Periodontal Education Program in a Trauma Affected Community

by

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Abstract

The goal of this study was to evaluate an oral health education program that focused on periodontal health and disease in a Trauma Affected Community (TAC) in a Dental Health Professional Shortage Area (DHPSA). The research question was, "Is a periodontally focused oral health education program effective in increasing periodontal knowledge in individuals who are part of a TAC in a DHPSA?" The Neighborhood Resilience Project (NRP) in Pittsburgh, Pennsylvania is a non-profit organization that offers a volunteer-run Free Health Center in a DHPSA and primarily serves a TAC. We administered a pre-presentation assessment to assess baseline knowledge at weekly NRP community events. Then, we gave presentations about periodontal health, periodontal diseases, risk factors, and home care. Gained participant knowledge was evaluated via a post-presentation assessment. 30 paired pre- and post-surveys were used in the analyses. Improvements in knowledge were identified for plaque causing tooth loss, diabetes affecting gum health, and pregnancy affecting gum health. This research is of public health importance because it focuses on a disease that affects nearly half of the adult population and examines an at-risk population to provide a sustainable solution and reproducible model for other TAC organizations. Per our review there is no literature that documents oral health knowledge and status of individuals from trauma affected communities. These results aid in understanding a TAC's baseline oral health knowledge and can be used to create programs that improve TACs oral health and consequently overall health.

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Preface

      I would like to thank Dr. Nyla Balakrishnan for her dedication to this project and its success. Her mentorship throughout this project was invaluable. I would also like to thank Dr. Steven Albert for his continuous support and guidance with this essay. This project would not be possible without the entire Neighborhood Resilience Project community and participants. I appreciate their smiles and friendship. Lastly, I would like to thank my husband, family, friends, and the "Front Row Girls" for always believing in me and providing me with love and support to flourish.

1.0 Introduction

1.1 Periodontal Health and Disease: Definitions, Prevalence, Impact

Periodontal health refers to the health of the periodontium, or the tissues that support the teeth, which also means the absence of inflammatory diseases like gingivitis and periodontitis in these tissues (Lang & Bartold, 2018). Gingivitis, or "reversible" gum disease, is an inflammatory response to bacterial plaque, but it is confined to gingival tissue and can be reversed with improved oral hygiene and plaque removal (Hajishengallis et al., 2020). Periodontitis, or "irreversible" gum disease, is the progression of gingivitis that results in connective tissue destruction and bone loss, which cannot be reversed and at best can only be stabilized (Hajishengallis et al., 2020). Since periodontitis results in bone loss, there is less bone left to support the teeth in this disease state, and this leads to mobile teeth and tooth loss (Hajishengallis et al., 2020). Tooth loss is associated with decreased chewing abilities, which is related to decreased oral health quality of life and general health (Brennan et al., 2008).

Also, periodontitis can be influenced, or exacerbated, by systemic conditions and risk factors. Diabetes mellitus is a systemic condition that influences periodontal disease, especially when diabetes mellitus is not well controlled (Bascones-Martinez et al., 2011). 11.6% of the United States population has diabetes, and 38.0% of the United States population is prediabetic (Centers for Disease Control and Prevention, 2023). Pregnancy is another systemic condition that can influence periodontal disease, and this happens through hormonal changes that pregnant people experience (Wen et al., 2023). Smoking is a risk factor for periodontal disease that increases the severity of the disease (Rivera-Hidalgo, 2003). These are conditions and behaviors that impact a

person's periodontal disease development and progression, making them important to discuss particularly with the study population.

The prevalence of periodontitis in adults in the United States 30 years and older was 47.2%, and 70.1% for adults aged 65 years and older (Brennan et al., 2008). Periodontal disease affects a significant proportion of the population; yet, most oral health education is focused primarily on dental caries, or tooth decay. Gunpinar and Meraci recognized this issue and investigated the impact of a periodontally focused oral health program compared to a standard oral health program (2022). They found that a periodontal specific program resulted in less plaque and bleeding and better oral hygiene compared to the standard program (Gunpinar & Meraci, 2022). Thus, it is hypothesized that more periodontal specific oral health programs should result in improved oral hygiene for a significant portion of adults.

