



# Oral Health Practice, Incidence of Dental Caries, and Plaque Index of Visually Impaired Students: A Basis for the Development of Oral Hygiene Braille Manual

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## ABSTRACT

Oral health is an integral part of a person's holistic health but it still an alarming health concern in the Philippines. This research focused on visually impaired students. Blind patients have a higher prevalence of dental caries because they cannot envision the plaque and caries in their oral cavity and would often struggle to obtain dental care due to their increased anxiety.

This is a cross-sectional observational study that aimed to produce an oral hygiene braille manual based on the extent of oral health practice, incidence of dental caries, and plaque index of the visually impaired students in a local school that caters for visually impaired. The questionnaire form has 3 parts: (1) consent form (2) demographic questions: sight impairment, primary care giver's income, age, gender (3) and questions concerning their oral hygiene practice. Results were correlated with the student's caries and plaque using the following index : Decayed Missing Filled Teeth(DMFT)/Simplified Oral Hygiene Index (OHI-S) .

Seventeen (17) students participated in the study, ranging from grade levels 1-10 and ages from 8-21 years old. Eight (8) out of seventeen (17) participants have low-vision while the rest are totally blind. The participants' monthly family income ranges from below 10,000-20,000php. All correlations were statistically non-significant. But since Oral health practices, plaque index, and caries incidence were fair there is a need for prevention to aim for good oral health practice hence, the creation of a manual focused on preventive dentistry

This pilot research had limitations that might have lead to the non-significant results of the study such as: limited sample size, Hawthorne effect and limitation of index used. Therefore, the author recommends future researchers to improve the survey questionnaires and use a more accurate index to a larger sample size.

**Keywords:** oral health practice, visually impaired, braille manual, caries, plaque index.

## INTRODUCTION

There has been a great advancement in today's society, and the dental community has hugely benefited from the modernization of the past century, especially with the creation of better instrumentations in handling patients according to their specific needs. People with special needs have also benefited from the advancement of technology, and now more of them are

living longer and experience a better quality of life. An example of patients with special needs is visually impaired. As indicated by Mohan, Raju, Gubbihal, and Kousalya (2016), blind patients may have more anxiety in dealing with people due to the fear of the unknown. The researchers intend to make them feel safe and comfortable, for them not to reject their dental rights and have better oral health. Tagliareni, G.F., and Sefo, D.L (2014), cited from the World Health Organization that two hundred eighty-five million people are impaired visually. Normal vision, moderately impaired, severely impaired, and total blindness are levels of visual function as classified by the International Classification of Disease. These individuals with visual impairment may feel like they are unfit to do anything normal in their lives and have trouble with different tasks. Those children who are completely blind, they miss the opportunity to learn things an average child with unimpaired sight experiences.

Visually impaired individuals from childhood to adolescence need special care and attention. They should be given patience and time to adjust to the interaction to be successful. Everyone should be given equal opportunity for quality oral health care, and this includes people with special needs. One reason may be that few dental clinicians have the proper training or awareness concerning the handling of visually impaired patients.

This study hopes to break the social stigma around handling visually impaired patients and in turn, provide quality oral health care to them.

The main objective of this study is to produce an oral hygiene braille manual through the extent of oral health practice, the incidence of dental caries, and plaque index of the visually impaired students.

## **LITERATURE REVIEW**

The lack of oral health practices, the prevalence of dental caries and periodontal diseases have been the leading cause of oral health problems of the visually impaired. As these problems arise, preventive measures should be done to facilitate oral health treatment.

### **Oral Health Practices of the Visually Impaired**

According to a research published by Priyadarshini et al (2015), the oral health practices of the visually impaired is found to be insufficient in a lot of aspects, as a lot of the respondents are not supervised during their tooth-brushing, and oral health habits are still lacking. In a recent study of Vozza et al (2016), proper education and training of the visually impaired individuals

together with proper instrumentation and techniques will give a positive result in their oral health.

