

International Baccalaureate Diploma Programme

Extended Essay

Research Title:

Observing and interpreting the level of plaque formation on individuals' teeth with the help of a survey, considering the variables, age and oral health knowledge.

Research Question:

Do individuals' age and knowledge about their oral health affect the levels of plaque formed on their teeth?

Subject of Essay: Biology

Word Count: 3912

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1. INTRODUCTION

1.1. Background Information

One of the reasons why I took my extended essay on biology was that, it offers us a visible and object-explainable science which we all see in real life. While thinking of a research question on this subject, I thought about an idea that I could easily observe in daily life and integrate directly into it with the experiments and observations I would make, then I thought of an activity that I do every day in my daily life, brushing teeth.

Brushing teeth is one of the few things that a normal person does every day. But, why do we brush our teeth? The answer is to clean and to get rid of bacteria that can damage our teeth. So, what kind of forms do these bacteria cause to be observed on our teeth, and what will change in the appearance of our teeth if we do not clean them? What factors stand out in the appearance of our teeth? I also thought of my uncle, who is a dental professor, whom I can get helpful information about my research question. It was then I had the idea of doing a detailed research on this subject, getting useful information from it to implement to my own life and writing an extended essay on it.

2. BACKGROUND RESEARCH

2.1. Structure of Teeth

Teeth are vital organs of vertebrates of which the main function is to bite and chew food into pieces. ¹The outer layer of the tooth is enamel, which is wholly inorganic and is the hardest tissue in the body, covers

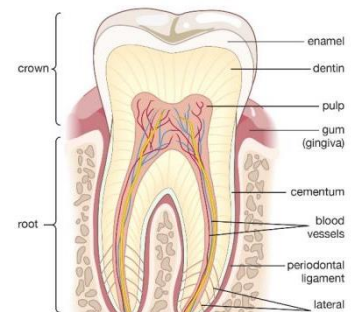


Figure 1: Structure of Teeth

© 2013 Encyclopædia Britannica, Inc.

1. Chen, H. and Liu, Y. (2013, September 13). Chapter-2

Teeth <https://www.sciencedirect.com/science/article/abs/pii/B978012394619500002X>

part or all of the crown of the tooth. The middle layer of the tooth is composed of dentine, which is less hard than enamel and similar in composition to bone. Dentine is nourished by the pulp, which is the innermost portion of the tooth. The pulp consists of cells, tiny blood vessels, and a nerve and occupies a cavity located in the center of the tooth. The gum (gingiva) is a pink tissue that surrounds each tooth like a collar around the crown and under the visible part of the tooth. As this tissue descends within the structure, it combines with different structures such as cementum, vessels, canals and nerves to form the structure of the tooth.²

Staining of Teeth

Staining of the teeth is called the formation of stains due to the fact that the tooth layers are affected by different factors. They don't look as bright or white as they should. These stains can cause discoloration of teeth together with developing white or dark spots in places.³



Figure 2: Real example of tooth staining

2. Britannica (1999). tooth anatomy

<https://www.britannica.com/science/tooth-anatomy>

3. Brennan, R. (2023, April 4). Tooth Discoloration

<https://www.webmd.com/oral-health/guide/tooth-discoloration>

For various reasons, the color of the teeth may be exposed to different colorations, but the main color change is observed in the yellow color caused by the staining of the teeth. The staining of teeth is mainly divided into two different titles, extrinsic stains and intrinsic stains.⁴

2.2. Dental Plaque

Dental plaque is a sticky, colorless and a complex biofilm that accumulates on the hard tissues in the oral cavity. It consists of broken-down sugars called sucrose and anaerobic, gram-negative bacteria that always exist in the mouth. Especially with the consumption of sugary and acidic foods and beverages, an acid which reacts with the bacteria inside the mouth, causes the formation of plaque around the gum line and between teeth. Left untreated, plaque can transform into dental calculus, also known as dental tartar.

However plaque formation is not considered as a type of teeth staining. Particularly the factors that cause staining, especially extrinsic stains, which includes high usage of acidic foods and beverages, also affect the formation of plaque on the teeth. However, plaque formation on the teeth does not cause various discolorations on the teeth except for yellow. The focus of this study is not on observing different colors in the tooth. Therefore, tooth staining should not be confused with plaque formation.

