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Article

Relationship between blood components, inflammatory factors and bacterial spp that cause tonsillitis and dental caries in Iraqi children

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Abstract: Aims and Objectives: Study the correlation between Anti streptolysin O Titer (ASOT) and Reactive Protein (CRP)with other related factors and the correlation between bacterial species and related tested parameters. Materials and Methods: 120 patients were part of the study and were divided into 6 groups; each group had 20 patients aged 6–12 years. Blood Sample Collection About 10 ml was withdrawn from each patient via vein puncture using 10 ml disposable syringes, 5 ml for immunological study and 5 ml for hematological study. Results: The results of ASOT titer showed a highly significant positive correlation with Monocytes and a highly negative correlation with eosinophil. CRP was found to have a highly significant positive correlation with eosinophils and lymphocytes and a highly negative correlation with neutrophil and monocyte percentage. With a positive correlation with ESR. Conclusion: Our study shows that ASOT is still a useful diagnostic tool for tonsillitis. CRP levels in the tonsillitis patients group were significantly higher than in other groups. In contrast, ESR levels in the tonsillectomy patients group were significantly higher than in
other groups.

Keywords: blood components, inflammatory factors, bacterial spp, tonsillitis, dental caries

Introduction

Tonsillitis is the inflammation of the pharyngeal tonsils and typically affects children. Tonsillitis produced by Streptococcus species is uncommon in children younger than 2 years of age, but viral tonsillitis is more prevalent in children younger than 5 years of age[1]. Dental caries is an irreparable microbial infection of the calcified tissues of the teeth, characterized by demineralization of the inorganic portion and deterioration of the organic substance of the tooth, leading to cavitation [2]. The best way to diagnose strep throat is to physically examine the oropharynx, although it rarely provides sufficient information to determine its cause. Typically, there is widespread hyperemia of the tonsil mucosa that is more or less extended to the pharynx, which may be accompanied by other symptoms such as petechiae on the soft palate, tonsillar exudate, or, less frequently, sore throat [3] Serology, which comprises the heterophile antibody test and complete blood count with manual differential, is used in conjunction with the findings of a physical examination to establish a diagnosis. Antistreptolysin O (ASO) testing can be used to identify past streptococcal infections linked to conditions such as rheumatic fever and glomerulonephritis. "The greatest evidence of antecedent group A streptococcus(GAS) infection is an increase in titer from acute to convalescent (at least two weeks apart). The antibody response of ASO peaks

between three to five weeks after GAS pharyngitis, typically during the first and third weeks of ARF[4]. Antibody titers are age-dependent, with children having significantly higher "normal" levels than adults due to regular exposure to S. pyrogenes[5]. In ARTI differential diagnosis, inflammatory markers such as Procalcitonin (PCT) and C-reactive protein (CRP) have garnered increasing interest recently. [6,7] In addition, these parameters have a strong link with disease activity. They can serve as an excellent indicator of the type of infection and are used to assess the infection's severity and whether the infection's origin is viral or bacterial [8,9].CRP is an unspecific acute-phase protein produced by the liver. It is increased about six hours after an inflammatory stimulus and reaches a maximum concentration after approximately 36 hours. Generally, CRP levels are higher in systemic bacterial infections than nonbacterial infections[10]. Study the correlation between Anti streptolysin O Titer (ASOT) and C Reactive Protein (CRP)with other related factors and the correlation between bacterial species and related with some tested parameters like Anti streptolysin O Titer (ASOT), C Reactive Protein (CRP) CRP, White Blood Cell (WBC), Neutrophil (NEU), Lymphocyte (LYM).

Material and method

Obtaining of the samples

The study was conducted among 120 children aged 6-12 years; 120 oral samples were collected from different mouth sites (teeth, tonsils, and throat) from 120 patients who visited the dental clinical unit and Otolaryngologic department in Hospital of Baghdad Medical City and Ibn Al Baladi Hospital for children and women of, whose were of both sexes and ages. These samples were divided into 6 groups: (1 dental caries, 2 tonsillitis, 3 tonsillitis and dental caries, 4 4 tonsillectomy, 5- tonsillectomy and dental caries, and 6-control). Then, 10 ml of blood sample collection was withdrawn from each patient via vein puncture using 10 ml disposable syringes. The blood sample was divided into three aliquots; the first aliquot of blood (2.5ml) was collected in the tube containing ethylene diamine tetra acidic acid (EDTA) as an anticoagulant with a slow mix for Complete blood count (CBC). Fresh blood was used to count the Hb, WBCs and differential WBC in the sample, which were measured by using the CELL-DYN Emerald Auto analyzer for the second aliquot blood (1.6ml) was dispersal in disposable ESR tubes for Erythrocyte Sedimentation Rate (ESR) measuring according to the manufacturing company of the kit (Zhejiang sorfa / China, the rest blood was dispersed in gel tube, left about 40 min in room temperature then centrifuged for 15 min at 3000 rpm to separate serum and stored in appendrofe tubes at -20°C for immunological study High sensitivity C-reactive protein (CRP) assay According to the manufactural company of the kit (Cusabio/USA). for the determination of ASOT level, ELISA kits were used, which was products of the company (My BioSource; USA) and based on similar principles.