#### Dental caries

During the initial stage of dental caries, blind people fail to recognize its manifestations of cavities. They only become aware of it after feeling pain and discomfort. In cautiousness in the treatment of caries during the outset stage will result in tooth loss. Loss of which will surely affect mastication and speech. Moreover, visually impaired populations tend to give more importance to their general health than their oral health (John et al 2017).

#### Plaque index, periodontal diseases, and the Blind people

In a study by Debnath et al (2017), the plaque scores of the visually impaired have raised to a percentage of 80% due to various difficulties in their oral health care practices. This was caused by miscommunication in relaying instructions to the visually impaired, the level of concentration of the individual or not having strong motor skills. Blind children have deficient oral hygiene, gingival inflammation, and periodontal diseases according to research. As stated in a Chinese study, ninety-two percent of visually impaired patients did not have consistent access to dental needs and thus, many of these patients had periodontal problems while 31% had pockets deeper than 3mm (John et al., 2017).

#### Age and gender

Sanjay et al. (2014), stated that as the children age the mean scores of caries gets higher and that males had more decayed component than female in all the age groups because the female group are more particular of their oral health care (Azodo et al 2012; Hamasha et al 2018). The dentist should play an essential part in improving the dental health of the children by early diagnosis and immediate treatment. As cited by Geethapriya et al (2017) there is no significant relation between the the age, incidence of dental caries and oral hygiene status of children

#### Importance of Oral Health to the Visually Impaired population

According to Bhor et al (2016), oral health is necessary for overall quality of life. Those who have a hearing impairment or are blind encounter oral and dental anomalies frequently. These patients depend on their parents or guardians for assistance to carry out day-to-day necessities

including oral care. Dental care is the most unmet need for the disabled. Oral and dental care of these patients has mainly been more deficient compared to the overall population.

Visual impairments encompasses people who have: (a) never had any visual function, those who (b) had a normal vision before becoming gradually or suddenly partially or totally blind, those with (c) visual impairment with disabilities, those with (d) selective impairments of parts of the visual field, and those with a (e) general degradation of sensitivity across the visual field. This happens when a problem arises with one or more parts of the eyes or the parts of the brain needs to process the visual images or a problem with eye-brain connections. It can be hereditary or acquired. (Scully et al 2007).

Researchers have found that people with disabilities, specifically blind patients, have a higher prevalence of dental caries and have a deficient state of oral hygiene, and a struggle in obtaining dental care. Patients who are visually impaired cannot envision the plaque on the surfaces of their teeth, more so understand the importance of oral hygiene. Hence, it is important to have an individual training for developing awareness in oral care and plaque control to minimize dental caries and periodontal disease among visually impaired individuals (Bennadi et al, 2013).

Sanjay et al. (2014), stated that good oral health is important for proper mastication, and speech. Their inability to maintain proper oral hygiene could be due to their physical or intellectual disabilities. In this case, children with visual impairment would have limitations both physically and intellectually, as they would not have seen how the oral cavity and its related structures look like, therefore they would not be able to visualize the oral cavity as a whole which may affect how they brush their teeth.

#### Oral health education modified for visually impaired patients

Visually impaired people progress heightened senses of hearing and touch that compensates for their lack of vision. As stated by Zwiers et al (2001), visual impairment may lead to flexibility and sharpening of the remaining senses to compensate for the lost sense. In the case of sound localization, it has been reported shortly that, under certain circumstances, early-blind humans can localize sounds better than sighted controls. Nonetheless, through experience and a lot of practice, blind children and adults can use their undamaged senses productively so that they seem to have greater responsiveness in hearing and touch than individuals. Having knowledge of this, other techniques for oral health education can be employed for visually impaired patients.

Mahantesha et al (2015) stated that the effectual oral health education technique needs to be established for visually impaired children. Blind patients depend on sound, speech, and touch to familiarize themselves with a setting. Use of oral health education booklet in Braille and audio instruction has great benefit to achieve good oral hygiene levels in this type of patients. And as visual perception is usually the method for proper tooth brushing, which is why blind children were not able to able to learn through imitation.

