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Monotonic Trend of Oral Health During the COVID-19 Pandemic Period in Caraga Region, Philippines

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A B S T R A C T

Oral diseases are among the prevalent non-communicable diseases worldwide, affecting billions of people. This research study analyzed oral health data from 2017 to 2021 to address the lack of published studies on dental cases in the Caraga Region. It focused on various aspects of oral health, including dental services, dental caries, gingivitis, and periodontitis. Data was collected by formally requesting information for various dental records collated from the Department of Health (DOH) Caraga database and collaborating with the Acebu Dental Clinic for images on dental diseases. In total, 547,405 individual dental cases from the Caraga region were collected from 2017-2021. The findings showed that noninvasive procedures often included oral hygiene counseling, while tooth extraction had the highest recorded data among invasive procedures. Data analysis by age group revealed that children aged nine and below had a higher susceptibility to dental caries, while those between 10 and 24 years old had higher instances of gingivitis. Individuals aged 25 and above were more prone to periodontal disease. The females exhibited a higher prevalence of dental caries, gingivitis, and periodontitis compared to males. Pregnant women also had a high incidence of untreated dental caries. This study reported a decline in the number of orally fit children, determined through oral examinations and complete rehabilitation, from 2017 to 2021. Trend analysis using the Mann-Kendall Test and Sen's Slope revealed a monotonic decrease with negative values. The disruptions caused by the COVID-19 pandemic, such as lockdowns, limited access to dental care, and decreased awareness of oral hygiene, likely contributed to the decline in reported cases during this period.

Keywords: *Dental Caries, Dental Services, Gingivitis, Periodontitis, Pregnancy*

1 Introduction

Oral diseases are among the prevalent noncommunicable diseases worldwide, affecting billions of people. The most common diseases include cavities and gum disease (Centers for Disease Control and Prevention 2022; World Health Organization 2023). While oral diseases are generally preventable, they persist with high prevalence, reflecting widespread social and economic disparities and insufficient funding for prevention and treatment. Thus, imposing serious health and economic burdens (Peres et al. 2019).

The COVID-19 pandemic led to a widespread decline in children's oral health and access to oral healthcare, with children in 2020 being less likely to have excellent dental health, more likely to have poor dental health, and experiencing reduced dental visits compared to previous years (Lyu & Wehby 2022). Most dental procedures generate significant amounts of droplets and aerosol, which could promote the spread of COVID-19 infection, thereby endangering dental care practitioners, staff, and patients (Meng et al. 2019). In May

2020, the Philippine Dental Association (PDA) published the "Interim Guidelines on Infection Prevention During the COVID-19 Pandemic" from existing COVID-19 literature and relevant international guidelines. This guideline was adopted and implemented for all dental clinics in the Philippines. The primary objective of such guidelines is to safeguard the well-being of dental healthcare practitioners, staff, and patients within dental facilities and mitigate the transmission of COVID-19 in the broader community (Philippine Dental Association 2020).

Oral disease remains a serious public health problem in the Philippines. The prevalence of dental caries on permanent teeth has consistently remained above 90% over the years. Approximately 92.4% of Filipinos have tooth decay (dental caries), and 78% have gum diseases (e.g., periodontal diseases; Ofilada 2018). The burden of gum diseases is carried by Filipinos from an early age, with children as young as twelve suffering from gingivitis. Failure to receive timely treatment could render these children vulnerable to irreversible periodontal disease as they progress into adolescence and adulthood. Fadare et al. (2021) conducted a study that assessed oral health knowledge and practices among elementary pupils attending Saint Louis College in the City of San Fernando, La Union, Philippines. The study revealed that most pupils demonstrated satisfactory knowledge about the causes (87.23%) and preventive measures (86.21%) of oral diseases. However, it also showed that oral hygiene practices among these pupils were only moderately practiced (55.80%).

The recorded number of dental cases in the Caraga Region has not been addressed in any published studies. Hence, this research was conducted with objectives including classifying dental services, comparing dental disease cases by demographics, and conducting a trend analysis for 2017-2021. By examining the trends in dental cases during this period, the study can contribute to a better understanding of the oral health situation in the region and inform future interventions and policies to address the prevailing oral health issues, including the impacts of the COVID-19 pandemic among individuals.

2 Materials and Methods

Data Collection and Documentation

Data collection involved two main approaches. Initially, a formal request letter was sent to the Department of Health (DOH) Caraga, seeking access to oral health data from 2017 to 2021 for all five provinces of the Caraga Region (Figure 1). It facilitated gathering comprehensive and reliable information on the region's trends, prevalence, and outcomes related to oral health. Subsequently, a separate request letter was submitted to Acebu Dental Clinic in Butuan City, requesting permission to obtain pictures of sample dental diseases. These visuals served valuable resources for the research, aiding in the analysis and documentation of various dental conditions and procedures with high regard to preserving the anonymity of photographed patients.

*Descriptive Statistic*s

Statistical tools are utilized to analyze oral health data collected over a specific period.

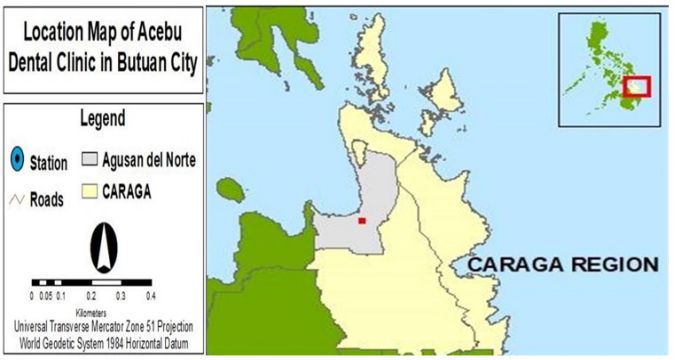

Figure 1. Map of The Caraga Region. Red Square is Acebu Dental Clinic located in Butuan City. Coordinates: 8.946035854274125°, 125.53659518550 285° or Latitude: 8° 56' 45.731' N Longitude: 125° 32' 11.744' E.

