Gestão e políticas públicas EM ODONTOLOGIA

2

Emanuela Carla dos Santos
(Organizadora)

Atena Editora
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APRESENTAÇÃO

As pesquisas científicas sempre visam o aprimoramento de determinada área para que seja entregue aos usuários um serviço de qualidade. A mesma lógica se segue na odontologia. No setor público, estudos sobre a necessidade dos indivíduos e formas mais eficientes de ofertar de saúde bucal embasam a gestão e organização de políticas públicas.

Este e-book traz um compilado de estudos de várias áreas da odontologia e dissemina o conhecimento para a comunidade científica.

Espero que a leitura do conteúdo aqui apresentado desperte cada vez mais sua busca pelo conhecimento.

Emanuela Carla dos Santos

SUMÁRIO

CAPÍTULO 12

SALIVARY INTERLEUKIN 6 AND SIALIC ACID IN PERIODONTITIS

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ABSTRACT: Background and Objective: Periodontitis is a multifactorial chronic infectious oral disease in dentate people. Sialic acid regulates innate immune responses that release cytokines. The study aimed to evaluate interleukin-6 levels in periodontitis and its relation to clinical features, total sialic acid and its fraction, and total proteins to clarify its role.**Material and Methods:** The study was an observational case-control study. It Carried in the periodontology clinic, College of Dentistry / Erbil /Iraq. A total of 60 individuals participated in this study. Participants were categorized into three groups. The first was control represents systemically and periodontally healthy subjects. The second was the dentate periodontitis and the finally partial edentulous group. Data collection was by an interview questionnaire, clinical periodontal examination, Biochemical tests for salivary; IL-6, total sialic acid and its fraction, and total proteins. Statistical analysis by Statistical Package for Social Sciences.**Results**: Statistical analysis showed a significant (P≤ 0.01) highest value of total sialic acid in periodontitis. The highest value of IL-6 was in the partial edentulous group. Old ages increased salivary IL-6 significantly. In periodontitis, there was a significant association of IL-6 with probe pocket depth, mobility scores of teeth, protein-bound sialic acid, and a significant negative association with lipid-bound sialic acid in the precipitate. The partial edentulous IL-6 associated significantly with gingival index and free sialic acid in the precipitate and negatively with probe pocket depth. **Conclusions:** Salivary sialic acid and IL-6 are periodontitis biomarkers in dentate. Levels of sialic can diagnose the pleiotropic role of IL-6. It is dependent on the treatment condition and age, which affects the number of teeth and salivary flow rate.

KEYWORDS: Sialic acid. Periodontal inflammation and IL-6.

NTERLEUCINA 6 SALIVAL Y ÁCIDO SIÁLICO EN PERIODONTITIS

ABSTRACTO: Trasfondo y objetivos: La periodontitis es una enfermedad oral infecciosa crónica multifactorial en personas dentadas. El ácido siálico regula las respuestas inmunitarias innatas que liberan citocinas. El estudio tuvo como objetivo evaluar los niveles de interleucina-6 en periodontitis y su relación con las características clínicas, el ácido siálico total y su fracción, y las proteínas totales para aclarar su papel. Material y métodos: El estudio fue un estudio observacional de casos y controles. Se llevó a cabo en la clínica de periodoncia, Facultad de Odontología / Erbil / Irak. Un total de 60 personas participaron en este estudio. Los participantes se clasificaron en tres grupos. El primero fue el control que representa a

sujetos sanos sistémica y periodontalmente. El segundo fue la periodontitis dentada y el grupo finalmente desdentado parcial. La recolección de datos se realizó mediante un cuestionario de entrevista, examen clínico periodontal, pruebas bioquímicas de saliva; IL-6, ácido siálico total y su fracción y proteínas totales. Análisis estadístico por paquete estadístico de ciencias sociales. Resultados: El análisis estadístico mostró un valor más alto significativo (P≤ 0.01) de ácido siálico total en periodontitis. El valor más alto de IL-6 estaba en el grupo desdentado parcial. La vejez aumentó significativamente la IL-6 salival. En la periodontitis, hubo una asociación significativa de IL-6 con la profundidad de la bolsa de la sonda, puntuaciones de movilidad de los dientes, ácido siálico unido a proteínas y una asociación negativa significativa con ácido siálico unido a lípidos en el precipitado. La IL-6 desdentada parcial se asoció significativamente con el índice gingival y el ácido siálico libre en el precipitado y negativamente con la profundidad de la bolsa de la sonda.Conclusiones: El ácido siálico salival y la IL-6 son biomarcadores de periodontitis en dentado. Los niveles de siálico pueden diagnosticar el papel pleiotrópico de IL-6. Depende de la condición del tratamiento y la edad, lo que afecta la cantidad de dientes y la tasa de flujo salival.
PALABRAS CLAVE: ácido siálico. Inflamación periodontal e IL-6.