Al-Sinaidi (2013) analyzed that the usual suggestion for preventing and treating of periodontal diseases is to brush their teeth twice a day, use floss at least once daily and maintain a regular 3-month dental visit. People who are visually impaired are at higher risk of developing periodontal diseases due to their incapability to visually analyze the effectivity of their tooth brushing and to distinguish the early signs of periodontal disease. As a result, they may be unable to take the right action to prevent and treat a particular oral condition. Moreover, the visually impaired population usually face strains in putting toothpaste on their brushes and exercising atraumatic-brushing strokes that can injure their. The ambiance in the clinic should be relaxing and that sudden movements and distractions should be avoided. The use of conversation should be simple and should be understood easily. The patient should be informed of every movement made in the room and should refrain. Speaking about the disability of the patient should be avoided also (Khokhar et al, 2016).

The researchers found many studies regarding visually impaired patients and their oral health and practices. However, there are very limited studies here in the Philippines. This leads to limited knowledge about their oral health and practices.

## **METHODS**

Research design: Descriptive correlational. This is a cross-sectional study which is a design is a type of observational study design. In a cross-sectional study, the investigator measured the outcome and the exposures in the study participants at the same time. The relationship of the two indices (DMFT and Plaque Index) will be correlated with the participants demographic profile. This study utilized the purposive sampling in recruiting the research participants.

The population of this study was composed of 17 visually impaired elementary and junior high school students; 8 totally blind students, and 9 students with low vision. This number of the population was secured from the guidance office of the school during the researchers' visit to the school. The researchers used purposive sampling in choosing the respondents based on the set of criteria (Crossman, 2018). The inclusion is Grade 1 to Grade 10 that has low vision and

total blindness of elementary and junior high school levels that are enrolled during the school year 2019-2020. The exclusion criteria is respondents who are multi-disabled and/or with a syndrome.

Forty parental consents with survey questionnaires were given to the teachers on their first visit for data gathering from grades 1 to 10 for them to distribute it to the students and have it signed and answered by their parents/guardian. The researchers contacted the school dentist to know how many parental consents and survey questionnaires were returned and only 13 sets were answered by the parents/guardians. The researchers tried to gain more participants by going back to the school and giving out more consent to the parents they were able to meet. The researchers were able to gather up a total of 23 signed consents. On the day of the data gathering procedures, only 17 participants came as the others were absent and went home already.

Prior to the interview, answering the survey, and oral exams, the nature, purpose, and procedures of the research were elaborated to the students and their parents. The participation was voluntary and written parental/guardian consent was obtained. The survey questionnaire was composed of questions about demographics, the status of their vision, diet, and oral hygiene practices.

The school has a total of 157 students from kindergarten to Grade 12. The students who reside inside the school are not separated by their sight impairment, rather, they are mixed together and is supervised by their house father for the boys and house mothers for the girls. With this type of living situation, instructions are given as one so as not to let anyone feel a little less than than the other.

On the day of the oral examination, 5 other dental students were brought to help the researchers. These other dental students were assigned to write on the charts and record the data gathered by the researchers. The oral examination was conducted in the school by seating the subjects in a chair using a flashlight, latex gloves, face masks, disclosing solution, sterile mouth mirrors, and dental explorers. The examination consisted of the assessments of the plaque index through Oral Hygiene Index-Simplified and dental caries index through DMFT (Decayed, Missing, and Filled Teeth). The researchers underwent calibration for the uniformity of the assessment tools with the help of their adviser. Prior to data gathering, the researchers explained the whole process to the principal, as well as to the school dentist. The contact numbers of the researchers were included in the consent form for the parents to communicate with them for further concerns and clarifications regarding the study.

The biostatistician has been informed about how the researchers will give the data gathered for analysis. Using the results and analysis of the data collected which consists of the respondents' extent of their oral health practices, their DMFT scores, their plaque index scores, as well as their favorite food, a production of braille manual consisting of information about what does the dentist do and what happens in a dental clinic, oral hygiene instructions, and also tells awareness on what food to eat and their effects in the oral cavity, this was carried out. The day of turnover, demonstration of proper tooth brushing with toothpaste and pumice was not done due to time constraints and the availability of the presence of the students, scaling and polishing were done by the researchers and 4 more dental students to help. This was carried out for the visually impaired students to know how professionally cleaned teeth feel like for them to have a basis to follow. After the scaling and polishing, the subjects received toothbrushes and toothpaste from the researchers as a form of incentive for joining the research.

