

Studying Some Factors Affecting in Gingivitis Caused by *Staphylococcus aureus*

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ABSTRACT

This study was performed to isolate and identify the *Staphylococcus aureus* which is associated with dental caries and periodontal disease in patients aged between (15-70) years old from both gender. All patients have no antibiotic for three days at least to state the relationship between gender, smoking, miswak, toothpaste, milk and sugar with black tea. The results show that smoking and miswak are the most influence factors under study on *Staphylococcus aureus* infection in both genders. The percentage of *S. aureus* was isolated with 71% from males and 29% from females, 77% of them were nonsmoker 10% smoke little and 13% smoke much and 97 % of them were nonmiswak users, 3% use it little. 35% of them were non toothpaste users and 52% use it little while 13% use it much. 55% of them didn't drink milk at all, 6% drink little and 39% drink it much. 32% of them drink black tea without sugar, 36% use it little and 32% use much sugar. Erythromycin shows biggest inhibition zone with Methicillin resistance *S. aureus* that also sensitive to Azithromycin, but it was resistance to Gentamycin, Oxacillin, Tetracycline, and Trimethoprim.

Keyword: *Staphylococcus aureus*, Gingivitis, antimicrobial activity, Dental caries.

INTRODUCTION

Dental caries refers to the localized destruction of susceptible dental hard tissues by acidic by-products from the bacterial fermentation of dietary carbohydrates. In most of the people, this is a chronic disease that progresses slowly, which results from an ecological imbalance in the equilibrium between oral biofilms (plaque) and tooth minerals^{1,2}. The dental caries is a result from acid producing bacteria and fermentable carbohydrate and many host factors that include teeth and saliva will cause. Other factors like sugars, the form of food or, the duration of exposure, nutrient composition, sequence of eating, salivary flow, presence of buffers, and oral hygiene fluid which have effect on the caries process across the life span³. In the caries include many diverse of facultatively and obligately-anaerobic bacteria which include the genera the *Bifidobacterium*, *Actinomyces*, *Lactobacillus*, *Eubacterium*, *Rothia* and *Parvimonas*⁴. It can also be caused by *Propionibacterium*, *Fusobacterium*, *Pseudoramibacter*, *Prevotella*, *Selenomonas*, *Scardovi*, *Enterococcus faecalis*, *Thiomonas*, *Dialister*, *Veillonella Atopobium* *Leptotrichia*, and *Granulicatell* these types considered members of the mitis, salivarius and anginosus groups of streptococci^{5,6}.

On the other hand staphylococci are considered members of the transient oral microbial and are rarely isolated from the oral cavity, *Staphylococcus* spp. are not usually isolated from the oral cavity, and considered to be opportunistic bacteria in the oral cavity, there was no significant differences in the frequency of isolation or

numbers of staphylococci isolated from healthy and diseased sites of subgingival. In periodontitis patients *Staphylococcus epidermidis* was the most abundant one that was isolate and characterized of subgingival staphylococci^{7,8}. In another study *S.auricularis* followed by *S.epidermidis*, were the most frequently species that statistically show no significant difference between the frequencies of these species that isolated either from the healthy and the diseased sites⁹.

In saliva the frequency of staphylococci isolation was (83.9%) while in dental plaque was (73.2%) with a total of nine different *Staphylococcus* species identified. The most frequently isolated species in saliva were *S. aureus* (46.4 %) and *S.epidermidis* (41.1%) followed in order by *Staphylococcus hominis*, *Staphylococcus warneri*, *Staphylococcus intermedius*, *Staphylococcus capitis* and *Staphylococcus haemolyticus* (12.5-7.1%). *Staphylococcus gallinarum* and *Staphylococcus lugdunensis* were rarely isolated with (1.8%) for each. Although *S. epidermidis* (60.7%) was more dominant than *S. aureus* (33.9%).The frequency of staphylococcal species that isolated from saliva was similar to that of dental plaque from¹⁰.

The series of side effects in the mouth like dryness, undesirable taste, and burning sensation disadvantage for patients to use mouth wash¹¹.