4. Bradford, A. (2018, July 11). Why Do Teeth Turn Yellow?

<https://www.livescience.com/54420-yellow-teeth.html>

A four-step breakdown of how plaque occurs;

1. **Attachment:** Plaque develops and attaches to teeth within a few minutes after brushing your teeth.



Figure 3: Plaque formation on dental regions

2. **Growth:** Unwanted bacteria begin growing in the plaque.

3. **Maturation:** The microbes continue to mature and multiply. As they eat the sugars in the food you consume, they produce an acidic byproduct that can harm your teeth.

4. **Erosion:** The acid produced by the bacteria in plaque will start damaging and eroding your teeth enamel. ⁵

2.2.1. Preventing Plaque Formation

The most effective solution to preventing plaque formation on an individual's teeth is undoubtedly through oral hygiene techniques. At this point, it is very important for the individual to pay regular attention to their oral health. Likewise, regular implementation of activities that cause stains on teeth and proliferation of bacteria, such as nutrition, is important in preventing plaque formation.

Things an individual can do to prevent plaque formation are listed below.

1. Brushing and Flossing
2. Usage of Mouthwash Rinses
3. Choosing Tooth Friendly Foods

5. 209 NYC DENTAL (2022, October 7). Plaque vs. Calculus

<https://www.209nycdental.com/plaque-vs-calculus/#:~:text=Plaque%20is%20a%20sticky%2C%20whitish,calculus%20is%20through%20professional%20cleaning.>

calculus/#:~:text=Plaque%20is%20a%20sticky%2C%20whitish,calculus%20is%20through%20professional%20cleaning.

4. Have Fluoride Treatments
5. Have Dental Sealants Applied
6. Go to Routine Dental Visits and Dental Cleanings⁶

2.3. Dental Calculus

Dental calculus or tartar, is the hardened, calcified advanced version of dental plaque. When plaque is left on teeth too long without brushing or flossing, it gets mineralized especially with a mineral salt calcium phosphate from the saliva. Unlike plaque, this calcified



biofilm is hard to remove from the teeth with brushing or with another method, it requires a treatment by a dentist or a hygienist.⁷ Dental plaque is preferred over dental calculus in this research because one of the aims of the research is to prevent the plaque that forms on individuals' teeth at the plaque level, so that it does not progress to the level of tartar and then to more dangerous dental problems like tooth loss. Therefore, working above the reversible level will make this research more useful

6. PEAK CITY DENTISTRY (2022, February 15). How Can You Prevent Plaque formation

<https://www.peakcitydentistry.com/blog/how-can-you-prevent-plaque-formation/>

7. BPharm, O. J. and Dr. McGrath, G. (2023, July 3). THE DIFFERENCE BETWEEN PLAQUE AND CALCULUS

<https://www.methoddental.com.au/the-difference-between-plaque-and-calculus/>

2.4. Aging Effect on Teeth Structure

Just as many life functions are disrupted as people get older, the structure of their teeth also begins to change with age. Years of mechanical use of the tooth, such as chewing, biting, and grinding, causes the tooth enamel to gradually thin. As the tooth enamel thins and wears away, the underlying softer layer, the dentin, begins to be exposed. The color of the dentin is darker yellow as seen in *Figure 1*. This causes more colorful teeth to appear in the elderly.⁸ In addition, increasing mechanical activities over the years cause the gums to move upwards, the roots becoming more visible and the teeth appearing longer. This situation also causes the tooth to separate from the root and fall out with advancing age. Teeth loss usually occurs between the ages of 60 and 70.

2.5. TePe PlaqueSearch Disclosing Tablet

This plaque disclosing tablet, developed by Swedish scientists and many dental experts, is a tablet used to observe where plaque forms in the mouth of the individual using it. It is difficult to observe plaque formation, but with the use of this tablet, the individual can see in which areas plaque has formed, and also this tablet shows whether this plaque is old or new, with the color difference.