This study used survey questions to collect data. The set of questions used was adapted from a published journal by Al-Sinaidi (2013). The questionnaire had 3 parts: the first part contained the letter of consent to be answered by their parents/guardian of the respondent since the latter is not of legal age. If the parents/guardian agreed to participate in the study, they will proceed in answering the second part which contained demographic questions such as age, level of education, gender, type of visual impairment, other medical conditions and if they are living with their parent or guardian. The third part contained the tested survey questions concerning their oral hygiene practice. Attached in this form is the DMFT/Plaque index form.

**Table 1. Interpretation of the Result of the DMFT Index**

<b>Score</b>	<b>Interpretation</b>
From 0 to $(x-SD)$	Low
Between $(x-SD)$ and $(x+SD)$	Moderate
From $(x+SD)$ to 32	High

DMFT is an index that describes the amount and the prevalence of dental caries in an individual. Caries prevalence is numerically expressed and is obtained by calculating the number of Decayed, Missing, and Filled teeth. Caries prevalence among the respondents was examined with the use of DMFT Index (Table 1). It indicates the total number of teeth that are decayed (D), missing (M), and filled (F) in each respondent

**Table 2. Criteria for Scoring the Oral Debris Component (DI-S)**

<b>Score</b>	<b>Criteria</b>
0	No debris or stain present
1	Soft debris that covers not more than one-third of the surface of the tooth, or presence of extrinsic stains without other debris regardless of surface area covered
2	Soft debris that covers more than one third, but not more than two thirds, of the exposed tooth surface.
3	Soft debris that covers more than two-thirds of the exposed tooth surface.

**Table 3. Criteria for Scoring the Calculus Component (CI-S)**

<b>Score</b>	<b>Criteria</b>
1	No calculus present
2	Supragingival calculus that covers not more than one-third of the exposed tooth surface.
3	Supragingival calculus that covers more than one third but not greater than two-thirds of the exposed tooth surface or the presence of individual spots of subgingival calcular deposits around the cervical portion of the tooth or both.
4	Supragingival calculus that covers more than two-third of the exposed tooth surface or a continuos heavy band of subgingival calculus around the cervical portion of the tooth or both.

On the other hand, the Simplified Oral Hygiene index deals with two components: the Debris index (Table 2) and the Calculus index (Table 3). Data gathered are based on numerical determinations that represent the amount of debris or calcular deposits present on a certain tooth. These indices were based on the evaluation of six surfaces which are: the buccal surfaces of the maxillary right first molar, maxillary left first molar, maxillary right central incisor, mandibular left central incisor and lingual surfaces of mandibular right first molar and, mandibular left first molar.

**Table 4. Interpretation of the Result of the Oral Hygiene Index - Simplified Score per person**

<b>Score</b>	<b>Interpretation</b>
0.0 – 1.2	Good
1.3 – 3.0	Fair
3.1 – 6.0	Poor

To determine the debris index, the total score for debris component was divided into the number of teeth seen. Then, to come up with the calculus index, the total score for the calculus



component was divided into the number of teeth seen. The Oral Hygiene Index-Simplified Score is the sum of debris and calculus index.

Statistical Analysis of Data

The data gathered was statistically analyzed using Mean, Percentage, and Standard Deviation t-test, ANOVA, and Pearson R.