Results

Correlation result of ASOT with other factors:-

Table 1 shows the correlation between ASOT and numerous markers such as (monocyte and eosinophil) displayed; in the G1 group, ASOT was shown to have a highly significant positive correlation with MONN ($r = 0.924$, $p \leq 0.05$), ASOT also was shown to have a highly negative correlation with eosinophil ($r = -0.950$, $p \leq 0.05$). The results showed no correlation between ASOT and the other factors under study.

Tested group	G1	Pearson's correlation
ASOT	MON N	0.924*
	G2	
ASOT	EOS N	0.950*
		©*. Correlation is significant at the 0.05 level
		****. Correlation is significant at the 0.01 level**

Table 1. Correlation result of ASOT with other factors.

Correlation Result of CRP with other factors:

Table 2 shows the correlation between CRP and numerous markers such as (neutrophil, eosinophil lymphocyte, monocyte and ESR) displayed; in the G2 group, CRP was shown to have a highly significant positive correlation with ESO P ($r = 0.932$, $p \leq 0.05$) and LYMP ($r = 0.955$, $p \leq 0.01$), on the other hand CRP was shown to have a highly negative correlation with NEU P ($r = -0.961$, $p \leq 0.01$) and MON P ($r = -0.905$, $p \leq 0.05$). While in the G4 group, CRP was shown to have a positive correlation with ESR ($r = 0.876$, $p \leq 0.05$).

Tested group	G2	Pearson's correlation
CRP	NEU P	-0.961**
CRP	EOS P	0.932*
CRP	LYM P	0.955**
CRP	MON P	-0.905*
	G4	
CRP	ESR	0.876*
		©*. Correlation is significant at the 0.05 level
		****. Correlation is significant at the 0.01 level**

Table 2. Correlation result of CRP with other factors.

Association between bacterial species and some tested parameters:-

The current search studies the association between bacterial species and related with some tested parameters like ASOT, CRP, WBC, NEU and LYM. Table 3 shows the mean of this parameter associated with bacterial species. In G2 showed that Streptococcus pneumonia had very highly significant differences with ASOT and CRP (55.9±3.8, 3.9±0.6) respectively, but had highly significant differences with WBC (8.22±1.3), While there were no significant differences with NEU and LYM .on other hand, in G 4 Streptococcus pneumonia showed highly significant differences with ASOT, CRP and WBC (23.2±2.6, 1.7±0.41 and 8.53±1.5) respectively, While there were no significant differences with NEU and LYM. However, in G5, G6 Streptococcus pneumonia showed significant differences with ASOT CRP and WBC (14.5±4.9, 1.4±0.32and 7.84±1.3), (12.3±1.7, 1.3±0.3, 6.45±0.9) respectively, While there were no significant differences with NEU and LYM.

In G2 showed that Streptococcus parasanguinis had very highly significant differences with ASOT and CRP (51.3±2.6, 3.2±0.4), respectively, but had highly significant differences with WBC (7.9±2.1), While there were no significant differences with NEU and LYM.

On the other hand, in G3a, Streptococcus parasanguinis showed highly significant differences with ASOT, CRP and WBC (22.8±1.2, 1.9±0.2), respectively, and displayed significant differences with WBC (6.1±0.3), While there were no significant differences with NEU and LYM. While in G3b, Streptococcus parasanguinis showed highly significant differences with ASOT (26.7±1.9) and displayed significant differences with CRP and WBC (1.1±0.1, 5.9±0.5), respectively, While there were no significant differences with NEU and LYM.

The results of Streptococcus parasanguinis for G4b showed highly significant differences with WBC (9.23±1.2). However, they had highly significant differences with ASOT (27.3±1.9) and displayed significant differences with CRP and LYM P (1.4±0.5, 34.6±3.2), respectively, While there were no significant differences with NEU. On the other hand, the results of Streptococcus parasanguinis for G5 revealed a highly significant difference with WBC (6.92±0.9). They showed significant differences with ASOT (12.6±3.2) but no significant differences with CRP, NEU and LYM.

The results of Moraxella catarrhalis for G1 showed significant differences with all five parameters. Table 3. On the other hand, in G3a and G3b, the results of Moraxella catarrhalis revealed highly significant differences with all immunological parameters.

The results of Kocuria kristinae for both G3b and CON groups showed no significant differences with all parameters.

