

Research Article,

Is There Any Association between Oral Hygiene and the Development of Tonsillitis or Tonsillar Hyperplasia

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Abstract:

Background: The number of recurrent tonsillitis and tonsillar hyperplasia requiring tonsillectomies, annually is huge. Poor oral hygiene has been linked with the occurrence of these tonsillar diseases.

Objective: To determine the association between poor oral hygiene and tonsillitis and/or tonsillar hyperplasia.

Methodology: This was a study of association between oral hygiene and tonsillitis and/or tonsillar enlargement determined by correlating the Oral hygiene index scores (OHIS) and Decay Missing and Filled Teeth (DMFT) of subjects with complaint of sore throat with development of tonsillitis or tonsillar hyperplasia. A corresponding number of subjects with no symptoms of sore throat were used as control.

Results: A total of 80 subjects with sore throat were recruited into the study, comprising 49(61.3%) females and 31(38.7%) males with age ranging from 16 to 32 years. The control group comprised 45(56.3%) females and 35(43.7%) males with age ranging from 16 to 48 years.. OHIS of the test group was poorer than that of the control. Erythema (redness) of the tonsil was significantly correlated with OHIS in the test group but not in the control.

Conclusion: Poor oral hygiene seems to have an association with tonsillar infection and so the, otolaryngologists managing tonsillar infection should consider inter-disciplinary approach in the management of tonsillar diseases.

Keywords: Oral hygiene, Tonsillitis, Tonsillar hyperplasia

Tonsils and all other epithelium-lined interface surfaces of the body are exposed to colonization by a wide range of microorganisms.¹ In general, the establishing macrobiotic live in harmony with the host because constant renewal of the surfaces by shedding prevents the accumulation of large masses of microorganisms.² In the mouth, however, teeth provide hard, non-shedding surfaces for the development of extensive bacterial deposits. This accumulation (plaque) or

its calcified form, calculus, around the teeth is an indicator of poor oral hygiene, and has been designated as the primary cause of caries, gingivitis and periodontitis.³ These oral lesions are considered as reservoirs for the systemic spread of bacterial antigens, gram-negative bacteria, cytokines, and other proinflammatory mediators that cause infections in other parts of the body, and especially in a contiguous structure like the tonsils.⁴ Studies have shown that poor oral

hygiene could predispose to various diseases within and outside the oral/oropharyngeal cavity.⁸ Priyadharshini *et al.*⁹ reported a case of tonsillar actinomycosis that was possibly due to infection from actinomycosis normally found in dental plaque.⁹ Similarly, Georgalas *et al.*¹⁰ reported a positive association between poor oral hygiene and tonsillar infection while examining 158 subjects in their prospective study.¹⁰ However, a study by Eryaman *et al.*⁷ did not find any significant association between poor oral hygiene and tonsillar hypertrophy. The association between oral hygiene and tonsillar diseases is therefore still not very clear. This study was therefore aimed at determining the association between poor oral hygiene and tonsillitis and/or tonsillar hyperplasia

Methodology

This was a study of association between oral hygiene and tonsillitis and/or tonsillar enlargement carried out at both the dental and otolaryngology clinics, Babcock University Teaching Hospital, Ilishan-Remo, Ogun State. Ethical Approval for the study was obtained from the Health Research Ethics Committee of the Babcock University and written informed consent (Appendix I) was also obtained from all the subjects before inclusion in the study. Sample size was determined using figures from a similar study by Georgalas *et al.*¹⁰ Eighty subjects with complaint of sore throat that presented to the otolaryngology clinic of Babcock University Teaching Hospital, within August 2016 and March 2017 and that satisfied the selection criteria were recruited into the study.. The selection criteria included subjects without craniofacial anomalies and no systemic or immune-comprising disease. Exclusion criteria were subjects that have had adenotonsillectomy, or with systemic or immunocompromising diseases or that decline consent. A corresponding number of subjects with no symptoms of sore throat and that satisfied the selection criteria were recruited from the dental clinic to serve as the control Age, gender, history of ENT visits, side of the affected tonsil (right/left), presence/absence of symptoms/signs of tonsillitis and/or tonsillar hyperplasia like tonsillar erythema, tonsillar stone, tonsillar discharge and tonsillar tenderness/pain were documented (appendix II). Oral hygiene status was assessed by using oral hygiene index simplified (OHI-S) as described by Greene and