**RESULTS**

1. The extent of Oral Health Practices of the Visually Impaired Students

**Table 5. Extent of the Oral Health Practices of the Visually Impaired**

<b>Ranges</b>	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Poor:0.00 - 4.35	3	17.6	17.6	17.6
Fair:4.36 - 6.82	11	64.7	64.7	82.4
Good:6.83 - 8.00	3	17.6	17.6	100.0
<b>Total</b>	<b>17</b>	<b>100.0</b>	<b>100.0</b>	

Table 5 denotes the extent of the oral health practice of visually impaired students. It shows that 11 out of 17 (64.7%) respondents have a fair extent of oral health practice which means they still need reinforcement of oral hygiene but has better prognosis compared to the poor results. Three students (17.6%) got poor scores which entails that they are at higher risk for sever gingival infections due to their poor oral hygiene. The other 3 out of 17 (17.6%) got good scores which means they are practicing oral hygiene and have low caries and gingival disease risk. The results are in agreement with the study of Priyadarshini et al. (2015) that when a student is not supervised during their brushing of teeth, their oral health habits are a bit lacking. In another study by Vozza (2016), proper education and training of the visually impaired student will give positive results in their oral health, with that being said oral braille manual may be of help to teaching the visually impaired student the proper oral hygiene they need to achieve.

**Table 6. Norm, Mean and Standard Deviation of DMFT and dmft**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>
DMFT	17	0.5576	0.32358
dmft	3	0.2	0.06928

Table 6 shows the incidence of dental caries of the visually impaired students with a mean score of 0.56 (SD = 0.32). The results show that more than half (64.7%) of the participants have fair scores of DMFT, which coincides with the study of John et al. (2017) that visually impaired people fails to recognize manifestations such as discolorations and only becomes aware of it when they feel pain or discomfort. On the other hand, the dmft scores have a mean score of 0.2 (SD = 0.07).

**Table 7. Incidence of Dental Caries of the Visually Impaired (dmft)**

<b>Ranges</b>	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Low: 0 - 0.12	1	5.9	33.3	33.3
High: 0.13 - 0.27	2	11.8	66.7	100.0
Total	3	17.6	100.0	

**Table 8. Incidence of Dental Caries of the Visually Impaired (DMFT)**

<b>Ranges</b>	<b>Frequency</b>	<b>Percent</b>	<b>Valid Percent</b>	<b>Cumulative Percent</b>
Good: 0 - 0.23	3	17.6	17.6	17.6
Fair: 0.24 - 0.88	11	64.7	64.7	82.4
Poor: 0.89 - 32	3	17.6	17.6	100.0
Total	17	100.0	100.0	

Table 7 and 8 show that 11.8% of the 17.6% primary dentition falls on the high range and 5.9% falls on the low range. According to Queddeng (2012), Filipino children's oral health status is terrifying. 97.1% of six year-old children are suffering from tooth decay. While 78.4% of 12 year-old children are suffering from it too and visually impaired students are not excluded from this.

**Table 9. OHI-S Norm, Mean and Standard Deviation**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>
OHIS	17	1.2359	0.64844

**Table 10. Plaque index of the Visually Impaired (OHI-S)**

Ranges		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Good: 0.0-1.2	8	47.1	47.1	47.1
	Fair: 1.3-3.0	9	52.9	52.9	100.0
	Poor: 3.0-6.0	0	0	0	0
	Total	17	100.0	100.0	

Table 9 and 10 represents the plaque index of visually impaired students with a mean score of 1.24 (SD: 0.65). 52.9% out of the whole population ranged as fair when it comes to plaque index. While 47.1% of the population falls on the good range. These results relate to a study by Debnath et al. (2017) stating that the plaque scores of the visually impaired are not that low due to various difficulties in their oral health care practices. This was caused by miscommunications in relaying instructions to the visually impaired.

