Original Article

The Relationship between Severity of Dental Caries and Chronic Tonsillitis among Iraqi Children

Zaid S. H. Ahmed * BDS, MSc, PhD,

Abstract:

Background: Chronic Tonsillitis outcomes from frequent attacks of acute Tonsillitis usually for six attacks or more per year for two successive years. Poor dental hygiene had been associated with oro- pharyngeal problems and causes both dental caries and Tonsillitis alike.

Objective: To evaluate the relation between chronic Tonsillitis and severity of dental caries among 4-5 years old children.

Patients and Methods: Random sample of children was selected in Hospital of Baghdad medical city Otolaryngologic department city. Fifty-four children aged 4- 5 years old were participated in this study divided into two group: 29 children with Chronic Tonsillitis (study group) and 25 children with intact tonsils (control group). The determination of Chronic Tonsillitis performed through a clinical and histopathological examination and Caries experience was recorded according to Mühlemann (d1-4 mfs) Index.

Results: Bacteriologic samples from children dental plaque(29 infected and 25 healthy) were cultured quantitatively for aerobic condition; Data reported that the mean values of bacteria (Strep. mutans, Strep. pyogenes, Lactobacilus spp, Strep. mitis and Strept. salivarius) and dental caries (dmfs, decayed, missing d3 and d4) among children with Chronic Tonsillitis were higher than children with intact tonsils with statistically highly significant difference (P< 0.001). Moreover the relations between (d4) and Strep. mutans, Lactobacilus spp and Strep. mitis were highly significant in positive direction among study group (children with Chronic Tonsillitis), while it was not among control group (children with intact tonsils).

Conclusion: There seems to be an association between dental caries and Chronic Tonsillitis in children aged 4-5 years old. And, it may be accepted that the infection to pass much more frequently from the teeth to the tonsils than in the opposite direction. So It is necessary to improve oral health condition through elective preventive dental programs among children to minimize any para-pharyngeal infections like Tonsillitis.

Keywords: Dental Caries, Children, Tonsillitis, Oral Microflora, Dental Plaque.

Fac Med Baghdad 2016; Vol.58, No.2
Received:April,2016
Accepted May:.2016

Introduction:

Dental caries is a post-eruptive multifactorial disease that results from the interaction between the bacterial biofilm (Strept. mutans and Strept. Sobrinus, collectively known as mutans streptococci (MS), and Lactobacillus), the environment (e.g., diet, saliva composition and flow rate), and the tooth structure (1,2). In sever condition, it initially affects the upper front teeth of children, and eventually spreads to the primary first molars (3,4). Tonsils are considered as lymphoid organs, providing oral cavity by immunoglobulins to a great extent depends on regional lymphoid organs. These play an essential role in suppression of cariogenic micro-flora, thereby providing caries prophylaxis or vice versa. In 2003, Kipiani and Davladze (5) reported the role of immune system condition of oral cavity in regulation of oral micro-flora via oral immune system in dental caries pathogenesis. Tonsillitis is an inflammatin of the tonsils most commonly caused by Group A streptococcal bacteria or viral infection. Chronic Tonsillitis or recurring is a persistent infection of the tonsils that can cause tonsil stone formation, and it is more common in children than in adults(6-11). Due to no previous studies in Iraq and Middle east conducted to assess the association between Chronic Tonsillitis and severity of dental caries among deciduous dentition for 4-5 years old children. This study represents the pioneering aspect. Its importance in terms of providing greater visibility to the relation between Chronic Tonsillitis and caries severity among children.

Aims of study : The aim of this study is to assess the relation between Chronic Tonsillitis and severity of dental caries among 4-5 years old children in Hospital of Baghdad medical city/ Iraq.