Cota et al. also found that health literacy plays a role in periodontal disease prevention and that focusing on an entire community is beneficial compared to only targeting people at risk for periodontal disease (2021). This is important in the study as the health literacy level is expected to be low for the population, and the study targets a trauma affected community rather than just individuals at risk. Further, while most oral health programs are directed to children, participant age does not play a role in program effectiveness (Ghaffari et al., 2018). Thus, a community-based approach for the adults at the Neighborhood Resilience Project (NRP) is expected to be effective in improving their oral health knowledge and oral health.

The Neighborhood Resilience Project's vision is, "To inspire a movement in which suffering people are raised up from the ashes of trauma in unconditional love to become empowered healers, community builders, and positive change makers" (*Mission and vision*, 2022). Their vision aligns with this research as the periodontal specific oral health program seeks to

empower participants to engage in learning and create positive change in their own lives related to their oral health. NRP also had a dental clinic prior to the COVID-19 pandemic; however, it was discontinued for a few years at the start of the pandemic. At the time of this study, NRP was reopening the dental clinic in a new space with renovations, and creating a sustainable program to educate NRP community members about oral health was an important goal for the organization as well.

The aim of this study is to evaluate the effectiveness of a periodontal specific oral health education program on increasing oral health knowledge in a trauma affected community. This study should also provide information to better tailor periodontal education programs for Trauma Affected Communities (TACs) and help create a sustainable education program for community centers, like the Neighborhood Resilience Project, to implement. This study should also serve as a starting point for future research.

2.0 Methods

The University of Pittsburgh Institutional Review Board approved of all consents, study materials, and activities for this study. Data was collected at The Neighborhood Resilience Project (NRP) during mealtimes to increase the number of participants because this is when most people are at the center. NRP members older than 18 years old were recruited to participate in the study and were incentivized with the opportunity to win a gift card. Gift cards ranged from five dollars to 50 dollars with some being donated by local businesses and others supplied by the University of Pittsburgh School of Dental Medicine Public Health Department funds. Each participant also received an oral hygiene kit including a toothbrush, toothpaste, and floss donated by the University of Pittsburgh School of Dental Medicine (UofPSDM). Dental care resources, such as UofPSDM service pamphlets and flyers with different available local clinics and their location, services, and payment requirements were distributed to help connect participants to care.

At each session, participants were given a packet prior to the start of the presentation with all necessary documents and a raffle ticket. The included documents were a consent form, a demographics survey, a pre-survey, a "wait" note, and a post-survey. The pre- and post-program surveys were identical and included 13 questions that were developed based on basic periodontal concepts and previously asked questions in the Center for Disease Control and Prevention's National Health and Nutrition Examination Survey (2011) and Foster et al.'s article, "Validity of self-reported periodontal questions in a New Zealand cohort" (2016).

The educational presentation was developed by University of Pittsburgh School of Dental Medicine predoctoral student, Zoë Stenholm, with oversight from Dental Public Health Faculty member Nyla Balakrishnan, BDS, MPH, MS. Zoë Stenholm gave the presentation at each NRP

education session. The material in the presentation was based on the questions asked in the survey and further expanded to include risk factors and systemic diseases that can play a role in periodontal disease. The presentation included definitions and examples of periodontal health, gingivitis, and periodontitis. There was also a question period at the end of each presentation. An outline of the presentation can be seen in **Figure 1**.

