

## INVESTIGATING THE PRESENCE AND GROWTH DYNAMICS OF DENTAL CARIES-CAUSING MICROBES IN LAHORE'S METROPOLITAN HUB

Khushbu Farva<sup>1</sup>, Huma Sattar<sup>2</sup>, Muhmmad Danish Mehmood<sup>3</sup>, Quratulaain Zohra<sup>4</sup>  
Razia Batool<sup>5</sup>, Amir Jalal<sup>6</sup>, Muhammad Aslam<sup>7</sup>  
Asif Hanif Chaudhry<sup>8</sup>, Ume Umaima<sup>9</sup> Muzammal Hussain<sup>10</sup>

<sup>1,4,5,6</sup> Sahara Medical College, Narowal

<sup>2,3</sup> University of Lahore, Lahore

<sup>7,\*8</sup> Department of Chemistry, University of Education, Lahore

<sup>9,10</sup> Department of Chemistry, Superior University, Lahore

Corresponding Author: \*

Asif Hanif Chaudhry

DOI: <http://doi.org/10.5281/zenodo.18935211>

Received  
19 September 2025

Accepted  
29 October 2025

Published  
14 November 2025

### ABSTRACT

To assess the incidence of cariogenic bacteria in dental patients based on a number of characteristics, including location and climatological factors, nutrition and diet, age, gender, socioeconomic position, genetics and family history. The Ethical Review Board Committee of the hospital gave its approval for the selection of patients who fulfilled the study's inclusion criteria. Each patient provided their informed consent. Based on the patients' age, gender, socioeconomic status, metabolic disorders, and genetic characteristics, 900 carry samples will be distributed. The frequency of oral infections, particularly those caused by cariogenic bacteria, will be evaluated for each parameter. There were 545 patients who reported having pain, with a valid rate of 60.6%. A valid proportion of 12.1% was identified in 109 patients who had bleeding gums. There were 246 patients with combined gum bleeding and pain, which equals a valid percentage of 27.3%. The patients took six different kinds of herbal medications to improve the condition of their teeth. These included aloevera, peppermint, cinnamon bark, bloodroot, caraway, and turmeric root. A total of 28 patients (3.1%) used bloodroot. A total of 14 patients (1.6%) used caraway. Cinnamon bark was used by 55 patients (6.1%). Forty-two patients (4.7%) used turmeric root. Thirteen patients (1.4%) and forty-nine patients (4.3%) utilized aloe Vera and peppermint, respectively. A total of 492 individuals, or 54.7%, had monthly dental appointments. A total of 175 patients, or 19.4% of the total, had rare dental visits. Of the overall population, 233 patients, or 25.9%, had no dental appointments. Patients' bacteria were isolated. We isolated *S. sobrinus* from twenty-three patients (28.1%). 262 patients (29.1%) had *S. mutans* isolated from them. A total of 99 patients tested positive with both *Bifidobacterium lactobacillus* and *Actinomucoe tripoli* (11%). *Propionibacterium acidifaciam* and *Eubacterium nodatum* were found in 66 patients (7.3%). There were 55 patients (6.1%) with *Terponema*. Present research discovered that neglecting oral and dental hygiene can promote the formation of cariogenic organisms, which in turn can result in dental caries. Taking good care of your teeth can help keep these dangerous bacteria from growing and promote dental health.

**Key Words:** dentistry; tooth decay; dental degradation; bacteria; SPSS

### INTRODUCTION

Preventing caries helps to maintain the teeth's structural integrity, lessen the demineralization of

the enamel, and encourage the body's natural healing process [1]. To determine the specific