Table 11. The demographic profile of the participants

	Group	Frequency	%
<i>Gender</i>	Male	9	52.9
	Female	8	47.1
<i>Grade level</i>	1	1	5.9
	2	1	5.9
	4	4	23.5
	5	1	5.9
	6	2	11.8
	7	5	29.4
	8	1	5.9
	9	1	5.9
	10	1	5.9
	<i>Age</i>	8	1
10		1	5.9
11		2	11.8
12		4	23.5
13		1	5.9
15		2	11.8
16		1	5.9
17		1	5.9
18		2	11.8
21		2	11.8

	Group	Frequency	%
<i>Level of Sight Impairment</i>	Low Vision	8	47.1
	Totally Blind	9	52.9
<i>Primary Caregiver</i>	Mother	15	88.2
	Father	1	5.9
	Others	1	5.9
<i>Monthly income</i>	Below 10,000	13	76.5
	10,000-20,000	4	23.5

Table 11 represents the demographic profile of the participants which are in grade levels of 1-10 and ages from 8 to 21 years old. Eight out of seventeen participants have low-vision (47.1%) while the rest are totally blind (52.9%). The results presented in survey question 2 revealed that each child is supervised by their parent or guardian, but as they are living in the dormitory of their school, their parents or guardians are not always with them and this coincides with the study of Priyardashini et al. (2015), that when the child is not supervised, their oral health habits are lack. Survey question 4 revealed the usual participants' family income a month which (76.5%) of the total population answered below ten thousand pesos and only (23.5%) answered ten thousand to twenty thousand. With this data, it is evident that the oral health of the visually impaired students is compromised, due to the fact that oral health care services and products are less prioritized

The significant difference in the Incidence of Dental Caries when grouped according to Students' Demographic Profile

**Table 12. Significant difference in the Incidence of Dental Caries when grouped according to profile**

	Q1P1	N	Mean	SD	t	df	p-value	VI
DMFT	Low Vision	8	0.5088	0.42073	-0.555	10.384	0.591	NS
	Totally Blind	9	0.6011	0.22363				

Table 12 represents the incidence of dental caries according to the level of sight impairment. A mean score of 0.51 for Low Vision (SD: 0.42) and 0.60 (SD: 0.22) for Totally Blind were calculated. Apparently, the results show that their level of sight impairment has no significant

effect on their DMFT scores due to the fact that the p-value of it is 0.60 which is greater than the level of significance.

Table 13 represents the incidence of dental caries according to their monthly income with a mean score of 0.58 (SD: 0.29) for those who answered "below 10,000" as their monthly income and a mean score of 0.5 (SD: 0.47) for those who answered "10,000-20,000" as their monthly income. Evidently, the results show that monthly income has no significant effect on their DMFT scores.

**Table 13. Significant difference in the Incidence of Dental Caries when grouped according to profile**

	<b>Q4P1</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>t</b>	<b>df</b>	<b>P-value</b>	<b>VI</b>
DMFT	Below 10,000	13	0.5754	0.28605	0.397	15	0.697	NS
	10,000-20,000	4	0.5	0.47469				

Table 14 represents the incidence of dental caries according to their gender. The male group has a mean score of 0.45 (SD: 0.27), while the female group gathered a mean score of 0.68 (SD: 0.35). The results show that their gender has no significant effect on their DMFT scores.

**Table 14. Significant difference in the Incidence of Dental Caries when grouped according to profile**

	<b>Gender</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>t</b>	<b>df</b>	<b>p-value</b>	<b>VI</b>
DMFT	Male	9	0.4522	0.2717	-1.476	15	0.161	NS
	Female	8	0.6763	0.35298				

Significant relationship in the Oral Health Practice and Incidence of Dental Caries of the Visually Impaired

**Table 15. Significant relationship in the Oral Health Practice and Incidence of Dental Caries**

	<b>Parameters</b>	<b>Oral Health Practice</b>
DMFT	r	0.068
	p-value	0.795
	VI	NS

Table 15 represents the overall relation of Oral Health Practice and Incidence of Dental Caries which shows a p-value of 0.80 which is greater than the level of significance. This leads to no significant relationship between the two variables.