i. Basic Oral Health
    a. How to Take Care of Your Mouth
        i. Brushing Your Teeth
        ii. Flossing Your Teeth
ii. Diseases in the Mouth
    a. Tooth Decay (Cavities)
    b. Gum Disease
iii. Healthy Gums
    a. Color
    b. Around the Tooth
    c. Texture
iv. How to Have Healthy Gums
v. What is Gingivitis?
vi. How Do You Get Gingivitis?
vii. What Does Gingivitis Look Like?
    a. Appearance
    b. Swollen
    c. No Bone Loss
viii. Preventing or Reversing Gingivitis
ix. What is Periodontitis?
x. How Do You Get Periodontitis?
xi. What Does Periodontitis Look Like?
    a. Pockets
    b. Bone Loss
    c. Loose Teeth
    d. Missing Teeth
    e. Recession
    f. Bad Breath
    g. Swelling
    h. Pus
    i. Pain
xii. How to Manage Periodontitis
xiii. What Else Affects Your Gums?
    a. Smoking
    b. Diabetes
xiv. Key Points
xv. Questions

Figure 1 – Periodontal Education Program Presentation Outline

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At each session, participants completed the consent form and pre-program survey fifteen minutes before the presentation. Then, participants engaged in the 35-minute periodontal specific oral health program. The session concluded with participants completing the post-program survey in the last ten minutes.

10 sessions were held with on average 5 people attending each session. Surveys were reviewed for completeness to be included in the study. 30 completed surveys were included in the study, and 27 surveys were omitted due to being incomplete. The incomplete and not included surveys included surveys missing consents, pre- and post-surveys that did not have every question answered, and demographics surveys that did not have every question complete. Any part of a survey that began with a series of incomplete questions voided the entire packet and participant due to a clause in the consent that mentioned a person may withdraw from the study by not completing their survey.

A Qualtrics survey was created to digitize the data from the demographics, pre-, and post-surveys. Each completed survey was then entered into the Qualtrics online survey manually. Digitized data was downloaded, cleaned, and coded. The survey questions and their corresponding codes can be seen in **Table 1 – Survey Questions and Data Coding Key**. The answer choices for each question were also assigned a numerical value. The most common answer choice options for the questions were "Strongly agree," "Agree," "Neutral," "Disagree," and "Strongly Disagree." These were coded as 1, 2, 3, 4, and 5 respectively. STATA was used to perform Paired T-tests for each pre- and post-test question. Demographics data was analyzed via percentages to identify the most prevalent group for each demographics question and better understand the population. Demographic survey questions can be found in **Table 2 – Demographic Survey Questions and Answer Choices**.

Table 1 – Survey Questions and Data Coding Key

Survey Question	Pre-Survey Code	Post-Survey Code
Diseases in the mouth can affect overall health	DZ	PDZ
Toothbrushing is useless to prevent gum infection	TB	PTB
Flossing is important for gum health	Floss	PFloss
It is normal for your gums to bleed when you brush your teeth	Bleed	PBleed
Germs are one of the reasons for gum infection	Germs	PGerms
Plaque/tartar can cause tooth loss even without cavities	Plaque	PPlaque
Diabetes can affect gum health	DM	PDM
Pregnancy can affect gum health	Preg	PPreg
Smoking can affect gum health	Smoke	PSmoke
Overall, how would you rate the health of your teeth and gums?	Health	PHealth
Have you ever had treatment for gum disease such as scaling and root planning, sometimes called deep cleaning?	SRP	PSRP
Have you ever had any teeth become loose on their own, without an injury?	Loose	PLoose
Have you ever been told by a dental professional that you lost bone around your teeth?	BL	PBL

Table 2 – Demographic Survey Questions and Answer Choices

Survey Question	Answer Choices
What is your gender identity?	Male, Female, Non-binary, Not listed, Prefer not to say
What is your age category?	Under 18 years old, 18-24 years old, 25-34 years old, 35-44 years old, 45-54 years old, 55-64 years old, 65 years or older
What is your race/ethnicity?	White, Black or African American, Asian or Pacific Islander, Native American or Alaskan, Hispanic, Middle Eastern, South Asian, Mixed Race, Prefer not to say
What is the highest level of education you have completed?	Less than high school, Completed high school, Completed Associate Degree, Completed 4-year Degree, Completed Graduate Degree, I Don't Know
Which of the following income categories best describes your total 2022 household income?	Less than $24,999, $25,000-$49,999, $50,000-$89,999, $99,000-$149,000, Greater than $150,000, I Don't Know
What is your zip code?	
Do you currently have dental insurance?	Yes, No, I don't know
How long since you last had a dental visit?	Less than 12 months, 1 to 2 years, 3 to 5 years, More than 5 years
What was the reason for your last dental visit?	
How would you describe the condition of your mouth and teeth?	Poor, Fair, Good, Very Good, Don't Know
How often have you experienced problems related to your mouth and teeth during the past 12 months?	Never, Rarely, Occasionally, Very Often, Don't Know

