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Review Article

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The Detection of Dental Plaque with Revealing Agents within the Context of Preventative Oral Hygiene Education Programmes

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Abstract

There is a need to examine and clarify any potential associations between the detection points for dental bacterial plaque and gender, age, socioeconomic status, body mass index, and oral health because no research have looked at these relationships. The objectives of this study were to characterise the distribution of DBP, look into and assess the variables influencing its localisation, and develop preventive measures. In a rural area of Greece, 588 public school students between the ages of 4 and 18 participated in the study. An oral health professional and a dietician, respectively, evaluated the individuals' anthropometric and oral health statuses. Chewable double-staining revealing tablets were employed to identify DBP. In conclusion, age, socioeconomic status, BMI, and oral health appear to have an impact on the identification of DBP in particular mouth regions. The detection points for DBP are not affected by gender. In order to provide more effective instruction on how to utilise oral hygiene equipment and to assess their effectiveness, disclosing agents can be employed in oral health prevention programmes.

Keywords: Dental bacterial plaque; Anthropometric; Oral health; Socioeconomic status

Introduction

It is now established that there is a significant and reciprocal association between dental health and overall human health. Protecting and fostering dental health should be emphasised and strengthened because it significantly impacts sustaining overall health and wellness. In this effort, the involvement of public healthcare providers is essential. Early oral hygiene education is very effective at educating the public, according to research. The identification and localisation of dental bacterial plaque, the primary cause of the majority of oral disorders, is a crucial component of this course. DBP, a thin, yellowish-white coating that sticks to different tooth surfaces and is made up of microbial colonies and metabolic byproducts of the oral microbial flora "Bacterial communities embedded in a self-produced matrix of extracellular polymeric compounds" is the definition of biofilm [1-5].

To prevent oral diseases, it is essential to regularly remove biofilm from different parts of the mouth cavity. This can be done by both individuals and professionals. It must first be precisely discovered in order to be effectively removed with tooth cleaning. Special dyes, namely iodine, gentian violet, erythrosine, basic fuchsin, quick green, food colours, fluorescein, and two-tone disclosing agents in the form of tablets, liquids, wafers, lozenges, or mouthwashes, can be used to correctly pinpoint biofilm. When ingested, these substances give the oral cavity where biofilm is present a coloured appearance; the strength of the colour is based on the thickness of the plaque. These disclosing agents are very useful because they (a) determine the user's oral hygiene level, (b) increase awareness of the need for biofilm removal, (c) offer individualised instructions and incentives for better oral hygiene, (d) facilitate user self-assessment, (e) measure oral hygiene effectiveness, (f) evaluate prevention and training programmes for better oral hygiene, and (g) enable studies on biofilm identification. Also, they play a crucial role in the execution of preventive dental programmes, which is especially beneficial for kids of school age. One's knowledge of the many theoretical concepts and medical phrases linked with them is facilitated by the live visualisation of the coloured surfaces of the children's teeth and tongues who take part in these activities. Also, biofilm staining enables better and more efficient supervision from healthcare instructors when it comes to the use of oral hygiene products during the experiential education of school children.

The most typical biofilm growth sites are those where it is challenging to maintain oral hygiene supplies and gain access to them. Moreover, biofilm develops in areas where the normal self-cleaning function of the tongue and saliva is ineffective for a variety of reasons. According to studies, the lateral surfaces of the tongue, "connected gingiva," and irregular areas tend to have higher concentrations of biofilm deposits.

The level of oral hygiene education and the usage of the proper equipment for a cleaner mouth directly affect the surface area of biofilm detection spots. Particularly with kids since they are easier to assimilate and maintain oral hygiene practises and behaviours, epidemiological research on biofilm identification and localization through the use of specific dyes in the mouth cavity are particularly helpful and required.

Based on the foregoing, this study's objectives were to (a) map the current situation by noting biofilm detection points, (b) research and assess the factors affecting biofilm, and (c) establish priorities for planning preventive interventions as well as for control, systematic monitoring, and evaluation of all phases of the implementation stages [6-8].

