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The Effectiveness of Illustrations Depicting the Use of Silver Diamine Fluoride in an Oral Health Campaign delivered via GoodHealth TV

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In this article, animal science student Nicole Holt describes her research being done at the Larsson Lab, a lab associated with the College of Nursing, and the CO-OP (Caring for Our Own Program). She is creating scientific illustrations of how silver diamine fluoride (SDF) acts on the tooth so that people will be more likely to allow dental hygienists to use SDF on their children's teeth. While the drawings are being aired on GoodHealthTV in Indian Health Services clinics across the state, surveys will be given to viewers to measure the effectiveness of the illustrations. Overall, the goal of this research is to be able to show visually how SDF works and to study how education on the treatment affects parents' willingness to allow it to be used on their children.

Introduction

The oral healthcare provider shortage in the state of Montana affects all of us, but the disparity especially affects the children of the twelve tribal nations.[1] In 2020, it was estimated that 84 percent of American Indian/Alaska Native (AI/AN) children will have experienced dental decay, such as carious lesions, by the time they are in the third grade (State of the State's Oral Health).

Usually, carious lesions are treated using the "drill-and-fill" technique. However, this can be costly and traumatizing to a child. Silver diamine fluoride (SDF) is a low-cost way to treat carious lesions in a way that is not traumatizing and does not require the use of anesthesia.

Many parents have concerns about dental hygienists using SDF on their children's teeth, as it stains the affected areas black (Figure 1). Although the coloration does look concerning, the treatment has little to no risk. Recent research from the Larsson Lab of the College of Nursing (CON) at Montana State University (MSU) suggests that when parents are educated on SDF, they are more likely to allow dental hygienists to use it on their children's teeth (Old Elk and Larsson, 2022).

To address this problem, we need to educate parents more, so this exploratory study will be measuring the effectiveness of a type of public health education. I will create scientific illustrations using the program Procreate (Savage Interactive, version 5.2.6) because scientific illustration can explain medical concepts when other forms of education do not suffice. After the drawings are completed, they will be broadcast to the residents of the American Indian nations across the state using GoodHealthTV, and then the effectiveness of the drawings will be measured through surveys.

Literature Review

The Importance of SDF in Pediatric Oral Healthcare

SDF is a cost-effective way to treat carious lesions in children without the use of anesthesia. It is a mix of silver, which has antimicrobial properties, and fluoride, which hardens the enamel of the teeth (Sarvas, 2018). It is painted onto teeth that have active decay to kill the bacteria, harden the enamel, and provide a short-term solution to oral infection (Figure 2). It is important to note that while SDF can arrest caries, it cannot prevent or fix them. SDF is an interim solution in deciduous or permanent teeth until dental treatment with a dentist can be completed or the baby tooth exfoliates.

SDF is much less costly than the typical "drill-and-

1 Apsaalooke (Crow), Nakota (Assiniboine), Tsis tsis'tas (Northern Cheyenne), Niitsitapi (Blackfeet), Ktunaxa (Kootenai), Ojibwe (Cree, Chippewa, and Little Shell Tribe of Chippewa), A'aninin (Gros Ventre), Kaniksu (Pend d'Oreille), Sqelix (Salish), and Oceti Sakowin (Sioux).

fill" method because it does not require the use of anesthesia, which can cost around $9,350 per procedure (Phipps et. al, 2019). SDF can be done very quickly, so parents do not have to take as much time off of work as they would for drilling and filling. Smiles Across Montana, a partner of the Larsson Lab, treats children's teeth with SDF during the school day.

Having a cost-effective way to arrest caries in children's teeth is important in all populations, but especially in AI/AN populations, which experience the highest poverty rate out of any race group (US Census). Additionally, AI/AN children are three times more likely than white children to experience carious lesions, and they are the most common health problem for AI/AN children (Phipps et. al, 2019).

SDF is an effective way to treat carious lesions in children that avoids the use of anesthesia and is affordable for parents.. This is favorable, as when children are exposed to anesthesia for dental procedures at a young age, they are more likely to have dental anxiety and poor oral health, as they are likely to only go to the dentist when they are in pain, rather than going for preventative measures (Haworth et. al, 2017).

The Importance of Scientific Illustration in Healthcare

Scientific illustration is an effective way to explain medical concepts when photographs and words do not suffice. It is an excellent way to help people understand things that are too small to be photographed, such as organelles in a cell, and it also helps people to understand the systems in their body, and how they work. Drawings can show patients what is happening in their bodies, and what will happen during a procedure (Perilli, 2019). Drawings can also help students understand how to perform procedures correctly, as "medical students depend on illustration to learn anatomical facts and details that may be too subtle for the written or spoken word" (Hajar, 2011).

Recent Research Being Conducted

This project is building off the work of Ms. Samantha Old Elk, who provided education on SDF using GHTV, and was successful in persuading a sample of American Indian respondents in Montana (n = 100), that SDF is an effective method of treating dental caries. This proposed project expands on the findings of Old Elk and Larsson's work. They found that only 20% of viewers had ever heard of SDF before the video was shown but 88% found the video very useful and more than half (54%) were very like to pursue SDF treatment for their children. Nearly all (96%) thought that their child's oral health would improve with the use of SDF. While 100 people elected to complete the survey, GHTV estimated that the video