3.0 Results

With a 0.05 significance value, the following items yielded significant results between the pre- and post-surveys: Plaque/tartar can cause tooth loss even without cavities, Diabetes can affect gum health, and Pregnancy can affect gum health. The results can be seen for each of the significant questions in **Table 3- Pre- and Post-Test Means and Paired T-test P-values**.

Table 3 – Pre- and Post-Test Means and Paired T-test P-values shows that the p-value for, "plaque/tartar can cause tooth loss even without cavities," is 0.0157, which is less than the 0.05 significance value. Thus, the null hypothesis that the pre- and post-survey results would be the same is rejected. Specifically, the results show that the knowledge in this question increased as the mean went from 1.60 in the pre-test to 1.27 in the post-test and the value being closer to one means more participants "strongly agreed" that plaque/tartar could cause tooth loss even without cavities.

Table 3 – Pre- and Post-Test Means and Paired T-test P-values shows that the p-value for, "diabetes can affect gum health," is 0.0389, which is less than the 0.05 significance value. Thus, the null hypothesis that the pre- and post-survey results would be the same is rejected. Specifically, the results show that the knowledge in this question increased as the mean went from 1.57 in the pre-test to 1.23 in the post-test and the value being closer to one means more participants "strongly agreed" diabetes can affect gum health.

Table 3 – Pre- and Post-Test Means and Paired T-test P-values shows that the p-value for, "pregnancy can affect gum health," is 0.0434, which is less than the 0.05 significance value. Thus, the null hypothesis that the pre- and post-survey results would be the same is rejected. Specifically, the results show that the knowledge in this question increased as the mean went from

2.07 in the pre-test to 1.67 in the post-test and the value being closer to one means more participants "strongly agreed" that pregnancy can affect gum health.

Table 3 – Pre- and Post-Test Means and Paired T-Test P-Values

Item	Pre-Test Mean	Post-Test Mean	P-Value
DZ	1.2000	1.0667	0.1033
TB	3.5667	3.4000	0.5243
Floss	1.1000	1.2000	0.1841
Bleed	3.3333	3.6000	0.2745
Germs	1.2667	1.3667	0.4146
Plaque	1.6000	1.2667	0.0157
DM	1.5667	1.2333	0.0389
Preg	2.0667	1.6667	0.0434
Smoke	1.2667	1.1667	0.2638
Health	3.2143	3.3571	0.3262
SRP	1.7000	1.7667	0.4888
Loose	1.6333	1.7000	0.1608
BL	1.6667	1.7667	0.1841

The most prevalent results of the demographics survey are detailed, and additional demographic results can be seen in **Table 4 - Demographic Survey Results**. 67% of participants identified as female. The most represented age group was age 45-54 years old at 30%, but 70% of participants were over the age of 45 years old. 80% of participants were Black or African American. High school was the highest level of education completed for 70% of participants. 93% of participants had an income less than $24,000. 93% resided in the 15219-zip code. 93% had dental insurance, and 27% had seen a dentist in the past year. 43% of people rated the condition of their mouth and teeth as good, yet 60% reported they had a problem related to their mouth in the past 12 months. There was also an open response question asking participants, "What was the reason for your last visit?" We identified seven answer themes to this question. The seven themes are listed from most to least frequent answer: cleaning/checkup (48%), tooth removal (15%), pain

(10%), forgot/haven't scheduled an appointment (10%), cavities (7%), having no teeth (7%), and

to receive a replacement (3%).