Figure 5: TePe PlaqueSearch Tablet

8. Klement Family Dental (2021, May 5). How Aging Can Affect Your Teeth?

<https://www.stpetedentist.com/blog/how-aging-can-affect-your-teeth/>

To use this tablet, the individual must first brush his teeth interdentally. Then, after chewing this tablet and rinsing your mouth, individual can see the areas of his or her teeth where plaque is formed by the color difference. This tablet creates a blue or red color on the individual's teeth. If the red color is more around the individual's teeth, plaque formation has been

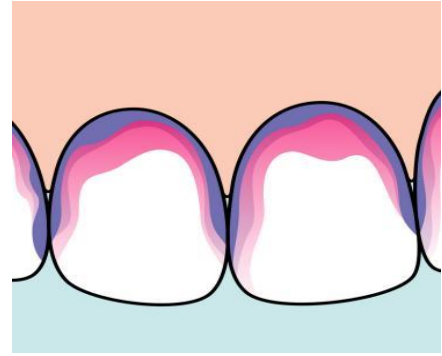


Figure 6: The effects of the tablet

observed on the individual's teeth in the last 12 hours and this plaque is new. If the blue color is observed more often, this plaque is an older and more established plaque that formed more than 12 hours ago. Settled plaque is a more dangerous situation for the individual, it means that the amount of dental plaque in the individual is high. The frequency of any color around the teeth also gives information to the individual about plaque formation.

3. Experimental Variables

3.1. Research Questions:

- Is advancing age in people, a factor that determines the level of plaque formation in the structure of their teeth?
- Is maintaining oral hygiene and keeping it healthy, a variable or factor that determines the level of plaque formation in people's teeth?

3.2. Hypotheses:

- As people get older weakness of the teeth structure, bacteria accumulating in dental areas will increase, and therefore plaque formation and blue color of the teeth will be observed more frequently.
- As people's oral hygiene behaviors deteriorate, plaque formations will become more visible on the teeth unless oral hygiene is maintained well, and as a result, blue color will be observed more frequently in dental region.

Table 1: Experimental variables in the research

Experimental Variables	Named Variables	Why is it chosen	How will it be obtained/controlled
Dependent Variable	Stage of the plaque formed in dental region	The purpose of writing the research is to try to understand why dental plaque formation occurs in humans and to prove this situation, therefore our independent variable is plaque formation.	With our plaque disclosing product (TePe PlaqueSearch), the plaque on the teeth will be stained and revealed, and the relationship between the variables and this plaque formation will be established in research analysis.
Independent Variable(s)	Oral Health Knowledge	People's oral health leads to the formation of plaque in dental areas, as estimated in research. It is within the scope of the purpose to determine the accuracy of this estimate.	Both age data and oral health knowledge data will be obtained in the questionnaires to be applied in the research. While the main purpose of both questionnaires is to measure the person's oral health awareness, the age variable will be compared with both oral health and plaque data observed on the teeth, together with the age data to be obtained from each person participating in the questionnaire, to determine whether this variable is a determinant or not. The person's oral hygiene score obtained from the questionnaires will be directly compared with the plaque formation and its effect will be determined.
	Age	It is widely thought that the age factor is related to both oral health and dental health in real life. This variable is important in this research to prove this assumption.	

Controlled Variables	Economic status of the people who took the questionnaire	As in every area of health, in dental health, economic status greatly affects how much and under what conditions a person protects his or her own health. Therefore, it is important that the people who took the questionnaire are in similar economic conditions.	Since the questionnaires will be applied to people in my own social environment, the difference in economic status among the people participating in the questionnaire will be almost insignificant.
	Education levels of the people who took the questionnaire	Although all of the 78 people who took the questionnaire belong to my own close circle, the age differences of individuals can create a difference in education level within the group. Although it is not necessary for an individual to have a high level of education to have the necessary knowledge about their teeth, the fact that only high school graduates are included in the group in which the questionnaire was conducted directly affects the awareness that should be had on this subject.	Likewise, the fact that the questionnaire will be applied to a fixed population minimizes the education level difference as much as possible, like it did in economic level.

4. Methodology

4.1. Disclosure of The Questionnaire

In this study, a questionnaire named HU-DBI were prepared to observe plaque formation. This questionnaire bring results to identify the relationship between the variables and plaque formation.

In this questionnaire, data will be collected about the person's age and oral health score and information. The experiment was conducted on 78 people in total. Since age data was analyzed as a variable in our research, the 78 people who took the questionnaire were distributed into 3 different age groups. Individuals under the age of 20 whose dental structure is developing, the adult age group between the ages of 20 and 40, which we call the young adult group, consists of individuals whose dental development has been completed or is about to complete, and finally the oldest age group between 40 and 60 consists of individuals who have completely completed their dental development. The reason why age groups up to 60 were chosen is that, as mentioned in the section *Ageing Effect on Teeth Structure*, tooth loss is frequently seen between the ages of 60-70. In this study, no results were obtained from any individual who experienced tooth loss. Of these 78 people in whom the experiment was conducted, 28 were under the age of 20, 25 were between the ages of 20-40, and the remaining 25 were between the ages 40-60.