INTERLEUCINA SALIVAR 6 E ÁCIDO SIALICO NA PERIODONTITE

RESUMO: Antecedentes e Objetivos: A periodontite é uma doença infecciosa bucal crônica multifatorial em pessoas dentadas. O ácido siálico regula as respostas imunes inatas que liberam citocinas. O estudo teve como objetivo avaliar os níveis de interleucina-6 na periodontite e sua relação com as características clínicas, ácido siálico total e sua fração e proteínas totais para esclarecer seu papel. Material e métodos: O estudo foi um estudo caso-controle observacional. Realizada na clínica de periodontologia, Faculdade de Odontologia / Erbil / Iraque. Participaram deste estudo 60 indivíduos. Os participantes foram categorizados em três grupos. O primeiro foi o controle que representa sujeitos sistemicamente e periodontalmente saudáveis. O segundo foi a periodontite dentada e o grupo finalmente edêntulo parcial. A coleta de dados se deu por meio de questionário de entrevista, exame clínico periodontal, exames bioquímicos para saliva; IL-6, ácido siálico total e sua fração e proteínas totais. Análise estatística pelo Statistical Package for the Social Sciences. Resultados: A análise estatística mostrou um valor mais alto significativo (P≤ 0,01) de ácido siálico total na periodontite. O maior valor de IL-6 foi no grupo de edêntulos parciais. A idade avançada aumentou significativamente a IL-6 salivar. Na periodontite, houve uma associação significativa de IL-6 com a profundidade do bolso da sonda, escores de mobilidade dos dentes, ácido siálico ligado a proteínas e uma associação negativa significativa com ácido siálico ligado a lipídios no precipitado. A IL-6 edêntula parcial associou-se significativamente com o índice gengival e ácido siálico livre no precipitado e negativamente com a profundidade da bolsa da sonda. Conclusões: O ácido siálico salivar e a IL-6 são biomarcadores da periodontite em dentados. Os níveis de siálico podem diagnosticar o papel pleiotrópico da IL-6. Depende da condição do tratamento e da idade, o que afeta o número de dentes e a taxa de fluxo salivar.
PALAVRAS CHAVES: ácido siálico. Inflamação periodontal e IL-6.

INTRODUCTION

Periodontitis is the main chronic inflammatory oral disease in dentate people. It is a multifactorial influence by genetics and as well as by the environment (Jawzaly et al, 2012). It was initiated d by gram-negative bacteria that secrete various cytokines from lipopolysaccharides (Murata et al, 2001). Improper or exuberant immune response leads directly toward the overproduction of inflammatory cytokines that lead to deleterious inflammatory processes and destruction of the periodontal tissue and alveolar bone, consequently periodontal attachment loss(Gemmell & Seymour, 2004).

Interleukin-6 (IL-6) is an important cytokine regulating host response to tissue injury and infection (Goutoudi et al., 2012). IL-6, produced locally in bone following stimulation by IL-1 and tumor necrosis factor (TNF) (Balto et al., 2001), by various cells, such as monocytes, fibroblasts, osteoblasts, and vascular endothelial cells in response to inflammatory challenges.

The activity of IL-6 is considered double-edged in the inflammation (a pleiotropic cytokine) that may enhance or suppress inflammatory bone destruction. Traditionally IL-6 has been considered a pro-inflammatory mediator because it is induced by IL-1 and TNF-α early in the inflammatory cascade and stimulates the expression of acute-phase proteins, which have anti-inflammatory properties (Nibali et al., 2012).

Previous studies reported anti-inflammatory properties of IL-6; it can increase the production of tissue inhibitors of matrix metalloproteinase (TIMP), suppresses IL-1 expression, can induce the synthesis of IL-1 receptor antagonist (IL-1Ra) and the release of soluble TNF receptors (Goutoudi et al., 2012). Recent studies demonstrate that IL-6 is deficient in many typical pro-inflammatory properties and exerts several anti-inflammatory activities. It stimulates indirect production of collagenase enzyme and matrix metalloproteinase or stromelysin. Inhibit superoxide production, and suppress spontaneous IL-1-mediated degradation of cartilage matrix (Balto et al., 2001).

Therefore individual variability in the ability to synthesize and release IL-6 may modulate the susceptibility, development, and progression of a number of autoimmune and inflammatory diseases (periodontal diseases) which are recently reported to be associated with IL-6 deregulation (Nibali et al., 2012).

Sialic acids are a family of nine carbon acidic monosaccharaides. The essential function of host sialic acid is to regulate innate immunity (Jawzali, 2016). Bacteria with capsular polysaccharide (such as gram-negative bacteria) containing sialic acid interacts with a component of the host's nonspecific immune response, may modulate the ability of the host to mediate an immune response by affecting the release of cytokine molecules thereby disrupting the coordination of the host's cell-mediated immune response (Robertst, 1995). Pro-inflammatory cytokines such as interleukin-1, interleukin-6, and tumor necrosis factor-α stimulated to produce acute-phase glycol-proteins with sialic acid as a component

of the oligosaccharide side chain (Shahid & Mahboob, 2006). Sialic acid is a stable and representative marker of the overall acute-phase response (Browning et al, 2004). The current criteria for the assessment of periodontal tissues surrounding teeth depend on clinical and radiographic changes. Saliva is a non-invasive suitable environment for biochemical and immunological analysis and can be an early indicator for detection of active periodontal disease (Yaghobee et al., 2014).