Table 4 – Demographic Survey Results

Gender Identity	Percentage	Count
Male	30%	9
Female	67%	20
Non-binary	3%	1
Not listed	0%	0
Prefer not to say	0%	0
Age Category	**Percentage**	**Count**
Under 18 years old	0%	0
18-24 years old	13%	4
25-34 years old	0%	0
35-44 years old	17%	5
45-54 years old	30%	9
55-64 years old	23%	7
65 years old or over	17%	5
Race/Ethnicity	**Percentage**	**Count**
White	7%	2
Black or African American	80%	24
Asian or Pacific Islander	0%	0
Native American or Alaskan	0%	0
Hispanic	0%	0
Middle Eastern	3%	1
South Asian	3%	1
Mixed Race	0%	0
Prefer Not to Answer	7%	2
Highest Education Level	**Percentage**	**Count**
Less than high school	0%	0
Completed High School	70%	21
Completed Associate Degree	20%	6
Completed 4-year Degree	3%	1
Completed Graduate Degree	7%	2
I don't know	0%	0
Income	**Percentage**	**Count**
Less than $24,999	93%	27
$25,000 to $49,999	7%	2

$50,000 to $99,999	0%	0
$99,000 to $149,000	0%	0
Greater than $150,000	0%	0
Zip Code	**Percentage**	**Count**
15219	93%	28
15213	7%	2
Have Dental Insurance	**Percentage**	**Count**
Yes	93%	28
No	3%	1
I don't know	3%	1
Time Since Last Dental Visit	**Percentage**	**Count**
Less than 12 months	27%	8
1 to 2 years	37%	11
3 to 5 years	17%	5
More than 5 years	20%	6
Describe Condition of Your Mouth/Teeth	**Percentage**	**Count**
Poor	14%	4
Fair	32%	9
Good	43%	12
Very Good	11%	3
How Often Experienced Mouth/Teeth Problems in Past 12 Months	**Percentage**	**Count**
Never	40%	12
Rarely	30%	9
Occasionally	23%	7
Very Often	7%	2
Don't Know	0%	0

4.0 Limitations

There were several limitations within the study. First, the environment in which the surveys were conducted was loud, and there were often distractions like the meals being served. Some participants also had difficulties maintaining attention and would disrupt the rest of the group both during surveys and the presentation. Thus, participants may not have been able to focus when filling out their surveys and may have misread questions. Also, participants may not have gathered the expected information from the presentation due to being distracted.

Also, this TAC community center is unique in that they have a dental clinic. Thus, the most frequent visits may be more inflated than answers at other TAC community centers. The onsite dental clinic could also be contributing to the participant's baseline oral health knowledge of basic topics because they have access to dental professionals.

Some participants may not be literate or have a lower reading level, which means the data they reported may not be representative of their true knowledge on these topics. This could be seen as answering questions incorrectly due to not being able to read them or circling the same answer choice, like the third option down, on every question.

Also, while identification information was not collected, familiar faces were seen at multiple sessions, so some participants may have sat through the presentation already. Hopefully, this means they took away the lessons from their first session, which made other results appear as not significant, even if they initially were learned topics.

Finally, there was a lack of follow-up with participants due to anonymity. However, it would have been beneficial to re-evaluate it later and track it over time to see how well the information was retained.

5.0 Discussion

The results of this study highlight that participants had baseline oral health knowledge beyond just caries as they generally appeared to understand the cause of gum disease and how to prevent it. However, the questions that returned as significant between the pre- and post-surveys were questions that may not be as frequently discussed between the general population and oral health professionals. This draws attention to the point that we need to make the intricacies of diseases, like periodontal disease, known. People may have lesser-known risk factors, like diabetes, pregnancy, or smoking and not realize it is impacting their oral health. Thus, future studies should continue to expand participant knowledge on the details of periodontal and other chronic diseases as the participants in the study showed they were capable of gaining knowledge in these areas, and this could benefit their oral health, overall health, and quality of life.