Significant Difference in the Incidence of Dental Caries and Plaque index when grouped according to Students' Demographic Profile

**Table 16. Significant Difference in the Incidence of Dental Caries and Plaque index when grouped according to profile**

	<b>Sight Impairment</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>t</b>	<b>df</b>	<b>p-value</b>	<b>VI</b>
DMFT	Low Vision	8	0.5088	0.42073	-0.555	10.384	0.591	NS
	Totally Blind	9	0.6011	0.22363				
OHIS	Low Vision	8	1.3113	0.71587	0.44	15	0.666	NS
	Totally Blind	9	1.1689	0.61791				

Table 16 represents the data of the two indices correlating to the level of sight impairment of the population. Low Vision group has a mean score of 0.51 (SD: 0.42) while the Totally Blind group has a mean score of 0.60 (SD: 0.22). Both levels of sight impairment are not significant to DMFT due to the fact that the p-value is higher than the level of significance.

On the other hand, correlating the level of sight impairment to plaque index, Low vision group has a mean score of 1.31 (SD: 0.72) while Totally Blind group has a mean score of 1.17 (SD: 0.62). Apparently, there is no significant effect between the level of sight impairment and the two indices.

**Table 17. Significant Difference in the Incidence of Dental Caries and Plaque index when grouped according to profile.**

	<b>Monthly Income</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>t</b>	<b>df</b>	<b>p-value</b>	
DMFT	Below 10,000	13	0.5754	0.28605	0.39	15	0.697	NS
	10,000-20,000	4	0.5	0.47469				
OHIS	Below 10,000	13	1.2054	0.70426	-0.34	15	0.739	NS
	10,000-20,000	4	1.335	0.49143				

Table 17 represents the data of the two indices correlating to the Monthly Income of the population. "Below 10,000" group has a mean score of 0.58 (SD: 0.29) and the "10,000-20,000" group gathered a mean score of 0.5 (SD: 0.47). The results show that Monthly income has no significant effect on their DMFT scores.

"Below 10,000" group has a mean score of 1.21 (SD: 0.70) while the "10,000-20,000" group has a mean score of 1.34 (SD: 0.49). These results exhibit that Monthly Income is not significant to OHI-S scores.

**Table 18. Significant Difference in the Incidence of Dental Caries and Plaque index when grouped according to profile.**

	<b>GENDER</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>t</b>	<b>df</b>	<b>p-value</b>	
DMFT	Male	9	0.4522	0.2717	-1.476	15	0.161	NS
	Female	8	0.6763	0.35298				
OHIS	Male	9	1.2589	0.55354	0.15	15	0.882	NS
	Female	8	1.21	0.78068				

Table 18 represents the data of the two indices correlating to the Gender of the population. The male group has a mean score of 0.45 (SD: 0.27), while the female group gathered a mean score of 0.68 (SD: 0.35). Evidently, these results show that Gender has no significant effect on the DMFT scores. The male group has a mean score of 1.26 (SD: 0.55) and the female group has 1.21 (SD: 0.78). These results show that Gender has no significant effect on the OHI-S scores.

2. Significant Relationship between the participants' Oral Health Practice and Plaque Index

**Table 19. Significant Relationship between the participants' Oral Health Practice and Plaque Index**

	<b>Parameters</b>	<b>Oral Health Practice</b>
OHIS	R	0.218
	p-value	0.4
	VI	NS

Table 19 shows that there is no significant relationship between the participants' Oral Health Practice and Plaque Index due to the fact the p-value is 0.4 which, apparently, higher than the level of significance.

Table 20 reveals that the age is not significant to the incidence of dental caries since its p-value is computed as 0.31 which is greater than the level of significance. But in the data that were gathered, student SB13 has a score of 1.67 in DMFT which is fairly high compared to the other students. It relates to the study of Sanjay et al. (2014) that caries scores get higher as they age. This table also shows that age has no significant effect on their OHI-S because evidently, the p-value is 0.98 and it is a lot greater than the level of significance.