The questionnaire chosen to have a scientific basis is HU-DBI (Hiroshima University-Dental Behavioral Inventory), a world-renowned oral health behaviors and attitudes assessment questionnaire. This questionnaire is a cross-national questionnaire organized by Hiroshima University in Japan. When calculating the HU-DBI scores; one point was given for each of agree responses to the items 4, 9, 11, 12, 16, 19 and one point was given for each of disagree response to the items 2, 6, 8, 10, 14, 15. Maximum HU-DBI score was 12. Higher scores signify better oral behavior.

Item No #	Item Descriptions
1	I don't worry much about visiting the dentist
2	My gums tend to bleed when I brush my teeth (D)
3	I worry about color of my teeth
4	I have noticed some white sticky deposits on my teeth (A)
5	I use a child-sized toothbrush
6	I think that I cannot help having false teeth when I am old (D)
7	I am bothered by the color of my gums
8	I think my teeth are getting worse despite my daily brushing (D)
9	I brush each of my teeth carefully (A)
10	I have never been professionally taught how to brush (D)
11	I think I can clean my teeth without using toothpaste (A)
12	I often check my teeth in a mirror after brushing (A)
13	I worry about having bad breath
14	It is impossible to prevent gum disease with tooth brushing alone (D)
15	I put off going to the dentist until I have a toothache (D)
16	I have used a dye to see how clean my teeth are (A)
17	I use a toothbrush which has hard bristles
18	I don't feel I've brushed well unless I brush with strong strokes
19	I feel I sometimes take too much time to brush my teeth (A)
20	I have had my dentist tell me that I brush very well

Table 2: HU-DBI questionnaire

In this table, as stated above, scoring is done according to the answers to some selected questions. Above, it is stated with expressions such as "(D)" and "(A)" that anyone participating in the questionnaire should give which answers to which questions to get a score.

4.2. Procedure of Applying and Analyzing The Questionnaire

1. This questionnaire was conducted among 78 friends and family members in my social circle who matches with the controlled variables of the study, mentioned in the *Table 1*, and could be subjected to the questionnaire. The questionnaire was prepared via Google forms and the results were obtained by examining them one by one.
2. After the questionnaire data was obtained, in the first stage, the two variables of the study, age and oral health information, were compared statistically among themselves. Then, the main purpose of the research, plaque formation on the tooth, was examined and compared with both variables in the same process.
3. After the questionnaire is conducted, a plaque staining tablet is used on those who give permission. With this tablet, the use of which is explained in the research, a physical observation is made about the amount of plaque on the individual's teeth. As a result of this observation, the relationship between the variables and the plaque is obtained by comparing the questionnaire results of this individual with the plaque observation. Appropriate statistical analyzes are used when explaining this relationship.

5. Safety & Ethical Considerations

Throughout the research, there isn't observed any application that would put ethical and social values at risk. The only risk carried by the research may occur during the use of the “TePe PlaqueSearch” product. If this product is swallowed rather than chewed, it may or may not react differently depending on the person. At the same time, when using this product, it should be taken into consideration that this product may stain any personal belongings. Additionally, a consent form was signed with questionnaire participants in order to provide legal procedures.

6. DATA&ANALYSIS

Number of people according to HU-DBI scores of people in specified age groups									
Age range of 78 people		Range of scores obtained throughout the questionnaire							
Age Groups	Mean Age	4	5	6	7	8	9	10	11
0-20 (28 people)	17.39	-	-	5	8	7	5	3	-
20-40 (25 people)	33.52	1	-	4	7	7	4	2	-
40-60 (25 people)	52.48	1	1	7	6	6	3	-	1

Table 3: Statistical comparison of age and oral health knowledge variables among themselves

6.1. Descriptive Statistics of Oral Health Knowledge and Age:

Calculating the mean value, standard deviation and Pearson's correlation coefficient for each age group.