MATERIALS AND METHODS

Staphylococcus aureus Isolation

Staphylococcus aureus isolate as¹² mention, by taking (100) swabs from patients suffering from dental diseases

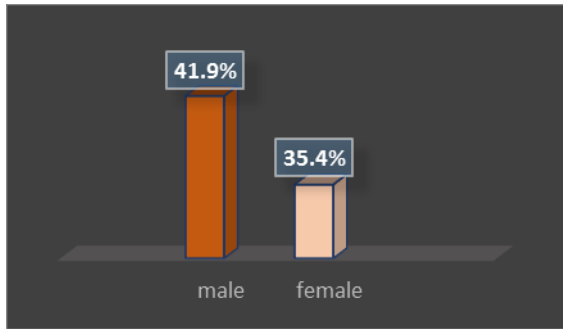


Figure 1: Relationship between infection and gender

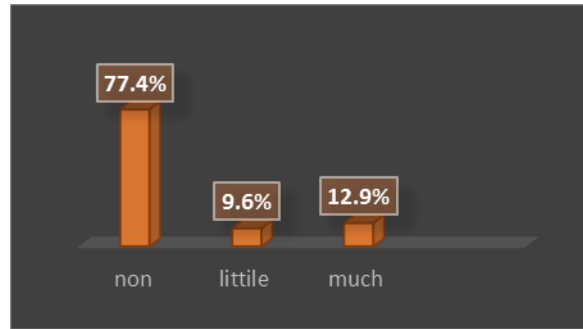


Figure 2: Relationship between infection and smoking

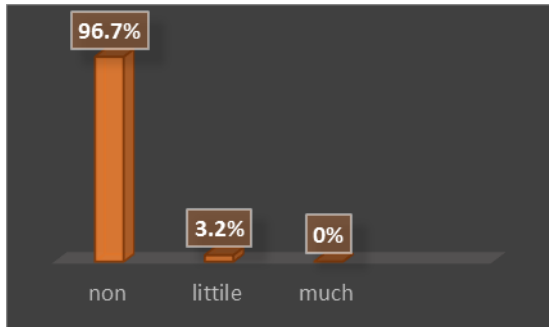


Figure 3: Relationship between infection and Miswak

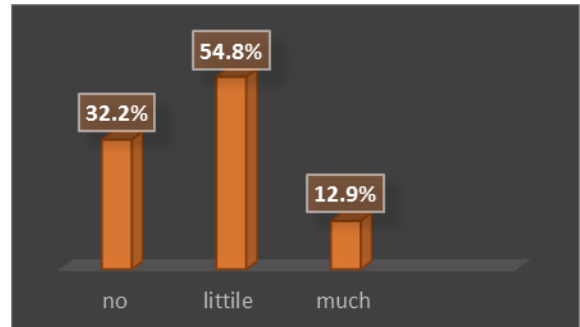


Figure 4: Relationship between infection and toothpaste

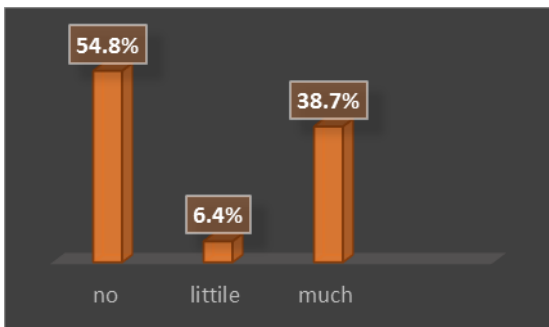


Figure 5: Relationship between infection and milk

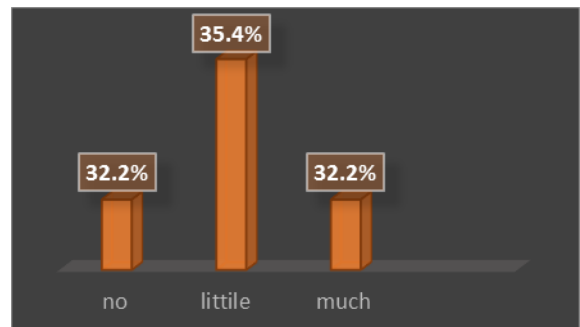


Figure 6: Relationship between infection and sugar in tea

Table (1): LSD Values for the Factors in The Study

Factor	Groups I-J	Mean	Mean Difference I-J	L.S.D _t Value	Sig.
Smoking	None	1.31-1.22	0.09	-0.988	0.244
	Little	1.22-1.31	-0.09		
	Much	1.57-1.31	*0.26		
Miswak	None	1.31-1.50	-0.19	-2.335	0.404
	Little	1.50-1.31	*0.19		
	Much	1.00-1.31	-0.31		
Teeth paste	None	1.27-1.31	-0.04	2.78	0.520
	Little	1.31-1.27	0.04		
	Much	1.42-1.27	0.15		
Milk	None	1.29-1.37	-0.08	3.631	0.297
	Little	1.37-1.29	0.08		
	Much	1.00-1.29	-0.29		
Sugar in tea	None	1.48-1.27	0.21	2.15	0.383
	Little	1.27-1.48	-0.21		
	Much	1.26-1.48	-0.22		

* Significant difference

and periodontal diseases (75) swabs were taken males and (25) females, who admitted to consultant unit of the collage of dentistry in Karbala university and also to consultant special center of dentistry in Al-Hur city, during a period extending from (1-28) February 2016.