The imbalance between pro-and anti-inflammatory cytokines could be involved in the initiation and progression of chronic periodontitis (Shaker & Hashem, 2012). There are conflicting reports on differences in salivary IL-6 levels between chronic periodontitis and healthy subjects. Clarifications of the roles of IL-6 and factors that affect it in periodontitis progression require more researches. Therefore this study was conducted to evaluate interleukin-6 levels in periodontitis and its relation to clinical features and inflammable salivary biomarkers; total sialic acid and its fraction, total proteins to identify its role in disease progression.

METHODS AND PATIENTS

The study was an observational case-control study. It was carried out in the dental teaching clinic - College of Dentistry / Hawler Medical University. During the period of 1st August 2009 up to 30th September 2009.

PARTICIPANTS (STUDY POPULATIONS)

A total of 60 convenient samples were in this study, with ages ranging between 18 and 70 years of both genders. They were screened for periodontal health status and divided into three groups; first were 20 participants free from periodontal disease and regarded as a control group., second 32 dentate outpatients group, diagnosed with chronic periodontitis disease,(had $^{>}3 \geq 7$mm pockets depth), according to the classification of the periodontal diseases issued by the American Academy of Periodontology (Periodontitis, 2015).The third group was eight partial edentulous periodontitis patients with a history of treatment.

INCLUSION CRITERIA

Included Healthy participants systemically and with no history of periodontal and antibiotic treatment before the study for three months.

EXCLUSION CRITERIA

Included Pregnant and lactating women and patients with systemic diseases.

SAMPLING TECHNIQUE

A structured questionnaire (interview form) was used to collect data by asking the studied population about social and behavior factors included; age, sex, occupation, educational levels, smoking status, oral hygiene habits (frequency of tooth brushing, use of dental floss), and use of medications. All participants were informed about the examination, and their consent took.

CLINICAL MEASUREMENT

The clinical periodontal examinations were carried out by the trained dentist and calibrated by the supervisor of the teaching clinic, included; bleeding on probing by Saxer and Muhleman (Saxer & Mühlemann, 2004), probe pocket depth (PD) was measured with (Williams probe), for all teeth from the gingival margin to the base of pocket at four sides (labial/buccal, lingual/palatal, mesial and distal surfaces), per teeth, mobility of teeth classified by (Carranza & Takei, 2006) and miss of teeth. Classifications of The (AAP) (Periodontitis, 2015) were used for identifying the severity of disease; probing depths >3 & <5 mm (mild pockets), ≥ 5 & <7 mm (moderate pockets) and ≥ 7 mm (sever pockets). The gingival index (GI) and plaque index (PI) scores were recorded, using criteria of (Löe, 1967).

SALIVA COLLECTION

Saliva samples (before the clinical measurements) were collected from all subjects between 9 and 11 hours am. The spitting method(Dowen B, 1989) was used for the collection of un-stimulated whole saliva. Patients were prevented from eating, drinking, and oral hygiene for 2 h before collection. The samples were stored at -200 C for one hour, then centrifuged immediately at (10000) g and at 40C for 20 minutes to obtain supernatant and precipitate. Both fractions were stored at -20C0 for analysis.

BIOCHEMICAL TESTS

This included salivary IL-6 Enzyme-linked immunosorbent assay (ELISA) kits (Beckman colter manufacture). Total sialic acid (TSA) and free sialic acids (FSA) were measured with the modified thiobarbituric acid method of (Skoza & Mohos, 1976). Extraction and determination of lipid-bound sialic acid (LSA) by (Masami, 1989). Determination of sialic acid bound to total proteins (PSA) (Shetty & Pattabiraman, 2004), salivary total proteins by Lowry method Davidson College(Davidson, 2000).

STATISTICAL ANALYSIS

The statistical Package for Social Sciences (SPSS, Version 18) was used for data

analysis by parametric and nonparametric tests for normal and abnormal distribution of variables checked by Shapiro- Wilk test. Analysis of variance (ANOVA-test) to compare between three or more means, and t-test to compare between two means. The correlation coefficient for measuring the correlation between quantitative data and the Eta test for measuring the association between nominal and interval. Binary logistic regression for odds ratios measurement. A p-value of ≤ 0.05 was considered statistically significant and ≤ 0.01 high significant.

RESULTS

The studied population composed of 32 (53.3%) periodontitis, 20 (33.3%)

Participant as control and 8 (13.3%) partial edentulous patients with teeth miss more than (10).

Salivary mean levels of IL-6, total sialic acid, and, total protein

Statistical analysis showed a significant (P≤ 0.01) difference in the means of total sialic acid and total protein between periodontitis, control, and partial edentulous group. Post Hoc *Least Significant Difference (LSD)* test showed significant (P≤ 0.01) difference of periodontitis with control and partial edentulous groups in sialic acid, while partial edentulous showed similarity with the control group. Total salivary proteins, in periodontitis, differ significantly (P≤ 0.05) with control but not with partial edentulous. There was also a significant (P≤ 0.01) difference in the means of IL-6 between the groups. Post Hoc (LSD) test showed significant highest value (P≤ 0.01) value of IL-6 in partial edentulous compare to periodontitis and control groups.

Relation of ages with salivary IL-6 and cases

Statistical analysis showed a significant correlation of IL-6 with ages and. significant differences of IL-6 among age groups. There was also significant relation and differences of ages among cases. Binary Logistic regression showed a significant little increase risk of IL-6 levels in old ages and in partial edentulous, Table (2).