Various factors, such as dental services, age, sex, pregnancy, dental conditions, and children's oral health, were examined. Nonparametric statistical methods, specifically the Mann-Kendall test and Sen's slope, are applied to identify trends in dental disease prevalence. These robust statistical tools effectively detect monotonic upward or downward trends, taking into account the ordinal nature of the data and incorporating medians to handle extreme values (Helsel and Hirsch 1992, Zaiontz 2023).

Ethics Statement

Permission secured from DOH-Caraga, seeking access to oral health data from 2017 to 2021, was obtained following prescribed ethical protocols. Ethical guidelines were strictly observed by obtaining consent from patients, their legal guardians (for minors), and the dentist at the Acebu Dental Clinic. Only the oral region of the patients was shown in the images.

3 Results and Discussion

Services Rendered

The breakdown of dental services rendered by dentists in the Caraga region is divided into noninvasive and invasive procedures (Table 1). Noninvasive procedures encompass preventive, restorative, and diagnostic treatments, while invasive procedures involve more complex interventions such as surgical procedures.

Noninvasive Procedures

A concerning trend is observed in the use of noninvasive procedures to improve oral hygiene over the five years from 2017 to 2021, which includes the challenging COVID-19 years (Figure 2). Counseling education on oral hygiene steadily declined, starting in 2018 and worsening in 2020, likely due to limited healthcare access during the pandemic. By 2021, there was a significant decrease in the number of individuals receiving counseling education, highlighting ongoing challenges. Similarly, the number of individuals completing fluoride therapy showed a decreasing pattern. Following a slight decline in 2018, a significant drop in 2019 continued into 2020 and 2021.

The Mann-Kendall test revealed a significant downward trend in oral hygiene counseling. The calculated Z-value (-2.2045) and the corresponding p-value (0.02749) indicate evidence to reject the null hypothesis of no trend. Additionally, Sen's slope estimates (-34519.83) suggest a substantial negative slope, indicating a notable decline in the number of individuals receiving counseling education on oral hygiene over the study period. These statistical results highlight the significance of the decreasing trend and emphasize the importance of targeted interventions during the pandemic.

Over the five-year period, which included the COVID-19 pandemic, the utilization of sealants

Table 1. Number of Noninvasive and Invasive Dental Procedures in Caraga Region from 2017-2021.

Noninvasive Procedure						
Procedure	**2017**	**2018**	**2019**	**2020**	**2021**	**TOTAL**
Given Counseling Education on Oral hygiene	141,753	119,500	116524	37642	4409	**419,828**
Completed Fluoride Therapy	88,897	88,008	30,348	23,172	2,176	**232,601**
Given Sealant	3,035	2,830	11,666	7,528	28	**25,087**
Given OP/ Scaling	4,874	5,190	10,411	0	135	**20,610**
Given Permanent Fillings	6,564	6,444	2,785	0	27	**15,820**
Given Temporary Filling	3,164	3,224	4,585	0	14	**10,987**
Given Post-Operative Treatment	1,279	2,362	1448	1,006	715	**6,810**
Given gum treatment	1,001	1,832	1,871	0	252	**4,956**
Referred	146	207	306	692	148	**1,499**
Invasive Procedure						
Procedure	**2017**	**2018**	**2019**	**2020**	**2021**	**TOTAL**
Given Extraction	37,247	23,445	12053	8025	1295	82,065
Patients with Oral Abscesses drained	84	180	153	0	0	417

and temporary fillings displayed a fluctuating pattern (Figure 3). Sealants initially declined from 2017 to 2018, followed by a notable increase in 2019 and subsequent decreases in 2020 and 2021, reflecting the direct impact of the pandemic. Similarly, temporary fillings showed a similar trend, with a slight rise in 2018 and a gradual decline afterward. The number of individuals receiving permanent fillings gradually decreased throughout the years, likely due to the various challenges posed by the pandemic. Additionally, oral prophylaxis or scaling utilization fluctuated, with a significant increase in 2019 and a decrease in 2021.

Dentists use fluoride to strengthen teeth because it prevents tooth decay by strengthening enamel, promotes remineralization to repair weakened areas, inhibits harmful bacteria that cause decay, and enhances enamel development, especially in children. Fluoride application is a widely accepted preventive measure in dentistry to protect teeth, prevent cavities, and improve overall oral health (Medjedovic et al. 2015).