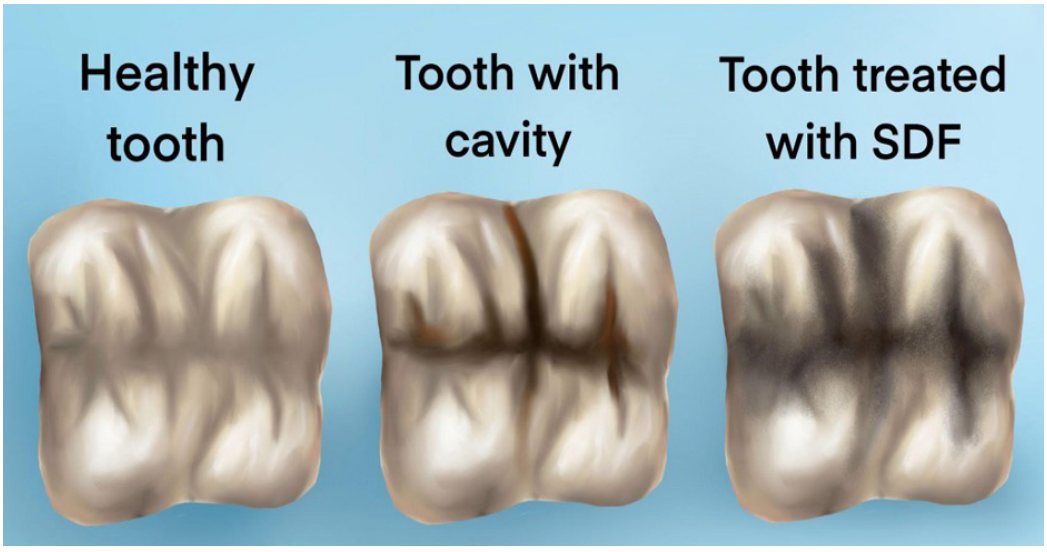

FIGURE 1
Artistic rendering of a healthy tooth, a tooth affected by a cavity, and a tooth treated with SDF.

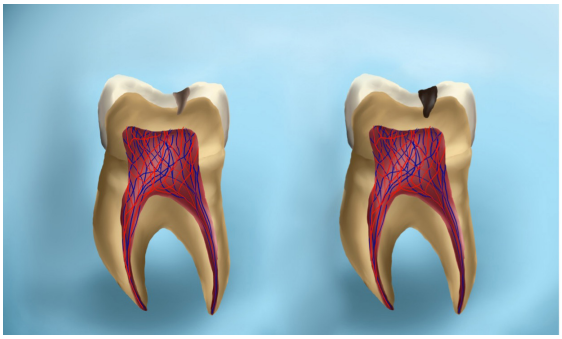

FIGURE 2

A tooth with a carious lesion (left) and that carious lesion being treated with SDF (right)

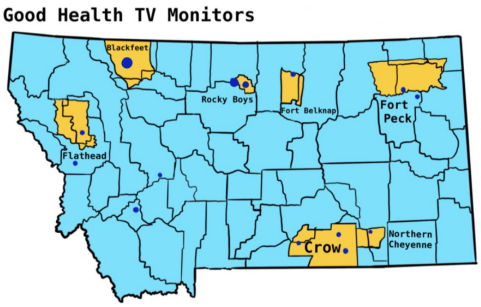

FIGURE 3

Map depicting the locations of all 48 GoodHealthTV monitors across the state of Montana.

Most GHTV monitors are in clinics in the American Indian nations across the country. Some of the GHTV monitors are in close proximity to each other, and are represented by a single, larger point on the map.

received 86,106 views over the 127 days of airtime (Old Elk and Larsson, 2022). I will be building off what Old Elk and Larsson found by illustrating the mechanism of action accomplished by the application of SDF to active decay, and then measuring the effectiveness of the illustrations through surveys.

Methodology

The illustrations will be aired using GoodHealthTV, a television program shown in medical clinics in the American Indian nations, that is used to educate and promote healthy choices. This program has been shown to be effective at providing healthcare education, as "99 [percent] of viewers indicated they... learned new information", and 92 percent went on to find more information on the topics covered (GHTV, 2021). Because this program has been shown to be effective, and because people feel they can trust it, I feel that airing the illustrations on this program will be beneficial for the education of viewers (Figure 3).

Currently, I am in the process of creating the illustrations. I am researching how SDF is applied, and then how it acts on the teeth so that my illustrations are accurate. I am also researching what elements make scientific illustrations effective for viewers so that my drawings can provide education in a way that is easy for parents to understand.

Soon, I will be submitting the illustrations to GoodHealthTV, and I am hopeful that they will be airing the illustrations in the spring of 2023 to 48 Indian Health Service medical clinics, at which time I will be collecting the data that will show whether my illustrations were effective.

Conclusion

The intent of this project is to use scientific illustration to help parents understand how SDF acts on the teeth so that they will be more likely to allow dental hygienists to use it on their children's teeth. These drawings will be aired to the American Indian nations across the state using GoodHealthTV. The children living in the American Indian nations would benefit from their parents allowing the use of SDF, as it is quick, painless, does not require anesthesia, and is inexpensive. Overall, the goal of this project is to improve oral health in dental care provider shortage areas in the state, many of which are in the American Indian nations.

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Nicole Holt is a freshman at Montana State University majoring in Animal Science with a concentration in equine science, and minoring in Native American studies. Nicole has worked with the Larsson Lab since fall 2021 and began her research at the same time. She moved to Bozeman in spring 2021, and has enjoyed hiking, and improving at Nordic skiing and flyfishing. In her free time, she enjoys drawing, riding horses, and spending time with her pets. In the future, Nicole hopes to go to graduate school and improve at horseback riding, especially cutting and reining.