Groups	No.	IL-6 (pg/ml) Mean ± S.E	F-value	P-value
Periodontitis	32	26.13± 7.4	18.7	0.00**
Control	20	1.7 ± 8.3		
Partial edentulous	8	66.35± 8.3		
Groups	No	Salivary protein Mean ± S.E.	F-value	P-value
Periodontitis	32	6.6± 0.34	11.5	0.00**
Control	20	4.12 ±0..27		
Partial edentulous	8	5.7± 0.47		

Groups	No.	Total sialic acid (mg/l) Mean ± S.E.	F value	P-value
Periodontitis	**32**	**156.84± 3.9**	**16.96**	**0.00****
Control	**20**	**96.80± 0.32**		
Partial edentulous	**8**	**100.36± 19.5**		

Table 1 Mean levels of salivary; IL-6, protein, and total sialic acid.

** (P≤ 0.01), * (P≤ 0.05), No= Number.

Age groups (Years)	IL-6 (pg/ml) Mean± S.E.	No	Value of R	P-value	F- value	P-value	B	95% CI
18-44	14.9 **± 3.7**	36	0.37	0.003**	- 2.3	0.028*	1.024*	1.0 - 1.1
45-75	35.9 ± 8.3	24						
Groups of the study (cases)	**Mean of ages ± SE**	**No**	Eta test	Degree	F- value	P-value	B	95% CI
Periodontitis	39.5 ± 2.23	32	0.79	Strong	3.5	0.037*	1.03*	1.0 – 1.06
Control	34.9 ± 3.5	20						
Partial ed.	49.5 ± 2.8	8						
Total	39.3 ± 1.8	60						

Table 2 Relation and differences of ages with salivary (IL-6) and cases.

(P≤ 0.01) ** (P≤ 0.05) *, R=Pearson's correlation coefficient, B =odds ratio, CI= Confident interval, ed. = edentulous.

Relation between IL-6 and periodontal health status in periodontitis

Table (3) shows significant positive correlations of IL-6 and protein-bound to sialic acid (PSA) with probe pocket depth (PD). There was also high relation of (IL-6) and total sialic acid with mobility of teeth. Statistical analysis showed significant differences in the means of IL-6 and PSA among groups of probe depth (PD) and TSA among teeth mobility scores.

Prop depth of teeth(PD) in mm	IL-6 (pg/ml) Means± S.E.	No.	Value of R	P-value	F-Test Value	P-value of Difference
Mild > 3- < 5	20.7 ± 4.9	17	0.37	0.039*	6.5	0.005*
Moderate ≥ 5-6	26.1 ± 4.9	13				
Sever ≥ 7	53.0 ± 37.75	2				
Total	26.14 ± 3.9	32				
Prop depth (PD) in mm	**PSA Means± S.E.(mg/l)**	**No.**	**Value of R**	**P-value**	**F-Test Value**	**P-value of Differences**

Mild > 3- < 5	26.5 ± 2.6	17	0.52	0.002**	15.1	0.001**
Moderate ≥ 5-6	30.2. ± 2.9	13				
Sever ≥ 7	79.5 ± 29.4	2				
Total	31.3 ± 17.9	32				
Mobility scores	**IL-6 (pg/ml) Means± S.E.**	**No.**	**Value of R**	**P-value**	**F-value**	**P-value of difference.**
0	16.44±5.3	9	0.37	0.038*	1.76	0.176
1	23.9±21.6	14				
2	40.3± 10.9	7				
3	36.0± 15.0	2				
Total	26.13±3.9	32				
Mobility scores	**TSA (mg/l) Means ± S.E.**	**No.**	**Value of R**	**P-value**	**F-value**	**P-value of difference.**
0	100.6 ± 28.9	9	0.35	0.047*	6.0	0.003**
1	87.7 ± 4.4	14				
2	130.3 ± 15.5	7				
3	145.1 ± 18.7	2				
Total	156.8 ± 41.6	32				

Table (3) Association of IL-6 and sialic acid with probe pocket depth and teeth mobility in periodontitis.

*= (P≤ 0.05) **= (P≤ 0.01) R- Pearson's correlation.

Assosiation of IL-6 in partially edentulous with periodontal health status

Prop depth of teeth (PD) in mm	**IL-6 (pg/ml) Means± S.E.**	**No.**	**Value of Spearman**	**P-value of R**	**Kruskal-Test Value**	**P-value of Difference**
Mild > 3- < 5	79.5± 35.7	4	- **0.22**	No sig.	0.33	No sig
Moderate ≥5-6	53.3±19.9	4				
Total	66.4± 19.5	8				
Groups of Gingival Index	**Means± S E**		**spearman**	**P-value spearman**		**Mann-Whitney**
Moderate (1.1-2)	42.8 ± 14.2	6	0.93	0.01**		0.047*
Sever (2.1-3)	136.9 ± 31.9	2				
Total	66.4 ± 19.5	8				

Table (4) shows a negative correlation of IL-6 with probe pocket depth and a significant positive correlation of IL-6 with gingival index GI. Also a significant difference in IL-6 among GI groups. There was also a negative correlation of probe pocket depth with TSA (0.85, P-value = 0.1) and its fractions, while GI showed a significant correlation (0.78, P-value = 0.05*) with FSA in the sediment of saliva.

Table (4) Association of IL-6 with probe pocket depth, and gingival scores.