Vermilion¹¹ and validated by Eryaman *et al.*⁷ and also with the use of DMFT (Decay Missing and Filled Teeth) as described by WHO.¹² Tonsil sizes were evaluated by using the Brodsky L. Scala grading scale.¹³ and validated by Zaid.¹⁸ The resulting OHI-S were grouped into ‘good’ 0.0 to 1.2, ‘fair’ 1.3 to 3.0 and ‘poor’ 3.1 to 6.0. Statistical analysis was done with the use of SPSS 20. Mean and standard deviation was calculated for Age, gender, DMFT, OHI-S and tonsillar sizes. Spearman correlation was used to compare the means of OHI-S and DMFT with those of tonsillar variables with ≤ 0.05 taken as statistical significance.

Results

A total of 80 subjects that complained of sore throat were recruited into the study, comprising 49(61.3%) females and 31(38.7%) males with age ranging from 16 to 32 years. The 80 subjects used as control comprised 45(56.3%) females and 35(43.7%) males with age ranging from 16 to 48 years. In the test group, 73(91.3%) have had sore throat before, of which 44(55%) have only experienced less than three episodes of sore throat in the last one year, while in the control group, 66(82.5%) have had sore throat before, of which 53(66.3%) have had less than 3 episodes in the last one year. (Table 1)

Table 1: Number of episodes of sore throat in the test group

Variable	Test	Control
Sore throat	Frequency (%)	Frequency (%)
Less than 3 times	44 (55)	53 (66.3)
3 - 4 times	14 (17.5)	14 (7.5)
5 - 6 times	12 (15)	12 (15)
7 - 8 times	3 (3.8)	0 (0)
9 - 10 times	1 (1.3)	1 (1.3)
More than 10 times	6 (7.5)	0 (0)
	Total 80 (100)	80 (100)

There were 18(23%) subjects that had erythema on either one or both tonsils in the test group while 4 subjects had a similar issue in the control group. Tonsillar pus discharge, tonsillar stone and tonsillar tenderness occurred in 5(6.3%), 2(2.5%) and 14(17.5%) of the subjects in the test group respectively while none (0%) was seen in the control (Table 2

Table 2: Tonsillitis variables in test and control groups

Variables	Test	Control
Tonsillar Erythema	Frequency (%)	Frequency (%)
Only right yes	5(6.3)	3(3.8)
Only left yes	1(1.3)	1(1.3)
No for both sides	62(77.5)	76(95)
Yes for both sides	12(15)	0(0)
Total	80(100)	80(100)
Tonsillar Discharge		
Only right yes	2(2.5)	0(0)
Only left yes	1(1.3)	0(0)
No for both sides	75(93.8)	80(100)
Yes for both sides	2(2.5)	0(0)
Total	80(100)	80(0)
Tonsillar Stone		
Only right yes	1(1.3)	0(0)
Only left yes	1(1.3)	0(0)
No for both sides	75(97.4)	80(100)
Yes for both sides	0(0)	0(0)
Total	80(100)	80(0)
Tonsillar Tenderness		
Only right yes	3(3.8)	0(0)
Only left yes	2(2.5)	0(0)
No for both sides	66(82.5)	80(100)
Yes for both sides	9(11.3)	0(0)
Total	80(100)	80(100)

Oral hygiene index scores (OHIS) of the subjects in the test group range from 0 to 4.0, a mean value of 0.67 ± 0.83 , with majority, 61(76.3%) being good, and DMFT scores range from 0 to 6 a mean value of 0.51 ± 1.19 , with majority, 70(87.5) having less than 2, while the summation of tonsillar enlargement of both sides ranges from 2 to 8, majority having grade 1 on either side.