Calculating the mean value with the formula:

$$\bar{x} = \frac{1}{n} \sum_{i=1}^N x_i$$

An example mean calculation for the first age group (0-20) as follows:

$$[(6 \times 5) + (7 \times 8) + (8 \times 7) + (9 \times 5) + (10 \times 3)] \div 28 = \bar{x} = 7.75$$

Calculating the standard deviation with the formula:

$$\sigma = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2}$$

An example standard deviation calculation for the first age group (0-20) as follows:

$$\sigma = 1.265642861$$

The age data and the obtained scores are written in two different lists and the r value is calculated from the TI-84 Plus CE-T calculator.

Stat → CALC → 4: LinReg(ax+b) → Xlist: Age , Ylist: HU-DBI scores → Calculate (r)

An example pearson's correlation coefficient calculation for the first age group (0-20) as follows:

$$r = 0.2761450956$$

Means and standard deviations of HU-DBI scores depending on age groups			
Age groups	0-20	20-40	40-60
Mean age of groups	17.39	33.52	52.48
Mean value of HU-DBI scores	7.75	7.56	7.16
Standard Deviation of scores	1.27	1.39	1.49
Pearson Correlation Coefficient	0.28	0.23	0.26

Table 4: Mean, standard deviation and correlation coefficient of the datas obtained between the variables age and oral health knowledge

Average mean score obtained by 78 people is:

$$(7.75 + 7.56 + 7.16) \div 3 = 7.49$$

6.2. Comparison of Age and Oral Health Knowledge with Plaque Formation

After the results obtained in the questionnaire, “Tepe PlaqueSearch” was tried on 64 people out of 78. The reason why this product was not tested on everyone was because some of them, did not want it or contact me. The remaining 64 people were balanced with equal numbers in all 3 age groups. This product was tested by 20 people from the 1st age group, 21 from the 2nd age group, and 23 from the 3rd age group.

Table 5: Numerical distributions of individuals in certain age groups according to the formed stain color in their dental areas

Numerical distributions of individuals in certain age groups according to the formed stain color in their dental areas			
Age range of 64 people		Color of the stain formed in the dental area	
Age Groups	Mean Age	Blue Stain	Red Stain
0-20 (20 people)	17.30	11 (55.00%)	9 (45.00%)
20-40 (21 people)	34.14	9 (42.86%)	12 (57.14%)
40-60 (23 people)	52.09	11 (47.83%)	12 (52.17%)

6.3. Descriptive Statistics of Oral Health Knowledge and Plaque Formation:

The scores obtained from the questionnaire were divided into 3 groups: lower than 6, between 6 and 10, and higher than 10. Depending on the number of people in these 3 score groups, the probability of each group in the distribution was calculated with the TI-84 Plus CE-T calculator. After all score values were listed on the calculator, a distribution graph was drawn with the mean and standard deviation values of the list. By entering the lower value, upper value, mean and standard deviation values in the “normalcdf” program on the calculator, respectively, the area of that group in the distribution graph, which means its probability, was calculated.

An example calculation of the second score group ($6 < r < 10$);

Normalcdf [Lower: 6 / Upper: 10 / Mean (μ): 7.5 / Standard deviation (σ): 1.37]