*= (P≤ 0.05) **= (P≤ 0.01).

Correlation of IL-6 with total sialic acid and its fractions among groups of studied population

Statistical personal correlation showed a significant correlation of (IL-6) with protein-bound sialic in the supernatant (r=0.468**), (Fig 1) and total salivary protein (r=0.451**) in

periodontitis. Lipid-bound sialic acid in sediment showed a significant (P≤ 0.05) negative correlation (r= -0.382*) with (IL-6) in periodontitis (Fig 2). As well as free sialic acid in the sediment of saliva showed a significant positive correlation (Spearman correlation value= 0.820*) with salivary IL-6 among the partial edentulous group.

DISCUSSION

Salivary levels of IL-6, total sialic acid, and total protein in periodontitis and controls

Total salivary; sialic acid, protein, and IL-6 showed significantly high concentrations in periodontitis patients compare to controls. This view pathogenesis role of increased salivary TSA levels in periodontal disease suggested by (Shinohara et al., 1994) and can differentiate between periodontal disease and normal conditions. A high level of IL-6 is in line with previous studies (Ebersole & Cappelli**,** 2000**)**, (Miller et al., 2006) who found that periodontitis patients have higher (IL-6) levels when compared to the periodontally healthy population. This result is in contrast with studies of (Nibali et al., 2012). and (Shaker & Hashem, 2012) who found no significant difference in the levels of IL-6 between chronic periodontitis and periodontal healthy subjects.

The significant difference in the level of the total; protein, sialic acid, and (IL-6) between periodontitis and control may be due to the virulence type of bacteria and its products in periodontitis. Additionally, biosynthesis and post-translational glycosylation processes of the acute-phase glycoprotein in the liver. It is confirmed by the significant positive and negative correlation of (IL-6) with, protein-bound to sialic acid (PSA) and lipid-bound sialic acid (LSA) in sediment respectively. Bacteria with virulence factors included either serotype lipopolysaccharide or specific antigen stimulates the secretion of cytokines from monocytes modulated with sialic acid. This result was in agreement with (Soell et al., 1994) who stated that structurally related cell surface proteins from *streptococcus mutants* (major bacteria of the oral cavity) binds to monocyte surface receptors via sialic acid residues and exerts immune-modulator effects on human monocytes like induction of (TNF-α), IL-1β, and IL-6). The mean level of salivary (IL-6) in control in this study was in agreement with other investigators (Rhodus et al., 2005; Stuart & Brown, 2007) who found low levels (1.4±1.0 pg/ml) and (1.8± 4.25 pg/ml) for salivary (IL-6) respectively.

Salivary levels of IL-6, total sialic acid and total protein in partial edentulous

The majority (75%) of the partial edentulous group were female, former smokers, in age group (45-70) years. The low number of teeth caused a lower intensity of inflammation compared to the dentate periodontitis group as indicated by lower levels of total salivary sialic acid. This result confirms the hypothesis that the severity of periodontal inflammation

has associated with the number of teeth affected (Persson & Persson, 2005) and ensured by no significant difference in the level of sialic acid between the partial edentulous group and controls. The similarity of the partial edentulous group in total protein with periodontitis. may relate to the history of accumulation effects of periodontitis and treatments process and increase in salivary antimicrobial agents. This result is consistent with (Jawzaly,et al, 2012) and (Shetty & Pattabiraman, 2004) who found high concentration of total protein in periodontitis and gingivitis.

A high value of IL-6 may be due to; sex and old ages, which affect salivary secretion and flow rate(Al-Azzawi et al., 2013). This result is consistent with (Alwan et al., 2015) who found a significant difference in the volume of gingival crevicular fluid between chronic periodontitis and healthy control and with (Slade et al., 2000) who suggested that C-reactive protein levels among edentulous not similar to periodontal healthy individuals and could raise by other risk factors; ages, and smoking,

Additionally, history of periodontitis and accumulative effects of treatments may affect the volume of saliva and change the equilibrium between the activities of pro-inflammatory and anti-inflammatory cytokines and determine the stage of severity and dissolution of inflammation as stated by (Shaker & Hashem, 2012) and reported that the total amount of cytokine might be more representative of the disease condition than its concentration. This result also accompanied with (Nibali et al., 2012) who reported that IL-6 increase associated with the short-term inflammatory response to therapy and long-term reductions when a clinical improvement - in the periodontal status is obtained. This idea was more abundant among former smokers who had a history of compromised outcomes of periodontal therapy and conform (Goutoudi et al., 2012) who found a higher concentration of IL-6 in gingival crevicular fluid in diseased sites following treatment. Better clinical result in nonsmokers following therapy of periodontitis.

Relation between ages and Interleukin 6 (IL-6)

The Poor periodontal status in old ages reveals cumulative effect of microbial challenges of periodontitis and therapy, which cause severe diseases in old ages as indicated by high PD and mobility scores in periodontitis and more teeth missing in partial edentulous. This result agrees with (Goutoudi et al., 2004) who reported deteriorated periodontal status (according to periodontal indices) with age. Also (Jawzaly, et al., 2012) concluded that old age individuals had received more therapy with selective extractions of teeth affected by periodontitis.