Restoring teeth, including both permanent and primary teeth, is extremely important for keeping a healthy mouth and ensuring proper chewing, speaking, and appearance. Composite fillings are valuable because they can make teeth look and function naturally. Saving primary teeth, also called baby teeth, is crucial for children's development as they help with eating, speaking, and guiding permanent teeth into the proper position. Losing

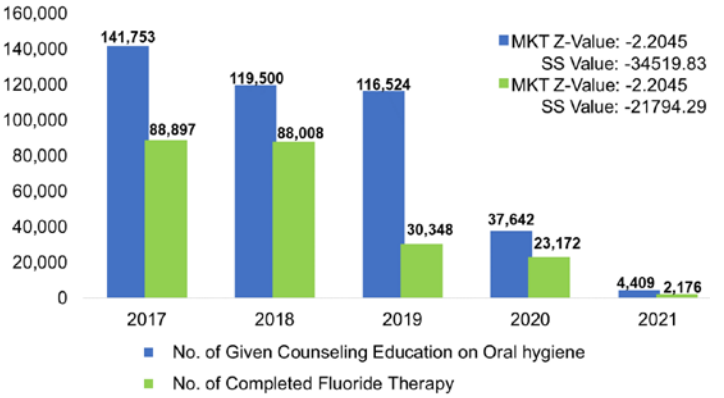

Figure 2. Noninvasive Counseling on Oral Hygiene and Fluoride Therapy in Caraga Region from 2017-2021. Mann-Kendall Test (MKT) Z-Value and Sen's Slope (SS) Value.

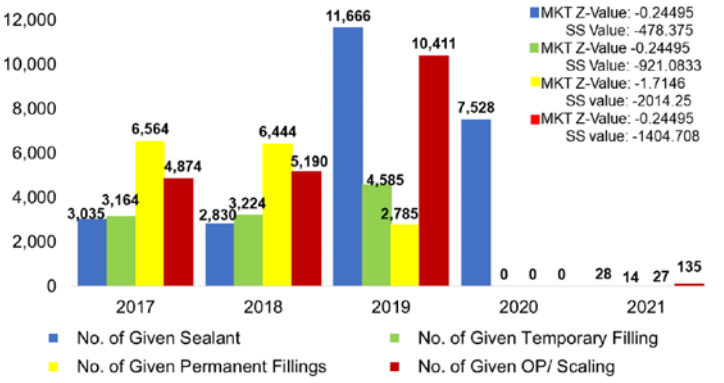

Figure 3. Cases of Sealant, Temporary Filling, Permanent Filling, and OP/ Scaling in the Caraga Region from 2017-2021. Mann-Kendall Test (MKT) Z-Value and Sen's Slope (SS) Value.

baby teeth too soon can cause problems like misaligned permanent teeth or overcrowding, which may require orthodontic treatment later (Yengopal et al. 2009).

Analysis of noninvasive data procedures from 2017-2021 (Figure 4) reveals distinct trends. The number of individuals receiving post-operative treatment fluctuated, indicating a need for ongoing evaluation and interventions for consistent access. Referrals for further treatment initially increased but showed fluctuations, highlighting the importance of minimizing referrals and optimizing patient management. The utilization of gum treatment has varied over the years. These findings underscore the importance of consistent post-operative care, reducing referrals, and addressing treatment availability gaps.

The statistical analysis of the data revealed declining trends in Post-Operative Treatment (-328.75) and Gum Treatment (-260.4583) based on Sen's slope values. However, the lack of statistical significance (p=0.2207 and 0.8065, respectively) prevents definitive conclusions. These trends may have been influenced by the global COVID-19 pandemic, which disrupted healthcare systems. Postponement or cancellation of non-urgent procedures and changes in referral patterns could have contributed to the observed declines. However, it is important to note that it is challenging to attribute these trends solely to the COVID-19 pandemic without additional context or data.

Invasive Procedures

The data from the DOH-Caraga sheds light on tooth extraction trends in the Caraga Region over five years (Figure 5). A significant decrease in tooth extractions is observed over time, with fluctuations indicating dynamic dental health patterns.

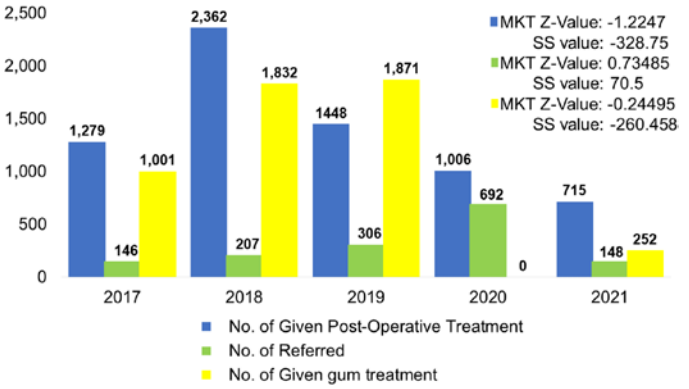

Figure 4. Post-operative treatment, Referred, and Gum Treatment in Caraga Region from 2017-2021. Mann-Kendall Test (MKT) Z-Value and Sen's Slope (SS) Value.

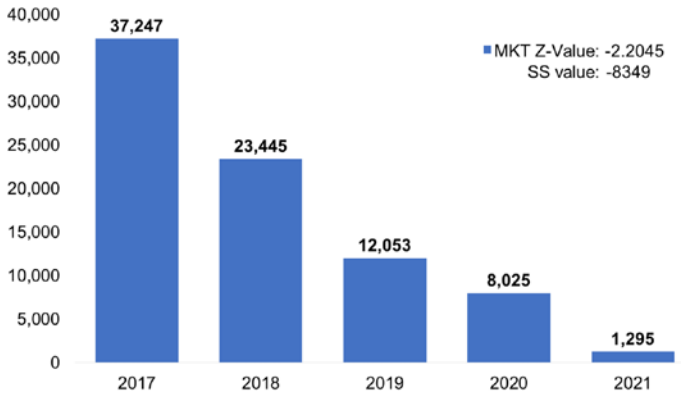

Figure 5. Cases of tooth extraction procedure in Caraga Region. Mann-Kendall Test (MKT) Z-Value and Sen's Slope (SS) value.