factors that prevent dental caries and whether therapeutic intervention is required when dental caries occurs, a caries risk assessment is conducted. According to John Featherstone *et al.*, dental caries is linked to a number of disease markers, including "bad bacteria," "lack of saliva," and "poor eating habits." During their investigation, the researchers found that dental caries can be prevented with any of the following strategies: saliva, sealants, antibacterials, fluoride, and a well-balanced diet. One of the best strategies to prevent dental cavities is to boost the quantity of healthy bacteria in the mouth. As mentioned in the preceding part, this article explains how to inhibit dental biofilms and stop caries from developing in the mouth. Oral biofilm, a complex microbial community that resides in the oral cavity, is created by infection-causing bacteria that colonize the mouth. [4] The findings of a large body of research indicate that the proportion of cariogenic bacteria in biofilms is correlated with the variation in the amounts of pathogenic and non-pathogenic bacteria in biofilms. The formation of a toxic biofilm on teeth surfaces is one of the main causes of dental caries. Dental caries results from a long-term interaction between acid-producing microorganisms and fermentable carbohydrates, according to an increasing body of studies [6]. Apart from the impact of the oral microbiota, other host variables (such saliva and teeth) also play a part in the development of dental caries. The patient thus experiences a chronic illness that worsens gradually. Dental caries progresses and new cavities are created in large part due to the biofilm in dentistry. The complexity of the matrix, the spread of resistance genes, and the physical protection provided by EPS must all be taken into account for caries to develop. Several studies [7] indicate that the control of the dental biofilm is the crucial to halting tooth decay; further challenges include inadequate treatment retention following local delivery and the absence of a single clear focus for therapeutic intervention [8].

## Material and methods

### Study Design

A cross-sectional design was used to conduct research from September 2019 to October 2020. It was planned to include all patients who visited the dentistry department of the University of Lahore's teaching hospital as a demographic source. Patients with potential dental caries who visited a UOL dentistry clinic were given consideration to take part in the study. Patients between the ages of eighteen and seventy-one were considered for this study. Studies were recommended for patients who complained of gingival or dentinal pain or bleeding. Patients with autoimmune disorders, such as those with severe cardiac, pulmonary, or renal disease, were not exempt from complications.

### Statistical Analysis:

The data collected for this study will be studied with SPSS version 22 software and computational methods. Additionally, the Chi Square test will be used to examine the intragroup data and mean standard deviation for each group; a P-value of less than 0.005 with a 95% confidence interval is deemed significant.

### RESULTS:

About 900 patients participated in our study. The patients' minimum age was 18 and their maximum age was 70, according to descriptive analysis. With 13.38 SD, the mean age was 38.9 years. The gender distribution was also noted, with 566 male patients—or 62.9% of the total number of patients—among the female patients. There were 334 female patients overall, or 37.1% of the total number of patients. The patients firstly complained of pain and gum bleeding, with some reporting both symptoms. Patients reported experiencing pain 545 times on average, with a valid proportion of 60.6%. A valid proportion of 12.1% was identified in 109 patients who had bleeding gums. There were 246 patients with combined gum bleeding and pain, which equals a valid percentage of 27.3%.

Table 1: Symptoms of dental caries.

Initial Symptom	Frequency	Percent	Valid Percent	Cumulative Percent
Pain	545	60.6	60.6	60.6
Bleeding gums	109	12.1	12.1	72.7
Pain and bleeding gums	246	27.3	27.3	100.0
Total	900	100.0	100.0	

Among the 900 patients, 735 patients (81.7% valid proportion) had tooth brushing seen in them. There were 165 patients, or 18.3% of the total, for whom no dental brushing was performed. 545 individuals were found to have a dental flossing habit, while 355 patients did not have a dental flossing habit. 60.6% of patients used dental floss, compared to 39.4% and 100% of patients who did not use any dental floss. The amount of time spent using mouthwash on a daily, weekly, monthly, and non-existent basis was also noted. Out of the total patients, 219 tried

mouth washing daily, 273 tried mouth washing weekly, 191 patients used mouthwash monthly, and 217 patients did not use mouthwash at all. The following categories had valid percentages of 24.3%, 30.3%, 21.2%, and 24.1%.