Relation between (IL-6) and periodontal health status among periodontitis and partial edentulous

Association both IL-6 and sialic acid with periodontitis indices reveals predictor roles both of them for severity of periodontitis. Results of IL-6 consistent with (Shaker & Hashem, 2012) who found a significant positive correlation between periodontal parameters and serum IL-6, also (Alwan et al., 2015) who found a significant correlation between quantities of IL-6 in crevicular fluid and tissues inflammation (gingival index ,GI) and destruction (pocket depth, PD). This agrees with (PYB, et al., 2007) who identified a significant correlation between alveolar bone loss score and (IL-6).

Accompanying association of (IL-6) and sialic acid with its fraction with indices of periodontitis can be explained by the interaction of sialic acid of salivary glycoprotein in pellicle and products of bacteria and immune system. This view the finding of (Murray et al., 1986) that pocket formation and mobility are the results of; plaque, bacteria toxic products, and immune system (collagenase, metalloproteinase) accumulation. These mediators are stimulated and produced by IL-6. It is online also with (Gani et al., 2009) who proposed releases of inflammatory cytokines, including interleukins IL 1α and IL-6 and tumor necrosis factor- α, as a result of the recruitment and activation of the monocyte/T-lymphocyte axis by bacterial proliferation and / or bacterial products in periodontal pockets. This in turn leads to periodontal tissue destruction.

Negative correlation of IL-6 and TSA with PD and significant positive correlation of IL-6 with GI in partial edentulous conforms moderate to severe gingivitis and history of irreversible tissues destruction and pocket formation among partial edentulous group. This result supports (Geivelis et al., 1993) who found significant positive correlations between GCF IL-6 levels in sites with gingivitis than in healthy ones and (Goutoudi et al., 2012) who found negative correlations between total IL-6 in GCF and PD among patients with chronic periodontitis, and (Murata T, 2001) who found no association between severity of periodontitis and the number of teeth and circulating IL-6 in the elderly. However, it is in contrast with previous results that suggested a positive correlation of total IL-6 with disease activity and bleeding as well as PD (Lin et al., 2005). Different results in different studies support the idea that the production of inflammatory mediators differs by type of sample and from subject to subject and other several factors; genetic and bacterial composition (Goutoudi et al., 2012).

Correlation of IL-6 with total sialic acid and its fractions in periodontitis and partial edentulous

The high correlation of (IL-6) with PSA and total salivary protein may due to the role of (IL-6) in inducing synthesis of other mediators and enzymes. This agrees with (Gani et al., 2009) who reported that (IL-6) increased hepatic protein synthesis of acute-phase

proteins (such as richly sialylated α-acid glycoprotein, c- reactive protein, and others) and decreased synthesis of the negative reactant proteins. LSA and FSA in the sediment of saliva represent a fraction of cells and (MG1) a high molecular weight mucin (Zhang et al., 2016). Negative correlations LSA and positive FSA with (IL-6) in periodontitis and partial edentulous respectively may explore the significant role of terminal sialic acid mucin in both adherence and aggregation by cleaving sialc acid and using it by bacteria depending on the severity of inflammation. Salivary sediment LSA in periodontitis may represent incorporation terminal sialic acid of MG1 with lipopolysaccharide of gram-negative bacteria that can hinder the function of the host defenses as reported by(Jawzaly, et al. 2012). Additionally, degradation of MG1 causes precipitation of its glycoprotein that has sequestering effect for soluble (IL-6) (PYB, et al., 2007), and may cause a decrease in the level of soluble (IL-6). These results consistent also with (Gibbons et al., 1983) that terminal sialic acid mucin glycoprotein cleavage creates a variety of carbohydrate linkages.

Correlation of salivary IL-6 with FSA in the sediment of partial edentulous may reveal the role of IL-6 in the regulation of the innate immune response to inflammation. This change in glycosylation of glycoprotein of free mucin induces IL-6 secretion. This result explores the suggestion of(Marcotte & Lavoie, 1998) that terminal sialic acid of free glycoprotein mucin is an important component of interaction with bacteria protein and prevents colonization by aggregation and swallowing and (McBride & Gisslow, 1977) who showed a correlation between the amounts of sialic acid released from normal saliva and its aggregating activity. Association may be due to IL-6 in modulation protein secretion and glycosylation as suggested by previous studies (Groux-Degroote et al., 2008), and (Chaudhury et al., 2016) that changes in glycosylation of mucin may induce interleukin 6 secretions.

These observations may reveal the anti-inflammatory role of IL-6 is consistent with (Tilg et al., 1997) that (IL-6) regulated acute phase proteins that have anti-inflammatory and immuno-suppressive properties, and may regulate the acute phase response negatively. Also (Schindler et al., 1990) concluded that IL-6 suppresses IL-1β and TNF production induced by LPS and may provide a negative feedback effect.

LIMITATION OF THE STUDY

Small sample size and lack of longitudinal monitoring of the changes in salivary biomarkers from the onset of periodontitis, progression, and treatment

CONCLUSION

The findings concluded that salivary sialic acid and IL-6 are oral inflammatory biomarkers in dentate periodontitis. Direction Balance of IL-6 toward pro and anti-inflammation can be diagnosed by sialic acid fraction, and affected by age (which determines the number of teeth, and salivary; flow rate and volume), and treatment history.

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CONFLICTS OF INTEREST

None.