Patients and methods:

The study was conducted among fifty four children aged 4-5 years, they were selected randomly from eighty nine children on voluntary basis in Hospital of Baghdad medical city ENT department / Iraq (12). And they were classified into two groups: study group included 29 children(15 males and 14 females) with Chronic Tonsillitis and control group included 25 children (14 males and 11 females) with intact tonsils. The diagnosis of a healthy tonsils was carried out through clinical examination done by ENT specialists. The Chronic Tonsillitis

**Ministry of higher education and Scentific research- Studies & planning & Follow up Office- Manager of Curriculum.*
dr.zaidsaadi1997@gmial.com

were represented to those children with frequent attacks of Tonsillitis for 6 attacks per year for at least two successive years and these cases were indicated for Tonsillectomy. Lastly the removed tonsils were sent for histopathological diagnosis through which tonsils were divided up in half and then fixed in 10% buffered neutral formalin (13). Concerning both study and control groups, the whole primary teeth were examined on the daylight using the dental mirror and WHO dental explorer (standard parodontologic round - headed explorer) according to the basic method proposed by WHO (1997) (14). Caries experience was recorded according to Decayed, Missing and Filled (d1-4mfs) Index described by Mühlemann (1976) (15) each group was divided into three group mild, moderate and severe) according to decayed, missing and filled teeth surfaces (dmfs) regarding fraction of dmfs(ds).Total of 54 children (study and control groups) underwent microbiological investigations and dental plaque materials were taken from the second primary molars' vestibular and frontal surfaces of lower jaw. Then dental plaque was placed in transport medium "Amies transport medium and send to microbiologic laboratory immediately to investigate. For identification of aerobic microorganisms for dental plaque specimens were cultured on Blood agar, Chocolate agar, MacConkey agar, and Mannitol salt agar, and all plates were incubated under aerobic conditions at 37 C for 24– 48 hours (16). Moreover, Mitis salivaris bacitracin selective media agar (MSB agar) was used for isolation of Strept. mutans bacteria confermed the diagnosis of bacterial species by biochemical test (17). A standard bacteria counting method according to Miller, 1972 (18). Concerning study group, dental plaque was collected 7 days prior to tonsillectomy to make sure that the patient was not taking antibiotics that may interfere with results of microbiological investigation. Statistical analyses were performed by using SPSS package version 16. Student's t-test were applied for comparisons between the study and control group. ($P < 0.05$) was considered statistically significant.

Results:

Concerning study group (Chronic Tonsillitis) and control group (intact tonsils) children aged 4-5 years, the mean values of dental caries experience and grades of decay fraction are illustrated in Table (1 and 2). Results of this study showed that the mean values of dental caries (dmfs, decayed, missing d3 and d4) among children with Chronic Tonsillitis was higher than children with intact tonsils with statistically highly significant difference ($P< 0.001$).

Table (3) illustrates the mean value of dental plaque biofilm of bacteria among study group (children with Chronic Tonsillitis) and control group (children with intact tonsils). Concerning bacteriological analysis of dental plaque, data reported that the mean values of Strep. mutans, Strep. pyogenes, Lactobacilus spp and Strep. mitis among children with Chronic Tonsillitis were highly significantly higher than than children with intact tonsils with statistically highly significant difference ($P< 0.01$). while it was not significant among Strept. salivarius ($P> 0.05$). The correlation coefficient between dental caries experience and grades of decay fraction and cariogenic bacteria among study group (children with Chronic Tonsillitis) and control group (children with intact tonsils) are illustrated in Table (4). Results showed that among study group (children with Chronic Tonsillitis), the relations between (d4) and Strep. mutans, Lactobacilus spp., Strep. mitis were highly significant in positive direction while it was not among control group (children with intact tonsils).

Table(1):Dental Caries Experience (dmfs) and Components (ds,ms and fs) among study group (Chronic Tonsillitis) and control group (intact tonsils) children aged 4-5 years by gender.