Statistical analysis using the Mann-Kendall test and Sen's slope values confirms a statistically significant association (Z-value: -2.2045; p-value: 0.02749; Sen's value: -8349) between the COVID-19 pandemic years and reduced tooth extractions. The data suggest that changes in oral health habits, limited dental care access, and pandemic-related factors contributed to this declining trend, highlighting the pandemic's impact on dental health outcomes in the region.

The DOH-Caraga recorded data on oral abscess drainage alongside tooth extraction (Figure 6). Patients with drained abscesses increased from 84 in 2017 to 180 in 2018 but slightly decreased to 153 in 2019. Surprisingly, no cases were recorded in 2020 and 2021. The Mann-Kendall test showed a negative trend (Z- Z-value: -1.0106; p-value: 0.3122), and Sen's slope (-27.5) indicated a consistent decline in abscess drainage. The absence of cases in 2020 and 2021 may be linked to the COVID-19 pandemic. Further investigation is needed to understand the factors influencing this downward trend.

Dental Diseases

The prevalence of dental diseases, including dental caries, gingivitis, and periodontitis (Figure 7), divided by age group, sex, and specifically for

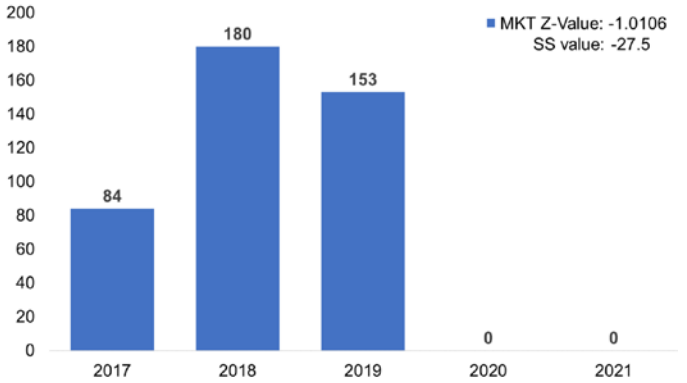

Figure 6. Cases of patients with oral abscesses drained in the Caraga Region from 2017-2021. Mann-Kendall Test (MKT) Z-Value and Sen's Slope (SS) Value.

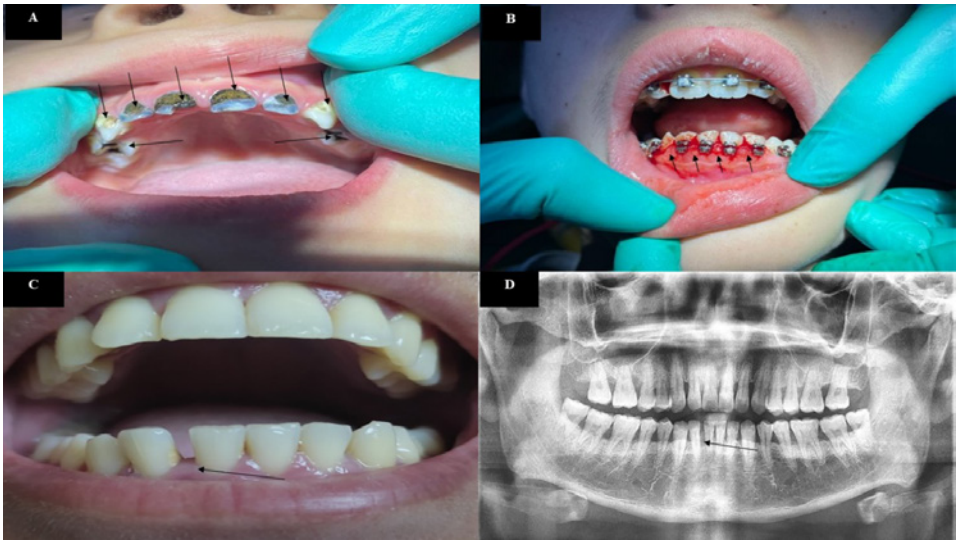

Figure 7. Some oral diseases are depicted. A. Dental Caries B. Gingivitis C. Periodontitis D. X-ray of periodontal case. Photo courtesy of JYatar and Acebu Dental Clinic.

pregnant women, are recorded over five years. By examining these graphs, valuable insights can be gained regarding the frequency and distribution of these dental ailments within different demographics, enabling a better understanding of the patterns and trends associated with these dental diseases.

Dental Caries

The data reveals a notable rise in dental caries in the Caraga Region from 2017 to 2018, followed by a sharp drop in 2019 and subsequent decreases in 2020 and 2021 (Figure 8). These findings depict a fluctuating trend in dental caries throughout the specified five-year span. The observed negative Mann-Kendall Z-value (-2.20454) provides evidence of a notable monotonic trend in the prevalence of dental caries, indicating a consistent and noteworthy decline in cases over the specified period. This downward trend in dental caries can be attributed to various influential factors, among which the COVID-19 pandemic is a significant contributor.

The dental caries cases differ across age groups from 2017 to 2021. Individuals aged nine years and below consistently had the highest number of cases, peaking in 2018 and gradually declining, reaching the lowest point in 2021 (Figure 9). This decrease may be partially linked to COVID-19 measures like lockdowns, school closures, and improved personal hygiene, potentially affecting dental care access, oral hygiene routines, and dietary habits. Comparatively, the 10-24-year-old age group had lower but significant numbers of dental caries cases, while individuals aged 25 and above consistently had the lowest numbers. These findings emphasize the vulnerability of those aged nine and below to dental caries, showing a decreasing trend during the five years, possibly influenced by the COVID-19 pandemic. Children aged nine and below are more prone to dental caries. A study by Othman et al. (2020) discovered that bottle feeding, particularly when combined with breastfeeding or extended beyond two years, increased the risk of early childhood caries (ECC).