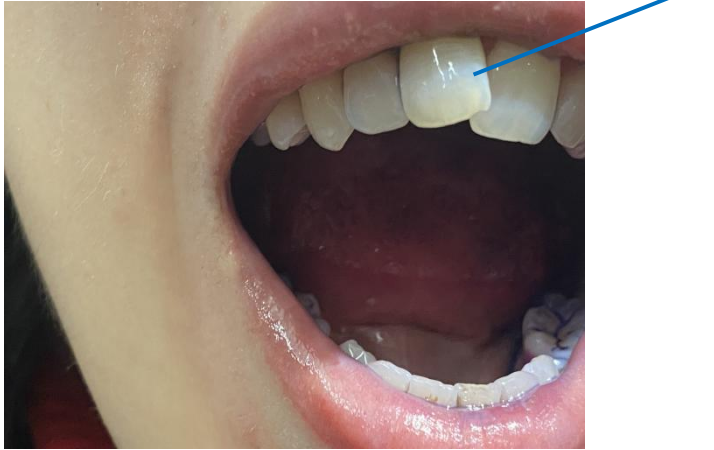
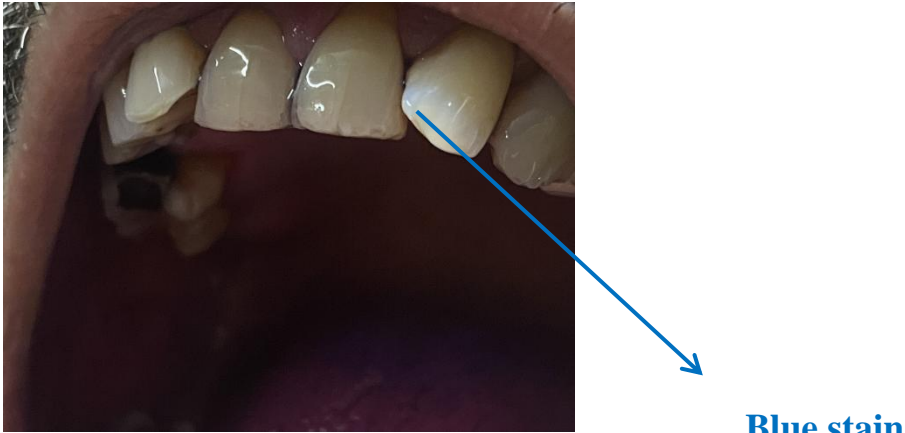
= 0.828

Numerical distribution of individuals with their HU-DBI results according to the formed stain color in their dental areas			
Distribution of the score		Color of the stain formed in the dental area	
HU-DBI Score (r)	Probability P(R=r)	Blue Stain	Red Stain
$r \leq 6$	0.138	10 (66.67%)	5 (33.33%)
$6 < r < 10$	0.828	16 (35.56%)	29 (64.44%)
$r \geq 10$	0.034	1 (20.00%)	4 (80.00%)

Table 6: Numerical distribution of individuals with their HU-DBI results according to the formed stain color in their dental areas.

7. Photographing The Stain Occurred

Figures 7,8,9 : Stains in the dental area of people who used 'TePe PlaqueSearch' tablet



Conclusion

The relationships intended to be observed throughout the research were established with the data obtained as a result of the questionnaire and the product used. Before examining plaque formation, the relationship between two variables affecting this formation was measured with the HU-DBI questionnaire. According to the data obtained in *Table 3* and *Table 4*, a proportional relationship could not be established between the two variables of the study, age and oral health knowledge. The Pearson's correlation coefficient (r), proved that is not a proportional relationship by obtaining a low value of around 0.2 for three groups. (This r value varies on a scale of -1 to 1. If it has a positive value, there is a positive correlation. It also says that the closer this value is to the maximum or minimum, correlation is more proportional.) Despite the increasing age group, it was observed that the score mean and deviation were best observed in the first and youngest age groups, and that there was actually a close to inverse relationship between these two variables.

Later in the study, these two variables were associated with plaque formation. According to the data obtained in *Table 5*, as a result of the variability of age groups, no proportional relationship was observed between the formation of colored stains, the level of plaque, on the individual's teeth. Results that were close to each other and difficult to interpret definitively were found in each age group. In *Table 6*, a proportional relationship was seen in the relationship between oral health knowledge and plaque level. Among each individual who participated in the questionnaire and tried the product, it was found that as the score received from the HU-DBI questionnaire increased, that is, as oral health knowledge increased, the level of plaque formed on the individual's teeth was more controlled and at a positive level. As a result, while the age variable could not establish a relationship with the other variable, the oral health knowledge variable, it was observed that it could not establish a relationship with the plaque level, which was the main observation of the

study, and it was seen to be an ineffective independent variable. It was found that oral health knowledge is a variable that is directly proportional to the plaque level in the individual.

Discussion

According to the results of the research, the desired result could not be reached in one of the two variables investigated and the hypothesis was falsified. According to the data, it was discovered that the age variable does not have a direct effect on the plaque level in the individual's dental area. Although it was mentioned throughout the research that as the age of the individual increases, tooth loss becomes more frequent, teeth become weaker, and therefore dental problems increase, this variable could not be determined as the cause of a problem such as plaque formation.⁹ The reason for this is that plaque formation in humans is a regular and uncontrolled mechanism. Although it is thought that the amount of bacteria accumulated on a person's teeth will increase as age increases, the fact that plaque formation occurs regularly and is cleaned in the same direction of this regularity, refutes this idea. Plaque formation on teeth is a formation that depends on the foods we eat in daily life and our habits of protecting our dental health. Therefore, while the formation of this mechanism cannot be controlled, it can be kept at a more controlled level. For this reason, it was observed that these habits were more frequent and plaque levels were more positive in people