The main focus of the study was on the potential relationships between biofilm and five different variables: (1) sex; (2) age; (3) socioeconomic status; (4) body mass index; and (5) oral health status.

Age, socioeconomic status, body mass index, and/or oral health status are all thought to have an impact on the occurrence of biofilm.

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Age, socioeconomic standing, BMI, and/or state of dental health have little bearing on the prevalence of biofilm.

Material and Methods

The information was collected in a rural location in northern Greece. Students from two preschool grades, six primary grades, three middle grades, and three high school grades participated in the study, which was carried out at 14 public schools over the course of 58 sessions in the academic year 2017–2018. 58 visits were made to finish the programme. 588 schoolchildren between the ages of 4 and 18 took part in the study. As they are more susceptible to a wide range of additional health issues than the general population, children with learning difficulties and special healthcare needs were excluded from the study.

The study was carried out as part of a national programme for preventive action in schools based on the principles of good clinical practise, which is the term for the international ethical standard of high-caliber research for the planning, execution, documentation, analysis, and reporting of clinical trials. The Ministry of Education has approved the study protocol's ethical guidelines [9].

The concerned government agencies alerted the schools and asked for cooperation from the medical community. Parents received information about the programme and signed a consent form by penning their name, surname, signature, and the date, approving their children's involvement in this clinical study. Health experts with specialised training in obesity prevention, oral health disorders, and oral hygiene instruction conducted the study.

School administrators gave information on students' sex, date of birth, class, and nationality. The dates of birth and examination were used to determine the precise ages. Since foreign students in this region frequently come from migrant families from other countries who are looking for jobs in rural areas, nationality was included as a socioeconomic factor. The students' private information was not kept on file.

Using a portable seca scale and height-measuring tools, anthropometric traits were determined. Each participant's height and weight were noted, and using standardised methods, their BMI was determined as the product of their weight and squared height. Child and adolescent BMI growth curves were used for the BMI classification.

During the physical examination, general extraoral traits were assessed, including the temporomandibular joint and facial anthropometry. The relationship between dental arches, occlusion, the relationship between the transverse and anteroposterior molars, the presence of oral parafunction, and passive lip seal were among the intraoral characteristics that were assessed. Together with a thorough intraoral examination of the teeth, a somatological evaluation also includes observation of the mouth's floor, lips, tongue, palate, vestibule, and oral mucosa [10].

There are three levels of caries disease according to the commonly used decaying, missing, and filled tooth index: (a) no caries disease, (b) moderate caries disease, and (c) severe caries disease.

Without further classification, orthodontic diseases were split into two groups: (a) absence and (b) presence.

There are two types of periodontal diagnosis. Just the gingival tissues can be seen in a healthy periodontium, as evidenced by the first condition, absence. Similar tissues are characterised as having different degrees of pigmentation in other races, being stippled, and pale pink, or coral pink, and not bleeding upon probing. Moreover, healthy gingival tissue has a knife-edge margin where it touches the tooth and is firmly connected to the underlying tissues. The gingival edge is found at the cemento-enamel junction when there is no pathology. The existence of bleeding on probing with either a loss or no loss of attachment is indicated by the second category, presence.

A sterile examination package including a mirror, dental explorer, and perio-probe was used to do the dental examination. Also utilised were articulating paper, a headlight, and sterile gloves.

Two-tone disclosing agents were employed to colour the teeth. Before using the revealing agents, the teeth and gingiva were examined because the dye in question stains oral soft tissues, dental surfaces, and dental plaque, and it stays that way for several hours after usage. The presence or absence of biofilm was noted for convenience sampling without revealing its grade or amount.

On the day of the visit, the kids were instructed to wash their teeth and bring their toothbrushes. The kids were told to rinse their teeth to get rid of any food residues before the clinical evaluation. Their lips were also coated in a water-based lubricant to prevent the stain from colouring them.

