the defected bone



(Dahlin, et. al., 1988). This will allow the gums to be able to regrow and regenerate effectively without the presence of bacterial pathogens.

Researchers also determined that by utilizing ATP, they can diminish the growth and presence of *P. gingivalis* because ATP diminishes bacterial growth by being an intracellular pathogen sensor (Choi, et. al., 2013). ATP also allows the secretion of cytokines into a cell, which allow different cells to communicate with one another in order to move towards different sites of inflammation inside of the body (Choi, et. al., 2013). The cytokines then allow the recruitment of different immune cells to fight the bacterial pathogens, and the sensing of different pathogens within the body to allow the ability of the recruited immune cells to fight off the harmful pathogens (Choi, et. al., 2013). Through ATP usage in gingival recession and gingival diseases, there can be a treatment. ATP will diminish the growth of different harmful pathogens and allow immune cells to fight the pathogens. Through periodontal plastic surgery and tissue regeneration of the gingival, gums and teeth can be restored back to their normal functions. Therefore, through these different methods, there can be a decrease in periodontal diseases and a reversion of gingival recession.

There are several different factors and methods that can be taken into account when diminishing the process of gingival recession. There are different ways through research and surgeries that can fix the problems when they have already occurred, and there are also ways to prevent gingival recession, and oral health implications and diseases through proper education. All in all, if individuals in developing countries are educated properly about how to brush and floss their teeth, oral health diseases will be minimized and oral hygiene will improve. Nonetheless, more research on diminishing oral pathogens and implementing tissue regeneration and oral plastic surgeries can revert the problem. However, education about proper oral health



care remains essential in order to prevent further implications and repetitions of the situation.

With proper education and the proper tools in order to maintain healthy oral hygiene, prevent oral health diseases, and diminish oral health and health problems in general, individuals will be less likely to obtain gingival recession and bone loss.

In conclusion, with proper education and oral health care, individuals in low income and developing countries can obtain a healthier mouth and decrease periodontal diseases. There needs to be more research done on the human body's response to adapting to the regeneration of the tissues in the gums; however, understanding the cause of periodontal diseases and diminishing oral pathogens in the mouth can help prevent or lessen an individual's periodontal disease. Immunology is a great factor in tissue regeneration of the gums, because each person can respond differently to the inflammation that occurs with the dental procedures that were presented in order to regenerate the gums in the mouth. Nonetheless, more research needs to be done on the immunology factor of these procedures in order to determine an effective way for the tissues of the receding gums to be regenerated in a healthy way. Tissue regeneration in receding gums can help prevent several oral health diseases. However, in order to apply tissue regeneration in gingival recession, inflammation and immunology needs to be taken into account in order to further examine this type of research. Tissue regeneration is a great way to revert gingival recession and diminish periodontal diseases along with the exposure of the cells in the mouth to ATP. The ATP will allow the immune cells to target the pathogenic bacteria and allow the body to fight the pathogen; therefore, causing a decrease in the pathogen, *P. gingivalis*, and oral health diseases. Nonetheless, in order to minimize an individual's chances of obtaining periodontal diseases, one must have better oral health care and education, and oral health hygiene,





as well as diminishing the growth of pathogens in the mouth and the possibility of going through mucogingival periodontal plastic surgery to regenerate the gums in the mouth.



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