Future studies should use this study as a framework for the educational component of their periodontal oral health program. They should also go beyond what was done here to include head and neck and oral examinations to evaluate participant oral health and further understand the population's needs from a clinical perspective. Future studies should track participants over time both via surveying methods and clinical examinations to assess participant retained knowledge and changes in oral health habits and clinical effects, like less plaque buildup. This study opens the door for oral health research for trauma affected communities and paves the way for further research to better understand and serve these communities.

6.0 Conclusion

To our knowledge, this is the first study to look at a Trauma Affect Community (TAC) and oral health. The TAC in this study gained knowledge about periodontal information, like plaque and tartar causing tooth loss without cavities, diabetes affecting gum health, and pregnancy affecting gum health. The periodontal specific oral health education program did increase knowledge, but this TAC may be different from other TACs due to their access to a community dental center.

Additionally, as the study shows knowledge was gained, the program shows effectiveness in educating this population. This educational program can be continued at the Neighborhood Resilience Project to educate the people who use their community center. It is important to create sustainable solutions and further research should evaluate the continued use and modification of this program.

More research on other trauma affected communities needs to occur to better understand the community and individuals who have faced community trauma and the effects of it. By better understanding community trauma, more appropriate programs can be created to address the disparities these communities face and create meaningful, sustainable solutions to empower them in regard to not only oral health, but overall systemic health and life.

Appendix A – Documents for Study

The following documents were provided to all study participants.

Appendix A.1 Demographics Survey

Please respond to these questions to the best of your knowledge:

1. What is your gender identity?

Male   Female   Non-binary   Not listed   Prefer not to say

2. What is your age category? (Circle one)

Under 18 years old   18-24 years old   25-34 years old   35-44 years old

45-54 years old   55-64 years old   65 years old or over

3. What is your race/ethnicity? (Circle one)

White   Black or African American   Asian or Pacific Islander

Native American or Alaskan   Hispanic   Middle Eastern

South Asian   Mixed Race   Prefer Not to Answer

4. What is the highest level of education you have completed? (Circle one)

Less than high school   Completed high school   Completed Associate Degree

Completed 4-year Degree   Completed Graduate Degree   I Don't know

5. Which of the following income categories best describes your total 2022 household income?   (Circle one)

Less than $24,999 $25,000 to $49,999 $50,000 to $99,999

$99,000 to $149,000   Greater than $150,000   I Don't Know

6. What is your zip code?

7. Do you currently have dental insurance?
- Yes
- No
- I don't know

8. How long since you last had a dental visit?
- Less than 12 months
- 1 to 2 years
- 3 to 5 years
- More than 5 years

9. What was the reason for your last dental visit?

10. How would you describe the condition of your mouth and teeth?
- Poor
- Fair
- Good
- Very Good
- Don't Know

11. How often have you experienced problems related to your mouth and teeth during the past

12. months?
- Never
- Rarely
- Occasionally
- Very Often
- Don't Know

Appendix A.2 Pre-/Post-Survey

Please respond to these questions to the best of your knowledge:

1. Diseases in the mouth can affect overall health
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
2. Toothbrushing is useless to prevent gum infection
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
3. Flossing is important for gum health
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
4. It is normal for your gums to bleed when you brush your teeth
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
5. Germs are one of the reasons for gum infection
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
6. Plaque/tartar can cause tooth loss even without cavities
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree

7. Diabetes can affect gum health
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
8. Pregnancy can affect gum health
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
9. Smoking can affect gum health
   - Strongly agree
   - Agree
   - Neutral
   - Disagree
   - Strongly disagree
10. Overall, how would you rate the health of your teeth and gums?
    - Excellent
    - Very good
    - Good
    - Fair
    - Poor
    - Don't know
11. Have you ever had treatment for gum disease such as scaling and root planning, sometimes called deep cleaning?
    - Yes
    - No
    - Don't know
12. Have you ever had any teeth become loose on their own, without an injury?
    - Yes
    - No
    - Don't know
13. Have you ever been told by a dental professional that you lost bone around your teeth?
    - Yes
    - No
    - Don't know

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