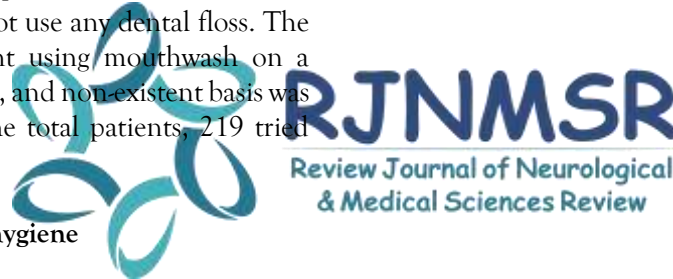


Table 2: Use of oral hygiene

Mouthwash Use	Frequency	Percent	Valid Percent	Cumulative Percent
Daily	219	24.3	24.3	24.3
Weekly	273	30.3	30.3	54.7
Monthly	191	21.2	21.2	75.9
Never	217	24.1	24.1	100.0
Total	900	100.0	100.0	

The patients' data was documented based on their usage of herbal remedies. 191 patients or 21.2% of the total, employed herbal remedies for their oral health out of 900 patients. 78.8% of the patients, or 709 out of the total, did not take herbal medications. The patients took six different kinds of herbal medications to improve the condition of their teeth. These included aloe Vera, peppermint, cinnamon bark, bloodroot,

caraway, and turmeric root. A total of 28 patients (3.1%) used bloodroot. A total of 14 patients (1.6%) used caraway. Cinnamon bark was used by 55 patients (6.1%). Forty-two patients (4.7%) used turmeric root. Aloe Vera was utilized by 13 patients (1.4%) and peppermint by 39 patients (4.3%), respectively.

Table 3: Use of herbs in treatment of dental caries.

Type of Herbal Medicine	Frequency	Percent	Valid Percent	Cumulative Percent
Bloodroot	28	3.1	3.1	3.1
Caraway	14	1.6	1.6	4.7
Cinnamon bark	55	6.1	6.1	10.8
Turmeric root	42	4.7	4.7	15.4
Peppermint	39	4.3	4.3	19.8
Aloe Vera	13	1.4	1.4	21.2
No use	709	78.8	78.8	100.0
Total	900	100.0	100.0	

For every month, 492 people, or 54.7%, saw a dentist Fig.1. A total of 175 patients, or 19.4% of

the total, had rare dental visits. Of the overall population, 233 patients, or 25.9%, had no dental appointments.

Table 4: Dental examination.

Dental Visits	Frequency	Percent	Valid Percent	Cumulative Percent
Monthly	492	54.7	54.7	54.7
Rarely	175	19.4	19.4	74.1
Never	233	25.9	25.9	100.0
Total	900	100.0	100.0	

A total number of 464 patients, ingested fast food and beverages, whereas 436 patients, did not consume any of these products. Patients'

bacterial samples were isolated Fig.2. We isolated *S. sobrinus* from twenty-three patients (28.1%).



Fig No.1: Collection of samples

262 patients (29.1%) had *S. mutans* isolated from them. A total of 99 patients tested positive with both *Bifidobacterium Lactobacillus* and

*Actinomucee Tripoli* (11%). *Propionibacterium acidifaciam* and *Eubacterium nodatum* were found in 66 patients (7.3%). There were 55 patients (6.1%) with *Terponema*.



Fig No.2: culture of bacterial strain

Table 5: Isolated Bacteria

Bacterial Isolate	Frequency	Percent	Valid Percent	Cumulative Percent
<i>Staphylococcus sobrinus</i>	253	28.1	28.1	28.1
<i>Staphylococcus mutans</i>	262	29.1	29.1	57.2
<i>Actinomyces tripoli</i>	99	11.0	11.0	68.2
<i>Bifidobacterium lactobacillus</i>	99	11.0	11.0	79.2
<i>Eubacterium nodatum</i>	66	7.3	7.3	86.6
<i>Propionibacterium acidifaciam</i>	66	7.3	7.3	93.9