Evaluation the Bactericidal Activity of Predisposing

Statistical analysis was performed using SPSS statistical computer software (version 14), person and spearman correlation test were used to investigate relationship between the parameters. $P < 0.01$ was considered statistically significant. The significant differences were determined by using (LSD) at the 0.01 or 0.001 level.

Table 2: Inhibition Zone for *S. aureus* by Antibiotics.

Antibiotics	Erythromycin	Gentamycin	Azithromycin	Oxacillin	Tetracycline	Trimethoprim
Bacterial Sample						
X ₁	33 mm	R	25 mm	R	R	R
X ₂	33 mm	R	25 mm	R	R	R
X ₃	32 mm	R	26 mm	R	R	R
X ₄	34 mm	R	26 mm	R	R	R
X ₅	33 mm	R	26 mm	R	R	R
X ₆	33 mm	R	25 mm	R	R	R
X ₇	32 mm	R	26 mm	R	R	R
X ₈	34 mm	R	26 mm	R	R	R
X ₉	31 mm	R	26 mm	R	R	R
X ₁₀	32 mm	R	25 mm	R	R	R
X ₁₁	34 mm	R	26 mm	R	R	R
X ₁₂	33 mm	R	26 mm	R	R	R
X ₁₃	32 mm	R	25 mm	R	R	R
X ₁₄	34 mm	R	26 mm	R	R	R
X ₁₅	34 mm	R	25 mm	R	R	R
X ₁₆	33 mm	R	27 mm	R	R	R
X ₁₇	33 mm	R	27 mm	R	R	R
X ₁₈	32 mm	R	27 mm	R	R	R
X ₁₉	32 mm	R	27 mm	R	R	R
X ₂₀	34 mm	R	26 mm	R	R	R
X ₂₁	34 mm	R	26 mm	R	R	R
X ₂₂	33 mm	R	25 mm	R	R	R
X ₂₃	33 mm	R	27 mm	R	R	R
X ₂₄	32 mm	R	26 mm	R	R	R
X ₂₅	34 mm	R	26 mm	R	R	R
X ₂₆	32 mm	R	26 mm	R	R	R
X ₂₇	33 mm	R	27 mm	R	R	R
X ₂₈	34 mm	R	26 mm	R	R	R
X ₂₉	33 mm	R	26 mm	R	R	R
X ₃₀	33 mm	R	26 mm	R	R	R
X ₃₁	34 mm	R	27 mm	R	R	R
Average (mm)	33 mm	R	26 mm	R	R	R

Factors Which Including:

Smoking, miswak, toothpaste, milk and sugar with black tea for both genders.

Antibiotics Susceptibility Test by Discs Method

It was used antibiotics sensitivity test by discs method for *S.aureus* as remanded in¹³, by using antibiotic disc which include Erythromycin (E 15 µg/ml), Gentamycin (CN 10 µg/ml), Azithromycin (AZM 15 µg/ml), Oxacillin (OX 30 µg/ml), Tetracycline (TE 30 µg/ml) and Trimethoprim (TMP 5 µg/ml). *S.aureus* isolates cultured on Mueller-Hinton agar then discs of antibiotic were placed on surface of agar. The dishes were incubated at 37 °C for 24 hours. The results were based on diameter of inhibition zone around the disc.