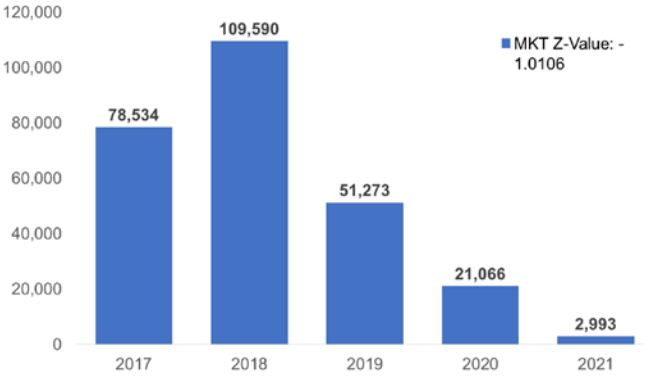

Figure 8. Cases of dental caries from 2017 to 2021 in the Caraga Region and Mann-Kendall Test (MKT) Z-Value.

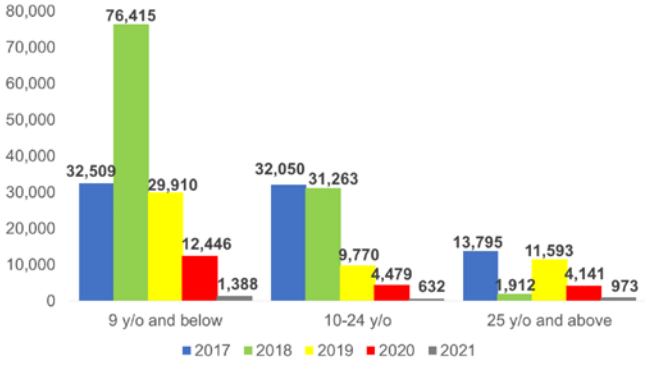

Figure 9. Cases of Dental Caries by Age Group in Caraga Region from 2017-2021.

Frequent feeding (more than six times per day) and nighttime feeding were also linked to more severe dental caries. The dental care of geriatric patients, however, is challenging and needs more attention than the dental care of younger people, as the elderly also encounter oral health problems and need serious attention (Ngwu and Fadare 2022). Coll et al. (2019) further highlight the increased vulnerability of geriatric individuals to oral infections and their associated complications. It emphasizes that chronic oral infections can lead to heart disease and malnutrition due to tooth loss. Moreover, the spread of infection to other body parts is a concern. Good oral hygiene, fluoride use, regular dental care, and appropriate antibiotic usage are underlined as preventive measures for geriatric individuals.

The number of cases fluctuates from year to year (Figure 10), and in 2018, the growth rate was significantly higher than in 2019, followed by a decline in 2020 and 2021. There is a higher prevalence of dental caries among females than among males. There was a widening gender gap in 2018 and a narrowing in subsequent years. Females consistently exhibit higher rates of dental caries than males, as Lukacs and Largaespada (2006) reported. This discrepancy can be attributed to early tooth eruption, food availability, snacking habits during food preparation, and hormonal influences during puberty, menstruation, and pregnancy.

Based on data from 2017-2021 (Figure 11), the number of dental caries cases among pregnant women fluctuated. The recorded cases in 2017 decreased in 2018 but increased in 2019. In 2020, the number decreased again, and in 2021, fewer cases were reported. The data highlights the changing trends in dental caries among pregnant women during this period. According to statistics, one in four women of childbearing age have untreated cavities, and children of mothers with untreated cavities are more than twice as likely to develop cavities. Untreated dental caries can lead to tooth decay and possible infections, negatively affecting the mother's oral health and overall quality of life (Yenen and Atacag 2019, CDC 2022).

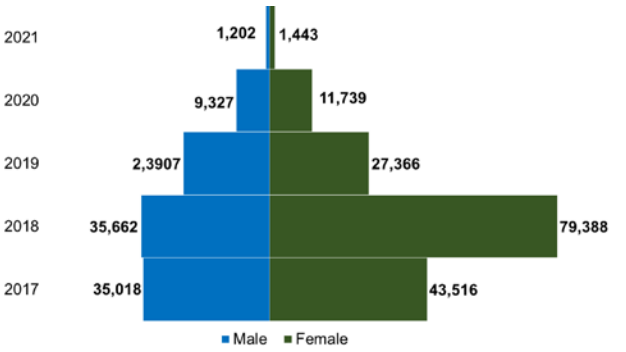

Figure 10. Comparison of Dental Caries in Males and Females in the Caraga Region from 2017-2021.

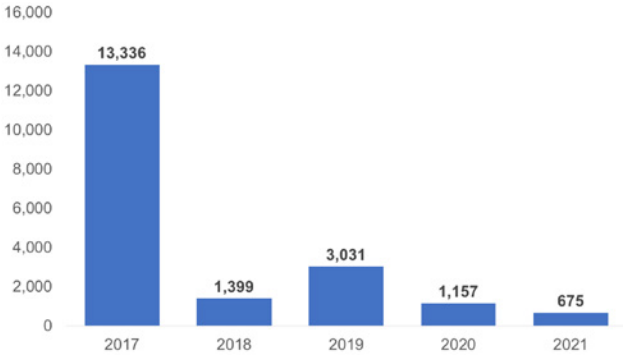

Figure 11. Dental caries cases in pregnant women in the Caraga Region from 2017-2021.