<i>Terponema</i>	55	6.1	6.1	100.0
Total	900	100.0	100.0	

## DISCUSSION

In 2010, 2.43 billion individuals (or 35.3% of the world's population) suffered from dental caries, a serious oral health issue. With an estimated frequency of 80%, dental caries is a major problem among youngsters in Saudi Arabia; other high-risk regions include South Asia, the Middle East, and Latin America. In order to achieve optimal health, the World Health Organization (WHO) highlights the necessity of reducing the global burden of dental caries. Regrettably, many poor and semi-developed countries, including Saudi Arabia, are unable to meet the WHO's targets due to gaps in knowledge regarding the availability of baseline data on oral health and population-specific key modifiable variables of dental caries. Furthermore, prioritizing the related elements was necessary in order to properly direct mitigation efforts for public health due to competing interests in health care funding [10,11,12]. Patients in our study reported 545 cases of pain, representing a genuine proportion of 60.6%. Gum bleeding occurred in 109 individuals, or a valid rate of 12.1%. There were 246 patients with gum bleeding and pain overall, which translates to a valid proportion of 27.3%. The patients used six different kinds of herbal therapies to get better dental health. Among them were aloe Vera, peppermint, cinnamon bark, bloodroot, caraway, and turmeric root. Thirteen patients, or bloodroot users, were used. Caraway was consumed by 14 patients (1.6 percent). A total of 55 patients (6.1%) used cinnamon bark. Turmeric root was beneficial for 42 patients (4.7 percent). Aloe Vera was taken by 13 patients (1.4 percent) and peppermint by 39 patients (4.3 percent). A total of 492 people (54.7%) saw a dentist per month. A total of 175 individuals, or 19.4% of the total, had uncommon dental visits. A total of 233 individuals, or 25.9% of the population, did not have access to dental care. Bacteria from patients were separated. *S. sobrinus* was isolated from 253 patients (28.1%). *S. mutans* was isolated from 262 patients (29.1%). In 99 individuals, *Actinomuace Tripoli* and *Bifidobacterium Lactobacillus* were found. (11%). *Propionibacterium acidifaciam* and *Eubacterium nodatum* were isolated from 66

patients (7.3 percent). *Terponema* was found in 55 patients (6.1 %). While a number of factors that influence the socioeconomic status of the population, including parental education levels, family income, and employment position, has been linked to dental caries. Furthermore, altering socioeconomic variables necessitates laborious macro level adjustments. On the other hand, by focusing the limited resources on elementary school students, individual characteristics that contribute to cariogenesis, such as feeding practices, oral health behaviors, and dietary habits, could be modified[14,15]. Previous research showed how important it is to follow healthy oral hygiene practices, such brushing, flossing, and using mouthwash, in order to minimize disease and achieve optimal oral health. Similarly, it was commonly known that sugary foods, like candy, contributed to cariogenesis. However, due to cultural and behavioral traditions, the relative importance of the aforementioned oral behavioral determinants on cariogenesis in relation to other host factors may fluctuate dramatically throughout various groups. [16,17] People are constantly migrating across our globalized world, and certain behaviors or practices (such children preferring flavored milk to plain milk) are commonplace. Therefore, by focusing mitigation efforts on susceptible groups (such as children), knowledge of the related variables for dental caries in Saudi children benefits not just the Saudi people but also international organizations like the WHO and health authorities [18]. Enhancing baseline data and identifying population-specific risk factors of such a highly prevalent and preventable condition would advance our understanding of dental caries. A prior study in Riyadh, Saudi Arabia, sought to estimate the prevalence of dental caries in primary teeth and identify key associated factors in 6-8-year-old school children. This investigation, which included parental socioeconomic status, children's oral health behavior and practices, child feeding practices, and dietary habits, was the first in Saudi Arabia to thoroughly assess and rank factors including all four key risk areas for dental caries [19]. Furthermore, using sophisticated modeling

techniques, the relative significance of individual characteristics (as opposed to socioeconomic factors) as determinants of dental caries was evaluated [20].