		Study group (Chronic Tonsillitis)			Control group (intact tonsils)			t-value	df	P- value
		N	Mean	+- SE	N	Mean	+- SE			
Decayed	Males	14	11.71	0.67	15	3.80	0.71	8.13	27	0.00 **
	Females	11	11.00	0.36	14	1.64	0.51	14.235	23	0.00 **
	Total	25	11.40	0.40	29	2.76	0.48	13.565	52	0.00 **
Missing	Males	14	0.43	0.17	15	0.00	0.00	2.572	27	0.02 *
	Females	11	0.00	0.00	14	0.00	0.00	2.476	23	0.02*
	Total	25	0.24	0.10	29	0.00	0.00	13.225	52	0.00 **
Filling	Males	14	0.29	0.16	15	0.27	0.15	0.085	27	0.93
	Females	11	0.27	0.14	14	0.43	0.14	-0.783	23	0.44
	Total	25	0.28	0.11	29	0.34	0.10	-0.434	52	0.67
dmfs	Males	14	12.43	0.70	15	4.07	0.80	7.841	27	0.00 **
	Females	11	11.27	0.41	14	2.07	0.63	11.474	23	0.00 **
	Total	25	11.92	0.44	29	3.10	0.54	12.443	52	0.00 **

* (Significant)= P value<0.05 (between groups) ** (Highly significant)= P value<0.01 (between groups)

Table(2): Grades of Dental Caries among study group (Chronic Tonsillitis) and control group (intact tonsils) children aged 4-5 years by gender.

		Study group (Chronic Tonsillitis)			Control group (intact tonsils)			t-value	df	P- value
		N	Mean	+- SE	N	Mean	+- SE			
d1	Males	14	0.07	0.07	15	2.33	0.39	-5.568	27	0.00 **
	Females	11	0.46	0.25	14	1.00	0.30	-1.362	23	0.19
	Total	25	0.24	0.12	29	1.69	0.27	-4.619	52	0.00 **
d2	Males	14	1.36	0.29	15	1.27	0.25	0.238	27	0.81
	Females	11	2.00	0.23	14	0.57	0.17	5.03	23	0.00 **
	Total	25	1.64	0.20	29	0.93	0.16	2.773	52	0.01 *
d3	Males	14	1.93	0.25	15	0.20	0.14	6.173	27	0.00 **
	Females	11	2.18	0.23	14	0.07	0.07	9.804	23	0.00 **
	Total	25	2.04	0.17	29	0.14	0.08	10.617	52	0.00 **
d4	Males	14	8.36	0.43	15	0.00	0.00	20.276	27	0.00 **
	Females	11	6.36	0.54	14	0.00	0.00	13.277	23	0.00 **
	Total	25	7.48	0.39	29	0.00	0.00	20.805	52	0.00 **

* (Significant)= P value<0.05 (between groups) ** (Highly significant)= P value<0.01 (between groups)

Table (3): Dental plaque biofilm of bacteria count between study group (children with Chronic Tonsillitis) and control group (children with intact tonsils)