The tablet was then explained to the user in detail. Youngsters were instructed to chew the tablet for 30 to 60 seconds, making sure to distribute it evenly across all of their teeth with their tongue. To promote use, the given tablets had a mild flavour.

The revealing chemicals did not penetrate the teeth's smooth surfaces. The staining was light-colored on surfaces with a relatively thin biofilm and darker and more opaque where there was a thicker biofilm, which indicated older and more resistant plaque.

Each jaw was divided into front and posterior sections for recording purposes in order to precisely read the tooth locations where the biofilm was deposited. Buccal and lingual areas made up the anterior region, whereas buccal, lingual, and occlusal areas made up the posterior region. The tongue's surface was also captured on tape.

Several responses to demographic, physical, and dental characteristics were tabulated in the biofilm detection by plaque-disclosing tablets. Effects on orthodontics and periodontal health were also looked into. To ascertain whether the rate of each answer varies over grouping levels, a likelihood ratio chi-square test was performed. Individual tests for significance between the observed and predicted results were then computed, using 0.05 as the reference level. The statistical analysis was conducted using Minitab® 18.1 and JMP 13.2.

Results

Gender was the only factor that had no discernible impact on the biofilm detection surfaces; therefore both men and women used the same amount of each type of detection surface.

Discussion

Biofilm detection spots were mapped in the current investigation. The research hypothesis on the impact of age, socioeconomic status, body mass index, and dental health on biofilm detection sites is also supported by this paper. The findings of this investigation do not support the concept that sex has an impact on the biofilm detection points.

Boys and girls did not have different biofilm detection points, according to our study. Nonetheless, sex-related disparities in oral health status have been extensively recorded throughout history and throughout cultures; these studies also revealed that the female population is more sensitive. According to bibliographical studies, these inequalities start in childhood and continue into adolescence and the years leading up to menstruation. The so-called gender gap in oral health can be partially explained by genetic variance, synergistic changes brought on by female hormones, pregnancy, and the history of women's reproductive lives, among other things.

The study's classification of age groups based on educational attainment revealed notable differences in the biofilm detection points for each group. On the higher anterior lingual and lower posterior buccal surfaces in children under the age of six, biofilm is more prevalent. This is presumably due to the lack of preventive dental instruction at this age and the inability to apply oral hygiene instruments at the inaccessible biofilm detection spots. These factors also have an impact on the disparities between elementary school and secondary school students as well as the superiority of identifying biofilm on the upper anterior lingual surface of preschool and primary school students as they gradually improve their brushing techniques. The results of our investigation cannot be compared to any pertinent literature, though.

We looked for significant variations in biofilm detection spots between immigrants and Greek schoolchildren. There are no comparable studies available, so it is impossible to compare the precise locations of biofilm in foreign pupils versus Greek schoolchildren. So it's important to take into account any potential dietary and dental hygiene disparities.

The location of dental plaque in relation to BMI is another intriguing finding from our study. Dental plaque appeared to be concentrated on the upper posterior buccal and occlusal surfaces, as well as on the lower posterior occlusal surface, in the group of overweight and obese schoolchildren. While no pertinent studies have looked at these relationships, these findings are distinctive. However, one might speculate that biofilm localization on these surfaces, where one can anticipate biofilm to be removed by "natural cleansing," may be caused by the fact that overweight and obese kids frequently swallow rather than chew their food, limiting their mouths' natural ability to self-clean. However, research linking BMI, dental hygiene, and gingivitis in schoolchildren has produced mixed results.

Conclusions

The current investigation shows that gender has no discernible influence on where dental biofilm is found. Age, socioeconomic status, body mass index, and oral health condition all appear to have an impact on the ability to identify biofilm in particular mouth regions. Whether there is dental caries or not has no bearing on the existence of biofilm on the tongue. Oral hygiene programmes in schools are necessary due to the high levels of biofilm in numerous parts of the mouth. To reduce disparities and lack of knowledge about oral hygiene, further research is necessary, coupled with the creation of public health initiatives that emphasise the significance of good oral hygiene.

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