Gingivitis

Gingivitis cases decreased steadily over the five years, from 15,946 cases in 2017 to 405 cases in 2021 (Figure 12). Notably, there was a significant decline in gingivitis cases between 2019 and 2020. The Mann-Kendall Test confirms this trend, showing a negative Z-value (-2.6944), indicating a consistent decrease in gingivitis. The impact of the COVID-19 pandemic should be considered, as changes in oral hygiene practices, access to dental care, and health awareness may have contributed to the declining trend of gingivitis.

From 2017 to 2021, gingivitis cases declined across all age groups (Figure 13). However, there was an increase in gingivitis cases in 2019 among individuals aged nine and below and those aged 25 and older. Overall, the number of cases decreased in 2020 and 2021, with the most significant decline observed in the 10-24-year-old age group. Among the age groups, the 10-24-year-olds had the highest total number of gingivitis cases, followed by those aged 25 and above and those aged nine and below. Gingivitis accounted for approximately 62.9% in the 10-24-year-old group, 19.1% in the 25 and above group, and 18.0% in the nine and below group, respectively. Both males and females have experienced a general decline in cases over time. As with dental caries, gingivitis is more prevalent in females than males (Figure 14).

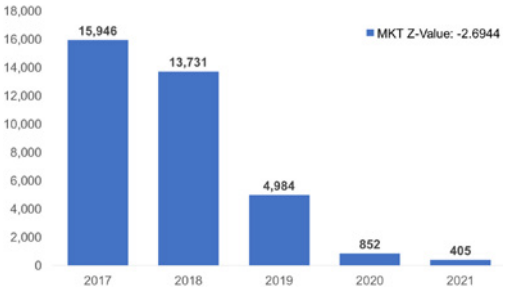

Figure 12. Gingivitis cases from 2017 to 2021 in the Caraga Region and Mann-Kendall Test (MKT) Z-Value.

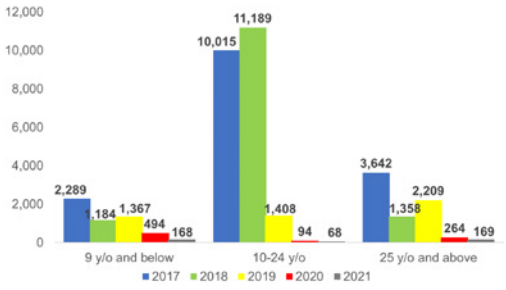

Figure 13. Cases of Gingivitis by Age Group in Caraga Region from 2017-2021.

In the study of Liu et al. (2022), insufficient adherence to proper oral hygiene routines, such as infrequent brushing and flossing, can lead to plaque buildup and bacteria proliferation, resulting in gum inflammation. Moreover, the accumulation of plaque and the formation of tartar can exacerbate gum irritation. It is crucial to promote the adoption of effective oral hygiene practices, maintain a well-balanced diet, and ensure regular dental examinations to mitigate the risk of gingivitis in children. It was also reported that a high prevalence of gingivitis (87.5%), with a higher incidence among girls (60.6%) than boys (39.5%). 58.2% of students had plaque-induced gingivitis, 67% had moderate gingival inflammation, and 64.7% had localized gingivitis among school students (Kane et al. 2018). The previous study's findings are consistent with the current results, demonstrating a higher incidence of gingivitis among females than males. This suggests that gender differences play a role in the prevalence of gingivitis cases.

The given data represents the incidence of gingivitis among pregnant women from 2017 to 2021 (Figure 15). There were 3,478 reported cases in 2017, which decreased to 715 cases in 2018. The number increased slightly to 1,035 cases in 2019 before dropping significantly to 502 cases in 2020. Finally, in 2021, there were 178 reported cases of gingivitis among pregnant women. These numbers reflect the prevalence of gingivitis as a common oral health condition experienced by pregnant women, with fluctuations observed over the years. Gingivitis, a common occurrence during pregnancy due to hormonal changes, can

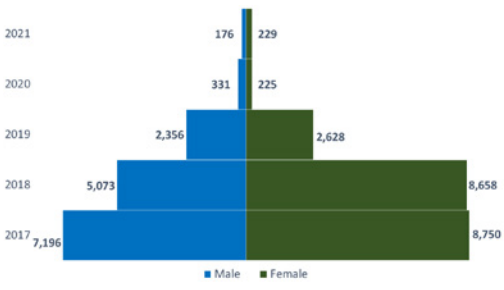

Figure 14. Comparison of Gingivitis Cases in Males and Females in the Caraga Region from 2017-2021.

progress to periodontitis if not properly managed (Rathee 2023). Proper management and prompt treatment of gingivitis are crucial to prevent its progression and minimize the risk of periodontitis.

Periodontitis

The reported cases of periodontitis exhibited a fluctuating pattern from 2017 to 2021. A total of 6,888 cases were recorded in 2017, and it significantly increased to 18,616 in 2018 (Figure 16). However, there was a sharp decline in 2019, with only 3,141 cases, followed by a minimal number of cases at 206 in 2020. In 2021, there were 366 reported cases. These figures indicate an initial rise in 2018, subsequent decreases, and a slight increase in 2021. This suggests varying levels of awareness, diagnosis, and treatment for periodontitis. It emphasizes the importance of continuous monitoring, targeted prevention, and considering public health implications to address the condition effectively.