REFERENCES

Al-Azzawi, S. I., Alwan, A. M., & Salal, R. H. (2013). Influence of age and gender on salivary flow rate in completely edentulous patients. *MDJ*, *10*(1), 64-68.

Alwan, A. H., Taher, M. G., Getta, H. A., & Hussain, A. A. (2015). Estimation of the level of Salivary Interleukin 6 (IL-6) and its' correlation with the clinical parameters in patients with periodontal diseases. *IOSR J Dent Med Sci*, *14*(9), 82-88.

Balto, K., Sasaki, H., & Stashenko, P. (2001). Interleukin-6 deficiency increases inflammatory bone destruction. *Infection and immunity*, *69*(2), 744-750.

Browning L. M., Mishra G.D., Cooke J.H., O'Connell M. A., Crook, M., A., et al. (2004). Elevated sialic acid, but not CRP, predicts features of the metabolic syndrome independently of BMI in women. *Int J Obes Relat Metab Disord*, *28*, 1004-1010

Carranza,F.A., Takei, H.H., Clinical diagnosis. In: Carranza's Clinical Periodontology. Michael G. Newman, Henry H. Takei, Fermin A. Carranza, Perry R. Klokkevold (editor) . Saunders Elsevier, 2006. Middle East and African Edition. P. 540-560

Chaudhury, N. M. A., Proctor, G. B., Karlsson, N. G., Carpenter, G. H., & Flowers, S. A. (2016). Reduced mucin-7 (Muc7) sialylation and altered saliva rheology in Sjögren's syndrome associated oral dryness. *Molecular & Cellular Proteomics*, *15*(3), 1048-1059.

Davidson College. Protein determination – Lowry Procedure. *Biology* 371. Davidson NC 28036; 2000

Ebersole, J. L., & Cappelli, D. (2000). Acute-phase reactants in infections and inflammatory diseases. *Periodontology 2000*, *23*(1), 19-49.

Gani, D. K., Lakshmi, D., Krishnan, R., & Emmadi, P. (2009). Evaluation of C-reactive protein and interleukin-6 in the peripheral blood of patients with chronic periodontitis. *Journal of Indian Society of Periodontology*, *13*(2), 69-69.

Geivelis, M., Turner, D. W., Pederson, E. D., & Lamberts, B. L. (1993). Measurements of interleukin-6 in gingival crevicular fluid from adults with destructive periodontal disease. *Journal of periodontology*, *64*(10), 980-983.

Gemmell, E., & Seymour, G. J. (2004). Immunoregulatory control of Th1/Th2 cytokine profiles in periodontal disease. *Periodontology 2000*, *35*(1), 21-41.

Gibbons, R. J., Etherden, I., & Moreno, E. C. (1983). Association of neuraminidase-sensitive receptors and putative hydrophobic interactions with high-affinity binding sites for Streptococcus sanguis C5 in salivary pellicles. *Infection and immunity*, *42*(3), 1006-1012.

Goutoudi, P., Diza, E., & Arvanitidou, M. (2004). Effect of periodontal therapy on crevicular fluid interleukin-1β and interleukin-10 levels in chronic periodontitis. *Journal of dentistry*, *32*(7), 511-520.

Goutoudi, P., Diza, E., & Arvanitidou, M. (2012). Effect of periodontal therapy on crevicular fluid interleukin-6 and interleukin-8 levels in chronic periodontitis. *International journal of dentistry*, *2012*.;2012:362905. doi: 10.1155/2012/362905.

Groux-Degroote, S., Krzewinski-Recchi, M.-A., Cazet, A., Vincent, A., Lehoux, S., Lafitte, J.-J., Van Seuningen, I., & Delannoy, P. (2008). IL-6 and IL-8 increase the expression of glycosyltransferases and sulfotransferases involved in the biosynthesis of sialylated and/or sulfated Lewisx epitopes in the human bronchial mucosa. *Biochemical Journal*, *410*(1), 213-223.

Jawzali, J. I. (2016). Association between salivary sialic acid and periodontal health status among smokers. *The Saudi dental journal*, *28*(3), 124-135.

Jawzaly,J.I.,Hasan,H.G.,Ahmed,B.M (2012). Levels of salivary biochemical's in periodontitis and related diseases. *Duhok Med J*, *6*(4), 86-86.

Lin, S.-J., Chen, Y.-L., Kuo, M. Y.-B., Li, C.-L., & Lu, H.-K. (2005). Measurement of gp130 cytokines–Oncostatin M and IL-6 in gingival crevicular fluid of patients with chronic periodontitis. *Cytokine*, *30*(4), 160-167.

Löe, H. (1967). The gingival index, the plaque index and the retention index hsystems. *The Journal of Periodontology*, *38*(6), 610-616.

Marcotte, H., & Lavoie, M. C. (1998). Oral microbial ecology and the role of salivary immunoglobulin A. *Microbiology and molecular biology reviews*, *62*(1), 71-109.

Masami, S. (1989). Method of measuring lipid bound sialic acid. United states Patent 4837144.

McBride, B. C., & Gisslow, M. T. (1977). Role of sialic acid in saliva-induced aggregation of Streptococcus sanguis. *Infection and immunity*, *18*(1), 35-40.