		Study group (Chronic Tonsillitis)			Control group (intact tonsils)			T	df	P –value
Strains and species of microorganisms	Gender	N	Mean of bacteria cell count	+- SE	N	Mean of bacteria cell count	+- SE			
Strep.mutans	Males	14	242.07 X 10 2	1.14 X 10 2	15	141.40 X 10 2	1.37 X 10 2	56.059	27	0.00**
	Females	11	230.27 X 10 2	1.38 X 10 2	14	121.57 X 10 2	1.17 X 10 2	60.617	23	0.00**
	Total	25	236.88 X 10 2	1.47 X 10 2	29	131.83 X 10 2	2.07 X 10 2	40.103	52	0.00**
Strep. pyogenes	Males	14	154.43 X 10 3	3.78 X 10 3	15	146.73 X 10 3	2.03 X 10 3	1.828	27	0.08
	Females	11	146.36 X 10 3	1.22 X 10 3	14	140.50 X 10 3	0.90 X 10 3	3.964	23	0.00**
	Total	25	150.88 X 10 3	2.30 X 10 3	29	143.72 X 10 3	1.26 X 10 3	2.832	52	0.01*
Lactobacilus spp.	Males	14	296.71 X 10 1	1.51 X 10 1	15	191.00 X 10 1	0.76 X 10 1	64.036	27	0.00**
	Females	11	280.64 X 10 1	1.18 X 10 1	14	177.50 X 10 1	0.61 X 10 1	82.758	23	0.00**
	Total	25	289.64 X 10 1	1.90 X 10 1	29	184.48 X 10 1	1.36 X 10 1	45.896	52	0.00**
Strep. mitis	Males	14	158.29 X 10 4	2.12 X 10 4	15	73.20 X 10 4	1.30 X 10 4	34.734	27	0.00**
	Females	11	135.27 X 10 4	4.13 X 10 4	14	70.07 X 10 4	3.35 X 10 4	12.394	23	0.00**
	Total	25	148.16 X 10 4	3.15 X 10 4	29	71.69 X 10 4	1.74 X 10 4	22.01	52	0.00**
Strept. salivarius	Males	14	274.00 X 10 4	3.18 X 10 4	15	271.87 X 10 4	1.81 X 10 4	0.593	27	0.56
	Females	11	264.45 X 10 4	3.07 X 10 4	14	270.36 X 10 4	2.02 X 10 4	1.665	23	0.11
	Total	25	269.80 X 10 4	2.39 X 10 4	29	271.14 X 10 4	1.34 X 10 4	0.506	52	0.62

* (Significant)= P value<0.05 (between groups) ** (Highly significant)= P value<0.01 (between groups)

Table (4): Correlation coefficient (r) between bacteria& dental caries experience (dmfs), components (ds,ms and fs) and grades among study group (children with Chronic Tonsillitis) and control group (children with intact tonsils) .

		Strep. mutans		Lactobacilus spp.		Strep. mitis		Strept. salivarius	
		r	P- value	R	P- value	R	P- value	r	P- value
Study group (Chronic Tonsillitis)	d1	-0.448	0.025*	-0.374	0.065	-0.39	0.054	-0.376	0.064
	d2	-0.228	0.273	-0.385	0.057	-0.233	0.263	-0.102	0.629
	d3	-0.208	0.319	-0.134	0.523	-0.152	0.47	-0.236	0.255
	d4	0.515	0.008**	0.823	0**	0.742	0**	0.201	0.335
	Decayed	0.163	0.436	0.434	0.03*	0.419	0.037*	-0.067	0.752
	Missing	0.246	0.236	0.581	0.002**	0.491	0.013*	-0.059	0.778
	Filling	-0.023	0.915	0.102	0.629	0.107	0.611	-0.05	0.813
	dmfs	0.203	0.331	0.563	0.003**	0.529	0.007**	-0.088	0.677
Control group (Intact tonsils)	d1	0.531	0.003**	0.622	0	0.431	0.02*	0.516	0.004*
	d2	0.455	0.013*	0.54	0.003**	0.415	0.025*	0.435	0.018*
	d3	0.15	0.437	0.255	0.183	0.183	0.342	0.124	0.521
	d4	-0.179	0.353	-0.094	0.628	0.399	0.032*	-0.186	0.334
	Decayed	0.485	0.008**	0.584	0.001**	0.42	0.023*	0.465	0.011*
	Missing	-0.126	0.515	0.045	0.815	0.579	0.001**	-0.127	0.511
	Filling	-0.158	0.413	-0.148	0.443	0.386	0.039*	-0.189	0.327
	dmfs	0.401	0.031*	0.49	0.007*	0.446	0.015*	0.377	0.044*

* (Significant)= P value<0.05 ** (Highly significant)= P value<0.01 groups)