Fluctuations across different age groups in periodontitis cases can be observed from 2017 to 2021 (Figure 17). The age groups analyzed were "9 years old and below," "10-24 years old," and "25 years old and above." In the "9 years old and below" group, there was an initial increase in cases from 2017 to 2018, followed by a decrease in 2019, a significant drop in 2020, and a slight rise in 2021. Similarly, the "10-24 years old" group experienced a gradual decrease in cases over the years, reaching a low point in 2020 and slightly increasing in 2021. Conversely, the "25 years old and above" group displayed a significant increase in cases from 2017 to 2018, a further rise in 2019, a decline in 2020, and a slight increase in 2021. The "25 years old and above" group reported the highest number of periodontitis cases, based on the provided data. In the study conducted in the Philippines by Punzalan et al. (2013), the prevalence of female smokers was found to be highest (23.2%) among those over the age of 70, followed by the 50-59 age group (15.3%). The lowest prevalence was observed among respondents in the 20-29 age group.

Periodontitis, a gum disease, affects people of all ages and is classified by gender (Figure 18). From 2017 to 2021, recorded cases increased significantly in 2017 and 2018, followed by a decrease in subsequent years. DOH Caraga

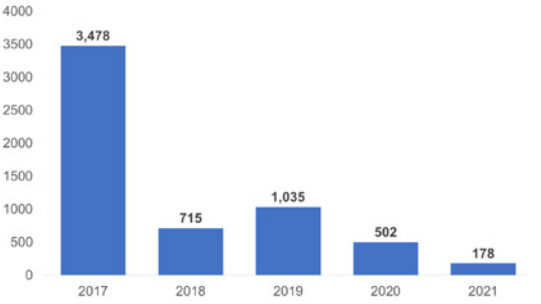

Figure 15. Gingivitis cases in pregnant women in the Caraga Region from 2017-2021.

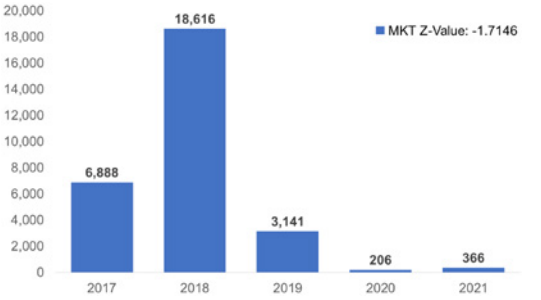

Figure 16. Periodontitis cases from 2017 to 2021 in the Caraga Region and Mann-Kendall Test (MKT) Z-Value.

reported a higher prevalence of periodontitis among females in all years. There were 18,616 cases reported in 2018, while only 206 cases in 2020. The periodontitis prevalence among pregnant women fluctuated from 2017 to 2021 (Figure 19). The numbers revealed a decline over time, with a notable decrease in recent years, indicating a changing pattern in the occurrence of periodontitis among pregnant women.

The DOH Caraga recorded a higher prevalence of periodontitis among females in all years, contradicting literature that suggests males have a higher prevalence and susceptibility to the disease. Ababneh et al. (2012) found that men have a higher prevalence of periodontitis, increasing with age. Grover et al. (2016) observed a variation in susceptibility, with males at a greater risk. Further investigation is needed to reconcile these findings. Smoking is considered the most significant risk factor for gum disease. Other factors include hormonal changes in females, certain medical conditions, medications, and genetic predisposition (Ababneh et al. 2012). Wen et al. (2023) suggest that hormonal changes during pregnancy contribute to the association between periodontal disease and adverse pregnancy outcomes, including preterm birth and low birth weight. The disruption of the fetal-placental unit caused by elevated systemic inflammation, increased periodontal pathogens, and a suppressed immune system are proposed mechanisms underlying these unfavorable outcomes.

Orally Fit Children

The data indicates a declining trend in the number of orally fit children aged nine years and below from 2017 to 2021 (Figure 20). The result shows a continuous decrease in the number of orally fit children aged nine years and below from 2017 to 2021, indicating a concerning

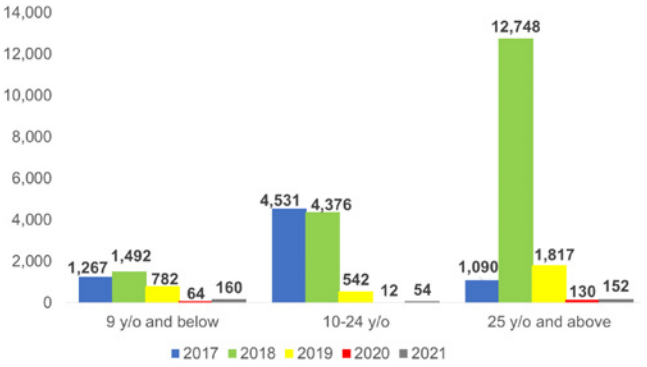

Figure 17. Cases of Periodontitis by Age Group in Caraga Region from 2017-2021.