It was investigated that the prevalence of cariogenic bacteria is the cause of dental caries. Pathological elements known as cariogenic microbes cause the oral milieu to become more acidic, which is directly linked to the development and progression of dental caries. *Streptococcus mutans* is recognized as the cariogenic bacterium (*S. mutans*). Nonetheless, research has shown that caries may still develop in the absence of *S. mutans*. Evaluating the presence of possibly cariogenic bacteria in the biofilm of human teeth was the goal of numerous studies. Human maxillary incisors that had been recently extracted due to dental caries were used to isolate the bacteria from the human mouth [21]. Based on their Acidogenic and Aciduric characteristics, the isolates were arranged with *S. mutans* serving as the reference strain. Four strains that might be cariogenic were chosen. Through morphological study and 16S rRNA gene sequence analysis, the selected strains were identified as *Lactobacillus sakei* (*L. sakei*), *Leuconostocmesenteroides* (*L. mesenteroides*), *Streptococcus salivarius* (*S. salivarius*), and *Streptococcus anginosus* (*S. anginosus*). [22] Analysis was done on the isolates' cariogenicity. For the first time, research links the fermented food ingredient *L. sakei* to tooth caries. The findings offer important insights into the contribution of oral commensal streptococci and lactic acid bacteria from fermented foods to dental caries. Our study also showed that food habits and eating habits are significant factors in dental caries experiences. It's interesting to note that changing patterns in milk consumption may be the cause of the correlation between flavored milk and dental caries that this study found. Even though previous observational studies don't support our findings, more research is necessary since flavored milk has a moderate cariogenic potential, as shown by a recent animal experiment, and because poorer countries may adopt this new practice. Current research work added to the growing body of evidence supporting the link between sodas and tooth caries. These soft drinks' acidic composition paired with their sugary content has been shown

to lower mouth pH and raise teeth cariogenic potential [22, 23]

#### CONCLUSION:

The frequency of oral infections, particularly those caused by cariogenic bacteria, has been evaluated for each parameter. There were 545 patients who reported having pain, with a valid rate of 60.6%. A valid proportion of 12.1% was identified in 109 patients who had bleeding gums. There were 246 patients with combined gum bleeding and pain, which equals a valid percentage of 27.3%. The patients took six different kinds of herbal medications to improve the condition of their teeth. These included aloe vera, peppermint, cinnamon bark, bloodroot, caraway, and turmeric root. A total of 28 patients (3.1%) used bloodroot. A total of 14 patients (1.6%) used caraway. Cinnamon bark was used by 55 patients (6.1%). Forty-two patients (4.7%) used turmeric root. Thirteen patients (1.4%) and forty-nine patients (4.3%) utilized aloe vera and peppermint, respectively. A total of 492 individuals, or 54.7%, had monthly dental appointments. A total of 175 patients, or 19.4% of the total, had rare dental visits. Of the overall population, 233 patients, or 25.9%, had no dental appointments. Patients' bacteria were isolated. We isolated *S. sobrinus* from twenty-three patients (28.1%). 262 patients (29.1%) had *S. mutans* isolated from them. A total of 99 patients tested positive with both *Bifidobacterium Lactobacillus* and *Actinomyces Tripoli* (11%). *Propionibacterium acidifacium* and *Eubacterium nodatum* were found in 66 patients (7.3%). There were 55 patients (6.1%) with *Terponema*. Our research discovered that neglecting oral and dental hygiene can promote the formation of cariogenic organisms, which in turn can result in dental caries. Taking good care of your teeth can help keep these dangerous bacteria from growing and promote dental health.

Poor dental and oral hygiene can encourage the growth of cariogenic organisms, which in turn can lead to dental caries, according to our research. Maintaining good oral hygiene can help stop the spread of these harmful microbes and improve dental health in general.

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