Miller, C. S., King Jr, C. P., Langub, M. C., Kryscio, R. J., & Thomas, M. V. (2006). Salivary biomarkers of existing periodontal disease: a cross-sectional study. *The Journal of the American Dental Association*, *137*(3), 322-329.

Murata T, Mizaki H., Senpuku H., Hanada N., (2001). Periodontitis and serum interleukin-6 levels in the elderly. *Jpn J Infect Dis*, *54*(2), 69-71. https://pubmed.ncbi.nlm.nih.gov/11427744/.

Murray, P. A., Levine, M. J., Reddy, M. S., Tabak, L. A., & Bergey, E. J. (1986). Preparation of a sialic acid-binding protein from Streptococcus mitis KS32AR. *Infection and immunity*, *53*(2), 359-365.

PYB, N.g,., Donley, M., Hausmann, E., Hutson, A. D., Rossomando, E. F., & Scannapieco, F. A. (2007). Candidate salivary biomarkers associated with alveolar bone loss: cross-sectional and in vitro studies. *FEMS Immunology & Medical Microbiology*, *49*(2), 252-260.

Nibali, L., Fedele, S., D'aiuto, F., & Donos, N. (2012). Interleukin-6 in oral diseases: a review. *Oral diseases*, *18*(3), 236-243.

Periodontitis, O. (2015). American Academy of Periodontology Task Force report on the update to the 1999 classification of periodontal diseases and conditions. *J Periodontol*, *86*(7), 835-838.

Persson, R. E., & Persson, G. R. (2005). The elderly at risk for periodontitis and systemic diseases. *Dental Clinics*, *49*(2), 279-292.

Rhodus, N. L., Ho, V., Miller, C. S., Myers, S., & Ondrey, F. (2005). NF-κB dependent cytokine levels in saliva of patients with oral preneoplastic lesions and oral squamous cell carcinoma. *Cancer detection and prevention*, *29*(1), 42-45.

Robertst, I. S. (1995). Bacterial polysaccharides in sickness and in health. *Microbiology*, *141*, 2023-2031.

Saxer, U. P., & Mühlemann, H. R. (2004). Epidemiology of periodontal diseases. *periodontology: Muelle HP*, 38-46.

Schindler, R., Mancilla, J., Endres, S., Ghorbani, R., Clark, S. C., & Dinarello, C. A. (1990). Correlations and interactions in the production of interleukin-6 (IL-6), IL-1, and tumor necrosis factor (TNF) in human blood mononuclear cells: IL-6 suppresses IL-1 and TNF.

Shahid S.M, & Mahboob T. (2006). Correlation Between Frequent risk Factors of Diabetic Nephropathy and Serum Sialic Acid. *Asian J Biochem*, *1*, 244-250. https://doi.org/10.3923/ajb.2006.244.250

Shaker, Z. F., & Hashem, B. H. (2012). Study the role of proinflammatory and anti-inflammatory cytokines in Iraqi chronic periodontitis patients. *J Bagh Col Dent*, *24*(1), 164-169.

Shetty,P.K., & Pattabiraman,T. N.(2004).Salivary glycoproteins as indicators of oral diseases. *Indian Journal of Clinical Biochemistry*, *19*(1), 97-101.

Shinohara, M., Ohura, K., Ogata, K., Inoue, H., Miyata, T., & Yoshioka, M. (1994). The relationship between the sialic acid concentrations in the serum and whole saliva in rats with naturally occurring gingivitis. *The Japanese Journal of Pharmacology*, *64*(1), 61-63.

Skoza, L., & Mohos, S. (1976). Stable thiobarbituric acid chromophore with dimethyl sulphoxide. Application to sialic acid assay in analytical de-O-acetylation. *Biochemical Journal*, *159*(3), 457-462.

Slade, G. D., Offenbacher, S., Beck, J. D., Heiss, G., & Pankow, J. S. (2000). Acute-phase inflammatory response to periodontal disease in the US population. *Journal of dental research*, *79*(1), 49-57.

Soell, M., Holveck, F., Schöller, M., Wachsmann, R. D., & Klein, J.-P. (1994). Binding of Streptococcus mutans SR protein to human monocytes: production of tumor necrosis factor, interleukin 1, and interleukin 6. *Infection and immunity*, *62*(5), 1805-1812.

Stuart, A. D., & Brown, T. D. K. (2007). α2, 6-Linked sialic acid acts as a receptor for feline calicivirus. *Journal of general virology*, *88*(1), 177-186.

Tilg, H., Dinarello, C. A., & Mier, J. W. (1997). IL-6 and APPs: anti-inflammatory and immunosuppressive mediators. *Immunology today*, *18*(9), 428-432.

Yaghobee, S., Khorsand, A., Ghohroudi, A. A. R., Sanjari, K., & Kadkhodazadeh, M. (2014). Assessment of interleukin-1beta and interleukin-6 in the crevicular fluid around healthy implants, implants with peri-implantitis, and healthy teeth: a cross-sectional study. *Journal of the Korean Association of Oral and Maxillofacial Surgeons*, *40*(5), 220-224.

Zhang, Y. F., Zheng, J., Zheng, L., & Zhou, Z. R. (2016). Influence of centrifugation treatment on the lubricating properties of human whole saliva. *Biosurface and Biotribology*, *2*(3), 95-101.

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