Statistical Analyses

RESULTS AND DISCUSSION

The samples were collected from 100 patient with gingivitis (75) male and (25) female. The results of identification show that only 31 identified as *S. aureus* with 31% percentage, 13 for males with 41.9%, and 11 for female with 35.4% have *S. aureus* infection. (Fig. 1) Non-smokers are more likely to have *Staphylococcus aureus* infections, it was found that infection with *S. aureus* was (24) with (77.4) %, while smokers people and smokes little are less exposed to infection, (4) with (12.9)% percentage, and (3) with (9.6)% respectively (Fig. 2). Nicotine has numerous detrimental effects on periodontal cells. In vitro, nicotine has been shown to inhibit gingival fibroblast growth and production of fibronectin and collagen, which are necessary building

Table 3: the effect of predisposing factors on *S. aureus*.

bacteria factors	Smoking	Miswak	Toothpaste	Milk	Tea with sugar
<i>S. aureus</i>	- 0.352	- 0.117	**0.487	0.321	- 0.88

** Significant difference at the 0.01 level.

blocks to a healthy periodontium. Nicotine also promotes collagen breakdown¹⁴. Also found that (30) with (96.7) % of them were non-miswak users, and (1) with (3.2) % use it little, while people that used regularly are less exposed to infection, according to the percentages (0)% (Fig.3). Miswak have a broad antimicrobial activity not only against *Staphylococcus aureus*, but also gram positive and gram negative bacteria the study including *Escherichia coli*, *Lactobacillus acidophilus*, *Streptococcus mutans* and *Pseudomonas aeruginosa*; the results show a strong antimicrobial activity in the aqueous extract and less activity in alcoholic and nonpolar extracts¹⁵, while the using of toothpaste against *Staphylococcus aureus* show the minimum percent of infection was related with much use of toothpaste, while the maximum was with little use of it, as the result was, (10) with (32.2)% of them were non toothpaste users and (17) with (54.8)% use it little, while (4) with (12.9)% use it much (Fig. 4). The misuse of toothbrush in terms of the storage area and period of use as stated¹⁶ that the toothbrush is a tool to pollution teeth if they did not use it improves¹⁷. The results showed that people who do not drink milk are more likely to have *Staphylococcus aureus* infections, and *S.aureus* had not been effected by drinking milk regularly, as the result shows that (17) with (54.8)% of them do not drink milk at all, (2) with (6.4)% drink little and (12) with (38.7)% drink it much (Fig. 5). That may be caused by the *Lactobacillus* that found in milk which produce lactic acid that do not inhibit the growth of *S. aureus* as *S. aureus* have the ability to ferment lactic acid aerobically and this result match with result for Darsanaki *et al.*, 2012¹⁸, which found that *lactobacillus* species have antibacterial activities against *S.aureus*, *Salmonella typhimurium* and *Escherichia coli*. The results showed that people who use a lot of sugar with black tea are more likely to have *Staphylococcus aureus* infections, while infection with *S. aureus* had not been effected by drinking tea with or without sugar as shown, (10) with (32.2)% of them drink black tea without sugar, (11) with (35.4)% use it little and (10) with (32.2)% use much sugar (Fig. 6). Table (1) showed significant difference at $p < 0.01$, for the effect of 5 types of predisposing factors including: smoking, miswak, teeth past, milk and tea with sugar, and by using (LSD), it was found the third group of smoking much, was the most influential in the infection, as the results show the mean differences for no, little and much smokers were (0.09), (-0.09) and (0.26) respectively, which is greater than the value of LSD under the level of significance (0.244), but the preference one was for smoking much. This result followed by the second group of miswak little use, which was the most influential in the infection, as the results show the mean differences for no, little and much miswak users were (-0.19), (0.19) and (-

0.31) respectively, which is greater than the value of LSD under the level of significance (0.404), therefore the preference one was for miswak little user. On the other hand, the mean differences between the three groups, for milk, toothpaste and sugar with tea was less than the value of LSD under the level of significance (0.00), which indicates there is no significant differences between these factors and the infection. The all (31) samples of *S. aureus* show sensitivity for the antibiotics of Erythromycin with Methicillin resistance and Azithromycin with the average of inhibition zone was (33 mm) and (26 mm) respectively, while show the resistance for Gentamycin, Oxacillin, Tetracycline and Trimethoprim as shows in table (2). In compered with result for Salih *et al.*,¹⁹, which found that *S. aureus* was resistant to tetracycline, Trimethoprim and oxacillin, while sensitive gentamycin. In other study *S. aureus* shows sensitivity to oxacillin, gentamicin, and tetracycline²⁰.

CONCLUSIONS

The result showed that people non-smoker, non-miswake user, those who do not drink milk and who use a lot of sugar with black tea, are more likely to have gingivitis, while the maximum of *S. aureus* was percent with little use of toothpaste. In conclusion this study at $p < 0.01$ significant difference that the little use of toothpaste was the most effect factor from other predisposing factors in *S. aureus* that may cause gingivitis, table (3).

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