Similarly, in the control group, **OHIS range from 0 to 2.2, a mean value of 0.57 ± 0.58** , with majority 71(88.8%) in 'good' category and **DMFT scores range from 0 to 2, a mean value of 0.51 ± 1.19** with the majority 77(96.3%) having less than 2 score, while the tonsillar size (right and left) ranges from 2 to 6 (absence of 8), majority 68(85%) being 2. (Table 3)

Table 3: Oral hygiene index scores in test and control groups

Variables	Test	Control
OHIS	Freq (%)	Freq (%)
Good	61 (76.3)	71(88.8)
Fair	17 (21.3)	9(11.3)
Poor	2 (2.4)	0(0)
Total	80 (100)	80(100)
DMFT		
Less than 2	70(87.5)	77(96.3)
2	5(6.3)	3 (3.8)
3 – 6	4(5.0)	0 (0)
7 – 10	1(1.2)	0 (0)
Total	80(100)	80(100)
Tonsillar grading (right size + left size)		
2	48(60)	68(85)
3	1(1.3)	1(1.3)
4	20(25)	9(11.3)
5	1(1.3)	0(0)

6	7(8.8)	2(2.5)
8	3(3.8)	0(0)
Total	80(100)	80(100)

In the test group, the association between OHIS and tonsillar erythema is positive and significant ($p = 0.044$). The association between DMFT and tonsillar erythema is however, negative and

insignificant ($p = 0.513$). The correlation of both OHIS and DMFT with tonsillar hyperplasia is also not significant ($p > 0.05$) (Tables 4, 5 and 6)

Table 4: Association between OHIS and tonsillitis variables

Variables	Test		Control	
	Correlation	p value	Correlation	p value
OHIS (0.57 ± 0.58)				
Tonsillar erythema	0.226	0.044	-0.032	0.775
Tonsillar discharge	-0.124	0.275	n/a	n/a
Tonsillar stone	0.061	0.589	n/a	n/a
Tonsillar tenderness	-0.047	0.677	n/a	n/a

Table 5: Association between DMFT and tonsillitis variables

Variables	Test		Control	
	Correlation	p value	Correlation	p value
DMFT (0.51 ± 1.19)				
Tonsillar erythema	-0.074	0.513	0.055	0.630
Tonsillar discharge	-0.185	0.100	n/a	n/a
Tonsillar stone	0.066	0.562	n/a	n/a
Tonsillar tenderness	0.108	0.340		

Table 6: Association between OHIS/ DMFT and tonsillar hyperplasia

Variables	Test		Control	
	Correlation	p value	Correlation	p value
OHIS and Tonsillar hyperplasia	0.043	0.707	0.502	0.001
DMFT and Tonsillar hyperplasia	0.014	0.903	-0.025	0.826

Discussion

It has been shown that poor oral hygiene could predispose to various diseases within and outside the oral/or pharyngeal cavity.⁸ Such diseases include cardiovascular disease, diabetes mellitus, preterm low birth weight, and osteoporosis.^{14, 15} In contrast, outcome of studies on association between poor oral hygiene and tonsillitis or tonsillar hypertrophy has been equivocal, however, in some studies, significant relationship seen could be adduced to the presence of poor oral hygiene.^{7, 10} In our study, the oral hygiene scores of the test group was poorer than those of the control group and this significantly ($p < 0.05$) correlated with the presence of erythema on the tonsils. This would suggest that the poorer the oral hygiene, the likelier the presence of erythema or redness which is a sign of inflammation of the