**Table 20. Correlation of age to the two indices**

	<b>Parameters</b>	<b>Age</b>
DMFT	r	0.264
	p-value	0.306
	VI	NS
OHIS	r	-0.007
	p-value	0.98
	VI	NS

## **DISCUSSION**

The extent of oral health practice of the 17 participants shows that 64.7% out of 100% falls on the range of 4.36-6.82. This result shows that the patients have a fair extent of oral health practice, it is acceptable but not to a good extent. This result commensurates with the incidence of dental caries (DMFT) and plaque index. The incidence of dental caries of the 17 visually impaired students has a mean score of 0.56 (SD: 0.32). 64.7% out of the whole population falls on the range of 0.24-0.88 which interprets as fair. The plaque index of the 17 visually impaired students has a mean score of 1.24 (SD: 0.65). 52.9% of the whole population stands at 1.3 – 3.0. This shows that the plaque index of the majority of the participants is fair. This proves that the fair extent of oral health practice leads to a fair incidence of dental caries and plaque index. Hence, they still need oral hygiene reinforcement and patient education.

On the other hand, the incidence of dental caries (dmft) among the participants with mixed dentition shows a mean of 0.2 (SD: 0.07). This reveals that 11.8% out of 17.6% of the participants with mixed dentition fall on the high incidence of dental caries which is different from the first two results. This may be due to the fact that primary dentition has been inside the oral cavity since age two and has been subjected to cariogenic situations.



The p-value between the level of sight impairment and oral health practice shows no significance along with the oral health practice and monthly income, incidence of dental caries and plaque index, and the oral health practice and plaque index. On the other hand, the p-values of the gender and incidence of dental caries reveal significant differences when correlated together.

### **Conclusion**

The extent of the oral health practice, the incidence of dental caries, and plaque index of the 17 visually impaired students are all in the fair verbal interpretation. However, this research's related literature stated that visually impaired patients have poor oral health practice, high incidence of dental caries and high plaque index. This is congruent to the researchers' observation that they had fair oral hygiene status, to begin with. Nonetheless, the researchers wanted to elevate the levels of the said variables to good levels. Since only dental professionals are capable of providing the oral health care of the Visually Impaired Community, the researchers ought to extend the dental services within their reach.

The researchers found no significant difference among the variables as the researchers observed that most of the visually impaired students are living in the dormitories, which means that lifestyle and practices can be the same with each of the participants. The fair levels of the plaque index may indicate that the participants have already changed his/her oral health practice and is brushing properly because there is someone guiding them every time. There is a term called the Hawthorne effect wherein a subject changes his usual behavior or something he has done regularly for the better when someone is observing them. The changes are from the person himself and not from the people around (Kerry, 2018). The differences between the low vision and totally blind were found to be non-significant because they might have the same oral health practices due to the same living situations and guidance coming from the school. Thus, the researchers concluded that all the null hypotheses that stated that "There is no significant difference in the incidence of dental caries when grouped according to profile", "There is no significant difference in the oral health practice of the visually impaired.", "There is no significant difference in the oral health practice and incidence of dental caries of the visually impaired.", "There is no significant difference in the incidence of dental caries and plaque index when grouped according to profile.", and "There is no significant relationship in the participants' oral health practice and plaque index." are proven. But since fair levels of oral health practice, the incidence of dental caries, and plaque index were statistically proven, the researchers still produced the oral hygiene braille manual to improve their oral health practice

to a good level and the incidence of dental caries, and plaque index will follow because according to Velasco (2015), the following are the criteria of orally healthy child: the absence of caries, filled carious tooth, no oral debris and dento-facial irregularities and healthy gingiva. The non-significant results maybe due to the small sample size and other study bias such as Hawthorne effect and low validity value of OHI-S. Hence the following are recommended to future researchers. A larger population of visually impaired students is needed to measure the incidence of dental caries and plaque index. Use a different index to measure plaque depositions on different surfaces of the teeth as Simplified Oral Hygiene Index only checks the labial surfaces of the anterior teeth wherein most of the accumulations are seen in the lingual area. Include in the survey questionnaire: "when was the last time that the visually impaired students got their teeth cleaned by a dentist?"

The visually impaired community in the Philippines does not receive much attention that lead to few studies and researches about them. Researchers are encouraged to invest more time and effort to use them as subjects of future studies. The researchers wanted to propose the Philippine National School for the Blind to be part of their community extension services and to implement programs that will enable the visually impaired community in the Philippines of their God-given privileges.

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