9. 172 NYC Dental (n.d). Teeth and Aging

<https://172nycdental.com/blog/teeth-and-aging/>

with more developed and higher oral health awareness. For this reason, the hypothesis based on the oral health knowledge variable was confirmed.¹⁰

Additionally, while calculating the relationship between the two main variables and plaque formation, the standard deviation and correlation coefficient between the two variables were not calculated. The reason why descriptive statistics were not included when observing plaque formation was that plaque formation only gave two results: blue or red. For this reason, the numbers of people in whom this color was observed and the percentage values of the numbers are given as in the tables, *Table 5 and Table 6*.

In the research conducted by Saveetha University, located in the city called Chennai in the state of Tamil Nadu, India, under the title “Association of age with dental plaque score-A record based analysis”, it was concluded that the age variable has an inversely proportional relationship with the plaque score. In this research conducted by Saveetha University, three different age groups were selected: 18-35, 36-50 and 51-70. This study, unlike our study, used an index called: “Silness and Loe’s index” to determine the relationship between age and dental plaque. This index was measured by analyzing dental cases observed between 2019 and 2020, which was collected from the digital database of the university's research hospital. During the measurement, three plaque scores were given to all three age groups: good, fair and poor. As a result of the measurement, it was observed that as the age groups increased, the percentage of good plaque scores decreased and poor plaque scores increased. (18 to 35 years had 52.3% of good plaque score while 51 to 70 years

10. Yildiz, S. and Dogan, B. (2011, July). Self Reported Dental Health Attitudes and Behaviour of Dental Students in Turkey

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3137437/>

had 32.2%) The reason why I could not find a correlation between age and plaque formation in my own research is that the research was not as detailed and scientific as the one conducted by Saveetha University. The survey-based research I conducted was able to conclude only the poor oral health knowledge which is the simplest cause of dental plaque formation.¹¹

Evaluation

Strengths:

The first strength of the research is the reliability of its procedure. Determining the variable under investigation with a scientifically valid questionnaire such as HU-DBI provides a solid basis for examining the effect of this variable. Likewise, the product used to determine the plaque level not only allows us to obtain a clear result in the individual's dental areas, but also shows whether the plaque level is progressing or not, whether it is at a controllable level, and allows us to obtain a good result from the research. Although plaque formation has a mechanism that is constantly active in daily life, this product, which shows whether a plaque is old or new even within this activity and makes the clearest interpretation possible about its level, gave us an advantage by using it in the research.

Weaknesses and Limitations:

The main reasons limiting our research are the similarity of the economic and educational conditions of the people participating in the questionnaire, which are stated as controlled variables

11. Parthasarathy, P. , Leelavathi, L. and Dharman, S. (n.d). Association of age with dental plaque score- A record based analysis

<https://ijrps.com/home/article/download/2494/9524?inline=1>

in *Table 1*. As per the procedure, the questionnaire was conducted with the participation of people in my social circle whom I, as the person conducting the research, could reach. For this reason, almost every individual who participated in this questionnaire was in the same sociological position as me, and the results obtained did not show a very large distribution. The standard deviations of the results were not found to be large. Although the scores showed a distribution at the point of observation, it was noteworthy that the average r score was included in the distribution with a probability of 0.828. For this reason, if the experiment had been conducted among people with different economic conditions or education levels, a different and wider score distribution could have been observed and more clearly interpretable results could have emerged. Likewise, if the number of people who participated in the questionnaire and then tried the product was higher than the number of people in this research, it would have given the same advantage. Another point that can be shown as a limitation is about the “TePe PlaqueSearch” product. Although this product shows clear results about plaque formation and the time elapsed after its formation, the fact that the product only gives two results prevents a more detailed interpretation of the research.

Further Research

For further investigations, this research can be improved by doing it in a more scientific way, just like the procedure followed by Saveetha university. Dental cases that occurred over a period of time could be examined. After this examination, plaque formation on the teeth of the people who own the case, could be observed depending on their age. Measuring oral health knowledge can be applied to people in these cases through a survey again.

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