G/Bacterial species	NO	ASOT Mean±SE	CRP Mean±SE	WBC Mean±SE	NEUT Mean±SE	LYMP Mean±SE
G2=Streptococcus pneumonia	9	55.9±3.8***	3.9±0.6***	8.22±1.3**	55.34±7.6	33.3±5.9
G4=Streptococcus pneumonia	12	23.2±2.6**	1.7±0.41**	8.53±1.5**	53.7±6.3	32.5±4.8
G5=Streptococcus pneumonia	5	14.5±4.9*	1.4±0.32*	7.84±1.3*	54.6±5.9	33.9±1.6
CON=Streptococcus pneumonia	10	*12.3±1.7	1.3±0.3*	*6.45±0.9	48.9±2.7	36.4±3.5
P value	36	0.001	0.001	0.01	NS	NS
G2= *Streptococcus parasanguinis*	3	51.3±2.6***	3.2±0.4***	7.9±2.1**	51.22±4.6	35.3±3.9*
G3a= *Streptococcus parasanguinis*	2	*22.8±1.2*	1.9±0.2**	*6.1±0.3	44.8±2.1	33.1±3.3
G3b= *Streptococcus parasanguinis*	2	**26.7±1.9	1.1±0.1*	*5.9±0.5	46.2±2.3	31.2±2.7
G4b= *Streptococcus parasanguinis*	5	27.3±1.9**	1.4±0.5*	9.23±1.2***	54.2±5.1	34.6±3.2*
G5= *Streptococcus parasanguinis*	6	12.6±3.2*	1.2±0.12	6.92±0.9**	51.9±3.8	29.8±2.1
P value	18	0.001	0.05	0.001	NS	0.05
G1=Moraxella catarrhalis	12	*13.5±3.6	1.7±0.22*	8.34±1.7*	51.6±4.7*	31.5±1.3*

G3a=Moraxella catarrhalis	7	62±4.9**	4.1±0.9**	9.62±2.3**	**58.22±5.8	**39.6±5.4
G3b=Moraxella catarrhalis	8	60±3.9**	4.3±0.5**	9.4±1.9**	**57.4±5.3	**38.7±4.9
P value		0.001	0.01	0.01	0.01	0.01
G3b= Kokyria kristinae	2	10.5±1.2	1.1±0.1	6.2±0.3	45.6±1.8	33.2±3.2
CON=Kokyria kristinae	4	11.1±1.7	1.2±0.2	5.9±0.9	45.2±2.1	32.1±2.9
P value	6	NS	NS	NS	NS	NS
Streptococcus mitis and *Granulicatella* were not calculated because the numbers were insufficient for comparison.						

Table 3. Correlation between bacterial species and some related parameters.

Discussion

As indicated in Table 1, this may be explained by the fact that monocytes may have a predisposition to fight staphylococcus aureus much more than eosinophils, and this may be related to their obtaining specialized receptors such as monocyte chemoattractant protein-1 as well as Fast or CD-95 which is responsible for monocyte phagocytosis of Staphylococcus aureus. Moreover, establishing the specific antibodies at this tremendous amount may decline the need for eosinophil action. The results in Table 2 were confirmed by Kotulska et al., who revealed that CRP levels were positively correlated with ESR in all investigated patients, especially those with SLE [11]. The results showed no correlation between ASOT and the other factors under study, as indicated in Table 2. EItis very standard for CRP to correlate with ESR since both have been shown and documented as important markers for the inflammatory response. On the same side, several hematological items such as monocytes, platelets, eosinophils and lymphocytes have also been demonstrated as good players at inflammation.

The association between bacterial species and some tested parameters showed similar results obtained by Zegeye et al., who also reported a statistically significant association between BHS culture positivity and ASO positivity (p = 0.0315) [12]. The seroprevalence of ASO antibodies was found to be 17.3 percent in the sera of 69 children in a study by Monemo et al. Twenty-four of these children were found to have beta-hemolytic streptococci in their pharyngeal swabs, which included 19 children with group C streptococci, four children with group B streptococci, and one kid with serogroup G. As established by a titer of _200 IU/mL in those children, there was no statistically significant connection between oropharyngeal carriage of beta-hemolytic streptococci and presence of ASO [13].

C-reactive protein (CRP) was initially found in sera from pneumonia patients in 1930 based on its capacity to precipitate Streptococcus pneumoniae C-polysaccharide [14]; since then, CRP has been linked to various bacterial illnesses [15]—inflammation caused by non-infectious factors [16]. In light of these connections, CRP is commonly used to distinguish between bacterial and nonbacterial pneumonia in clinical settings. Pneumonia caused by bacteria has been observed to have greater CRP levels than pneumococcal pneumonia [17], whereas others have not [18]. In the present study, the results agreed with Higdon et al., who reported that Elevated CRP was related favorably to bacterial pneumonia and negatively to respiratory syncytial virus pneumonia[(18)].

Conclusions

Our study showed that ASOT is still a good indicator for diagnosing tonsillitis. The Tonsillitis patients group was significantly higher than other groups regarding CRP level, while ESR in the tonsillectomy group was significantly higher than in other groups.

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