tonsils. Opportunistic pathogens have been known to be detected from saliva, dental plaque, and tonsil¹⁶ and on this precept, Georgalas¹⁰ in 2002, showed that an overlapping of species of organisms involved in periodontitis and peritonsillar infection occurs. Further researches by Hakuta et al.¹⁷ and Zaid¹⁸ were able to culture the same species of microorganisms in both the dental plaque and tonsillar crypt and therefore suggest that oral biofilm like dental plaque may be a reservoir for pathogens involved in tonsillar infection.^{17, 18} Our study is therefore in agreement with these studies. Decay Missing and Filled Teeth, another marker of poor oral hygiene was higher in the sore throat group than in the control group but this was not statistically significant ($p > 0.05$). This might not be unexpected because DMFT is an index that indicates past oral hygiene

practices as it takes time for caries to develop.¹⁹ However, no significant association was seen when this was correlated with the number of past episodes of sore throat in the last one year. This result seems to be in agreement with that of Eryman ET al.⁷ that also used DMFT as part of the denominator of oral hygiene but in disagreement with that of Zaid.¹⁸ This two studies are similar with ours in that tonsillar hypertrophy or chronic tonsillitis were the study focus. Kerekawauchi et al.¹⁶ provided an explanation into why tonsillar infection may occur in the absence of hypertrophy in that protein-specific immunoglobulin A (iga) and immunoglobulin G spot-forming cells were found to be increased in patients with tonsillitis, usually caused by Streptococcus Pyogenes compared to patients with tonsillar hypertrophy.¹⁶ The assumption is that oral bacteria like Streptococcus Mutans and

Streptococcus Sobrinus, may induce this immunologic process in the tonsils.¹⁶ Further research by Fukuizumi et al.²⁰ found out that caries incidence decreased because of increased Ig A against the oral bacteria.²⁰ This could partly explain the association between tonsillar diseases, OHIS and DMFT in our study. The poorer the oral hygiene, the more the tonsillar erythema, the more the antibodies against caries-causing bacteria, and the lower the caries index and DMFT.

In conclusion, Poor oral hygiene seems to have an association with tonsillar infection and so the otolaryngologist managing tonsillar infection should consider inter-disciplinary approach in the management of tonsillar diseases and one can also speculate that the treatment of poor oral hygiene could have a prophylactic effect against tonsillar infection.

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APPENDIX I (INFORMED CONSENT)

The title of this research work is “Effect of oral hygiene on development of tonsillitis/tonsillar hyperplasia.

The purpose of this study is to determine the relationship between poor oral hygiene and tonsillitis or tonsillar hypertrophy. It is also to determine if past dental hygiene practices evident by DMFT could be used as markers for the development of tonsillar hypertrophy or tonsillitis.

The outcome of this research will help in enlightening the society on the need to maintain a good oral hygiene and healthy dentition so as to prevent the development of tonsillar disease and its attendant economic burden.

Should you decide not to continue with the research for any reason, be rest assured that you will not in any way be penalized. You are very free to withdraw at any stage of the research if you so wish as there is no conflict of interest of whatsoever. You are however, assured that your response will be treated in utmost confidence and used only for academic and patients management

Please bear with me as there is no reward or compensation for your participation in this study. Thank you

If you agree with these terms, please write your name and sign this consent form on the space provided below.

NAME -----

SIGNATURE -----

APPENDIX II

Name	Please choose or write as appropriate
HISTORY	
Age	
Sex	Male or female
Occupation	
Systemic disease	Present or Absent Nature
Sore throat?	Yes or no
Have you had sore throat before?	Yes or no
If yes, how many episodes in the last 1 year?	
Do you have painful swallowing?	Yes or no
Halitosis (Stop after this place)	Yes or no
EXAMINATION	
Submandibular lymphadenopathy	Right or left
Tonsillar erythema	Yes or no
Tonsillar discharge	Yes or no
Tonsillar stone	Yes or no

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Tonsillar tenderness/pain	Yes or no
Oral hygiene scores	Debris score Calculus score
Upper anterior	
Upper right posterior	
Upper left posterior	
Lower anterior	
Lower right posterior	
Lower left posterior	
OHI-S	$\frac{(\text{debris score} + \text{calculus index})}{6}$
D	
M	
F	
Tonsillar grading	Right side Left side