Discussion

Laboratory investigations reported that Strep. pyogens play a role as pathogenesis of recurrent tonsillitis. Tonsillectomy is generally indicated when there are frequent attacks of acute tonsillitis, usually six attacks or more per year for two successive years and this tonsils hyperatrophy believed to cause mouth breathing and this may have a deleterious effect on the teeth, and this may account in some measure for the relationship between dental caries and enlargement of the tonsils (5,19). In the pre-antibiotic era, poor dental hygiene had been associated with dental caries, tonsillitis and pharyngitis. In other word, dental caries is the most common oral diseases that may be complicated by para-pharyngeal infection. Dental plaque plays an important role in etio-pathogenesis of dental caries and several researchers investigated that Strep. mutans as the main etiological bacteria of caries experience. Along with that, presence of cariogenic and other bacteria in dental plaque microbial structure points on pathogenetical interrelations between Chronic Tonsillitis and dental caries (2, 21). This may explain a higher dental caries among children with Chronic Tonsillitis in comparison to healthy children group Table 1,2. The data of dental caries in the present study difficult to compare with that reported by different studies, this may be due to differences in: the criteria of the sample selection and size and the varying definitions of Chronic Tonsillitis, as the previous studies might have included the different number of frequent attacks of acute tonsillitis.

Many researchers reported the importance of Strep. mutans and Lactobacilli of dental plaque in the development of dental caries (21,22) and they revealed that with a higher count of both Strep. mutans and Lactobacilli among caries active group in compare to those with caries free, this may explain the higher number count of Strep. mutans and Lactobacilli among study group in compare to control group. In general, it has been known that microbial pathogenesis of peritonsillar infection and dental caries is the same concomitantly especially when the anatomy of tonsil and molar teeth are in close relation to each others and this finding tallies with the present study result and may explain a highly positive correlation between cariogenic bacteria of both Strep. mutans and Lactobacilus spp (that may increase severity of dental caries) and the Chronic Tonsillitis in present study (Table 3,4). The findings are in agreement with Fukuizumi and his coworkers study (23), while disagree with other researchers that found no statistically meaningful relation between oral hygiene and tonsils size (24).

Clinical results of this study agreed with concept that in

children aged 4-5 years old under chronic stimulation of poor oral hygiene, the microbiological invasion of dental plaque act as reservoir for Chronic Tonsillitis and statistically meaningful correlation between dental caries and Chronic Tonsillitis was reported. No such relevant study has been conducted on local oral microflora for person so there is a need to know the main cariogenic genotypes of Strep.mutans and its mechanism of transmission from dental plaque to tonsils in oral cavity.

Acknowledge : gratefully acknowledge the kind help of specialists Ass.Prof. MUSA- ID LAFTA HAMZA ALBADRI 1 and Ass.Prof. Azzam M. A. Alsamai 2, in Hospital of Baghdad medical city ENT department / Iraq and I wish to express my deep appreciation to Prof. Mohamed A. Alfaham3 for microbiological investigations.

1 & 2 Baghdad University- College of medicine- Department of surgery (ENT)

3 Baghdad University- College of Medicin- Department of Microbiology

References

1. Seki M, , Karakamaa F, , Terajimaa T. , Ichikawaa Y, , Ozakib T, , Yoshidab S. , Yamashitaa Y. , Evaluation of mutans streptococci in plaque and saliva, Correlation with caries development in preschool children. J.Dent. (2003); 31:283-290

2. Velusamy SK, Markowitz K, Fine DH, Velliyagounder K. Human lactoferrin protects against Streptococcus mutans-induced caries in mice. Oral Dis. (2016) Mar;22(2):148-54.

3. Mouradian WE, Wehr E, Crall JJ. Disparities in children's oral health and access to dental care. JAMA. (2000), 284:2625-31.

4. Wakai K, Naito M, Naito T, Kojima M, Nakagaki H, Umemura O, Yokota M, Hanada N, Kawamura T. Tooth loss and intakes of nutrients and foods: a nationwide survey of Japanese dentists. Community Dent Oral Epidemiol. (2010), 38: 43–49.

5. Kipiani G and Davladze K. Dental Caries in Children with Chronic Tonsillitis. Annals of Biomedical Research and Education (2003) April/June; 3 (2): 86-90.