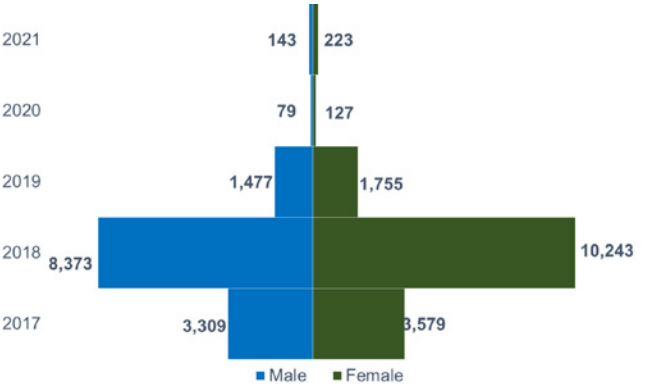

Figure 18. Comparison of periodontitis cases in males and females in the Caraga Region from 2017-2021.

decline in oral health among this age group. This highlights the need for interventions and awareness programs to improve oral health practices among young children.

Figure 21 shows the number of orally fit children aged nine years and below who underwent complete oral rehabilitation. In 2017 and 2018, 380 children received these services, indicating some access and focus on providing them, contributing to improved oral health and well-being. However, in 2019 and 2020, no children underwent complete oral rehabilitation, suggesting a lack of interventions and potential negative implications for their oral and overall health. In 2021, there was a partial resurgence, with 163 children receiving complete oral rehabilitation. Although a step in the right direction, this number is significantly lower than in previous years, underscoring the need to increase focus and access to these services for children. Policymakers

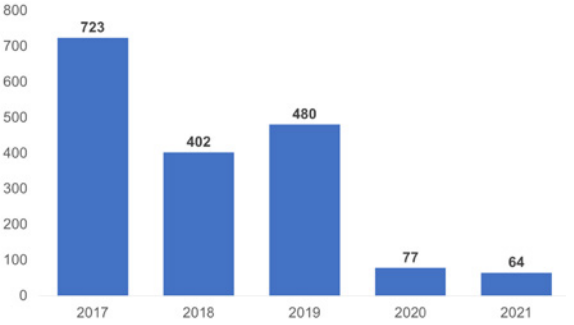

Figure 19. Periodontitis cases in pregnant women in the Caraga Region from 2017-2021.

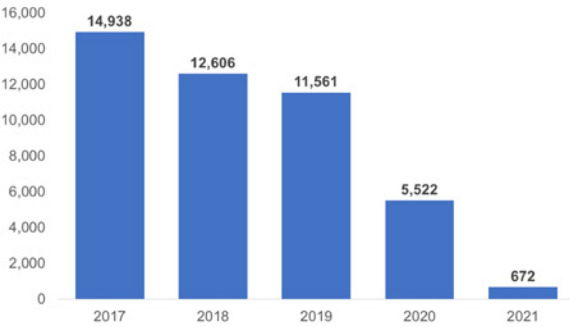

Figure 20. Report of orally fit children 9 years old and below upon oral examination in Caraga Region from 2017-2021.

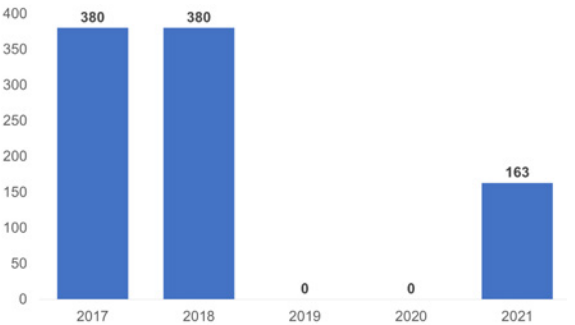

Figure 21. Orally fit children 9 years old and below upon complete oral rehabilitation in the Caraga Region from 2017-2021.

and healthcare providers must recognize the importance of such interventions and work towards ensuring their availability and affordability to all children in need to enhance their oral health and overall well-being.

In statistics, a monotonic trend refers to a consistent and structured pattern of change in a dataset over a specific period. It indicates a steady and predictable progression or regression of variable values (Raj 2014). The closure of dental clinics during the COVID-19 pandemic and the increased cost of traditional dentistry have led to declining access to dental care, particularly affecting individuals with limited financial means (Brillo et al. 2022). Consequently, many people have turned to home remedies for treating dental issues instead of seeking professional dental assistance during lockdowns (Pavithra & Anjali 2020). An analysis of Google Trends data from 2020 to 2022 reveals that Northern Mindanao, along with Western Visayas, Davao Region, Central Visayas, and Calabarzon, ranks among the top subregions with the highest searches for toothache home remedies (Brillo et al. 2022).

4 Conclusion and Recommendations

The five-year analysis of dental cases in the Caraga Region reveals noteworthy dental disease and service trends. It points to decreased gingivitis cases, fluctuating periodontitis cases, and varying outcomes in dental services. Additionally, there is a decline in oral health among children, while pregnant women exhibit a high incidence of untreated dental caries. These findings demonstrate a consistent decline in dental health, which can be attributed to the impact of the COVID-19 pandemic. The pandemic's influence on dental care and disease prevalence, whether during pandemic periods or not, necessitates reevaluating and enhancing dental care strategies. This study underscores the importance of organized and safe access to dental care services and the implementation of a robust oral health education and awareness campaign targeting vulnerable populations, specifically children and pregnant women. Furthermore, it advocates for regular dental check-ups and promoting proper oral hygiene practices. These initiatives should be tailored to address the unique needs of these groups and reduce disparities in oral health outcomes.

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Statement of Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contribution Statement

JC Yatar conducted the study, collected data, and did some analysis, and JH Jumawan conceptualized the study design, analysis, and editing. JC Jumawan and MEQ Won provided technical inputs in the writing of the article. JC Jumawan and JH Jumawan, as members of the JESEG Editorial Board, did not interfere with the review process. All authors approved the final version of the article.

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