6. Putto A. "Febrile exudative tonsillitis: viral or streptococcal?". Pediatrics. (1987); 80 (1): 6–12.

7. Jochen P. Windfuhr , Nicole Toepfner, Gregor Steffen , Frank Waldfahrer. Reinhard Berner Clinical practice guideline: tonsillitis I. Diagnostics and nonsurgical management. European Archives of Oto-Rhino-Laryngology, April (2016), Volume 273, Issue 4, PP: 973-987.

8. Cowan D.L., Hibbert J. , Tonsils and adenoids, Scott Brown's Otolaryngology, vol 6, Butterworth- Heinemann, Oxford, (1997), 6, 1-4

9. Kurien M, Stanis A, Job A, Brahmadathan, Thomas K. Throat swab in the chronic tonsillitis: how reliable and valid is it? Singapore Med J (2000);41:324-26.

10. Schroeder BM. Diagnosis and management of group A streptococcal pharyngitis. Am Fam Physician. (2003);67:880-884.

11. Tagg JR. Prevention of streptococcal pharyngitis by anti-Streptococcus pyogenes bacteriocin-like inhibitory substances (BLIS) produced by Streptococcus salivarius. Indian J Med Res. (2004);119(Suppl):13–16.

12. Budjav L. Methodology and techniques of medical science statistical studies. Ulaanbaatar, (2002).

13. Dellaringa AR, Juares AJ, Mello Cd, Nardi JC, Kobari K, Perches RM. Histological analysis of tonsillectomy and adenoidectomy specimens – January 2001 to May 2003. Braz Otorhinolaringol (2005);71:18-22.

14. WHO. Oral health surveys basic methods 4th ed world health organization. Geneva, Switzerland. (1997).

15. Mühlemann HR. Oral epidemiology- caries. Introduction to oral preventive medicine.Buch-und Zeitschriften- Verlag. Die Quintessenze. (1976), 73-100.

16. Sadoh WE, Sadoh AE, Oladipo AO, Okunola OO. Bacterial isolates of tonsillitis and pharyngitis in a pediatric casualty setting. J Med and Biom Res (2008); 7:37-44.

17. William B. Whitman. Bergey's Manual of Systematics of Archaea and Bacteria (2015).

18. Miller JH. determination of viable cell count: bacterial growth curves. experiments in molecular Genetics. 1972,New York; Cold Spring Harbor, 31-36.

19. Baugh RF, Archer SM, Mitchell RB and et al. Clinical practice guideline: tonsillectomy in children. Otolaryngol Head Neck Surg (2011) Jan; 144(1 Suppl):S1-30.

20. Sofia D. Forssten, Marika Björklund, and Arthur C. Ouwehand. Streptococcus mutans, Caries and Simulation Models. Nutrients. (2010) Mar; 2(3): 290–298.

21. Zoitopoulos L, Brailsford SR, Gelbier S, Ludford RW, Marchant SH, Beighton D. Dental caries and caries-associated micro-organisms in the saliva and plaque of 3- and 4- years old Afro-Caribbean and Caucasian children in south London. Arch Oral Biol. (1996);41:1011–8.

22. Hegde PP, Ashok Kumar BR, Ankola VA. Dental caries experience and salivary levels of streptococcus mutans and lactobacilli in 13-15 years old children of Belgaum city, Karrnataka. J Indian Soc Pedod Prev Dent. (2005);23:23–6.

23. Fukuizumi T. , Inoue H. , Tsujisawa T. , Uchiyama C. Tonsillar application of formalin-killed cells of Streptococcus sobrinus reduces experimental dental caries in rabbits. Infect. Immun. (1999) Jan;67(1):426-8.

24. Esra Eryaman MD ; Banu Oter MD ; Erdinç Aydin MD: Any relation between poor oral hygiene and tonsillar hypertrophy? KBB-Forum (2013);12(1): 6-9.