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Oral Inflammation and The Role of Cytokine

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ABSTRACT

Acute inflammation becomes chronic when inflammation prolongs. Oral inflammation can develop become chronic and can be serious disease. Cytokines are small secreted proteins released by cells have a specific effect on the interactions and communications between cells. Based on studied that cytokine can be one of markers of inflammation. In many diseases cytokines can be biomarkers of inflammation and recently many studies use cytokines as one of the biomarkers in additional examination for their studies.

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1. INTRODUCTION

The characteristics of Inflammation are the heat (color), pain (dolor), redness (rubor), swelling (tumor), and loss of function, that characterize the clinical symptoms of inflammation as they were defined in the first century AD by the Roman scholar Celsus. Reverse to Centers for Disease Control and Prevention (CDC) oral health is the health of the teeth, gums, and the entire oral-facial system that allows us to smile, speak, and chew. Some of the most common disease that impact our oral health include cavities (tooth decay), gum (periodontal) disease, and oral cancer [(1)]. Sequera et al. 2020 reported that the role of the immune system and inflammation in the initiation, promotion and progression of oncologic pathology of the oral cavity has deserved maximum attention from the scientific community. Pro-inflammatory factors associated with immunosuppression are closely related to oral oncogenesis and poor prognosis. The chronic inflammation can contribute to modulate and amplify risk factors actions [(2)].

There are pro-inflammatory cytokines that play a role in inflammation such as s such as interleukin 1-b (IL1-b), tumor necrosis factor (TNF-a) and interleukin 6 (IL-6). Zhang and An (2007) described that Inflammation is an immune response of the body and also being the gateway for many diseases. Acute inflammation becomes chronic when inflammation prolongs. One of the inflammatory mediators is cytokine. Cytokines are small secreted proteins released by cells have a specific effect on the interactions and communications between cells. Cytokines may act on the cells that secrete them (autocrine action), on nearby cells (paracrine action), or in some instances on distant cells (endocrine action) [(3)] . Oral inflammation can cause by many factors such as high antigenic exposure (to food or microbial flora), physiologic micro trauma related to mastication of food, and the range of dental pathology to which small companion animals. Besides that, systemic pathology (e.g., uremia) may also contribute to the likelihood of clinical expression of oral inflammation [(4)]. In this review we can describe oral inflammation and role of cytokine generally in oral cavity.

2. METHOD

This review was carried out by following several stages, namely determining the PICO analysis (Patient/Population, Intervention, Comparison, Outcome) and searching for data sources. Research articles was conducted on Pubmed using a combination of the following keywords: “Oral Cavity Inflammation and Cytokine” and the articles published less than 10 years. We found 2899 journal with that keywords in PubMed. For the final result article will select with characteristic especially in publication year, journal type, and base on title and topic.

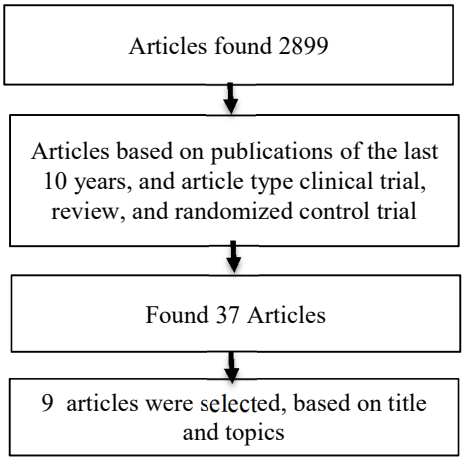

Figure 1. Process of literature review

3. RESULTS AND DISCUSSION

Result of this study based on analysis the articles showed that that inflammation in oral cavity can cause of many factors, and one of the markers in this case in cytokine. Table. 1 showed that cytokine can be mediators in many result of the research:

Table 1. Oral Inflammation and Cytokine Studies

Result	The Biomarkers	Autors (years)
Inflammation can be one of contributors for development of chronic disease especially in oral cancer.	The treatment can reduce **IL-1β, IL-6, and IL-8** concentrations and suggested that APG-157 could serve as a therapeutic drug in combination with immunotherapy.	Basak, et al 2020[5]
mediators are released from the pulp tissue because of bacterial invasion which causes inflammation. The biomarkers can be a promising tool to evaluate pulp tissue health or even in pulpitis treatment.	**IL-1α, IL-rα, IL4, IL-7, IL-12p40, IL-13 and IL-15**	Dutza, et al. 2016 [6]
The in vitro study periodontal research showed that EMD and its high and low molecular weight fractions reduced the secretion of pro-inflammatory cytokines and chemokines compared to untreated cells	**TGF-α, IL-4** were reduced with control group. But **IL-6** was also significantly increased	Villa, et al. 2016 [7]
Patients with gingivitis/periodontitis examined plasma. On the contrary, the bacterial counts at day 10 showed reductions in red and orange complex bacteria known to be highly associated with periodontal disease	The plasma test showed that proinflammatory cytokines, example **interleukin (IL)-1β, IL-6, tumor necrosis factor-alpha, and interferon gamma**.	Hasturk, et al 2021[8]
Strict control of supra gingival biofilm has a limited effect on systemic inflammatory markers, and	serum levels of **interleukin (IL)-6, IL-17A, IL-8, tumor necrosis factor α (TNF-α),**	Artese, et al 2015 [9]

a moderate effect on periodontal clinical parameters.	monocyte chemoattractant protein (MCP)-1 were obtained at baseline at 6 months post-therapy and there was a change	
The dental pulp is equipped to express numerous mediators of inflammation, which can combat irritating factors	**IL-1a, IL-1b, IL-2, IL-4, IL-6, IL-7, IL-8, IL-12p40, IL-13, IL-15, IL-18, TNF-a**	Rechenberg, et al. 2016 [10]
Periodontitis is one of the most common human inflammatory diseases in oral cavity	in the lesions of human chronic periodontitis, expression of the **cytokine interleukin (IL-) 17 and an abundance of T helper (Th) 17** cells have been reported	Dutzan, et al 2018[11]
The level of salivary IL-1β positively correlates with oral bacterial load among orthodontic patients; the relationship between inflammatory cytokines and oral microflora deserved further study	**IL-1β**	Chen, et al. 2020 [12]
salivary cytokines are associated with oral inflammation, it will be a potential biomarkers for disease diagnosis and treatment efficacy	Pro-inflammatory cytokines including **interleukin (IL)-1β, IL-2, IL-6 and tumor necrosis factor (TNF)-α** were associated with the severity of oral mucosal tissue damage	Diesch et al 2021[13]

The pathways of the disease have clinical manifestations. When a tissue is infected or damaged, an inflammation will form and the surrounding cells will respond. Inflammation indicates of a cell or tissue has a problem. These changes can certainly return to normal, and certain treatment is needed. Human saliva is a complex fluid secreted by the salivary glands and gingiva. It contains proteins, including cytokines, organic and inorganic substances[13]. In many studies reported that oral inflammation can develop become chronic inflammation and it will become tumor and cancer. Many factors can contribute for that cases. One of factor is microbiota, and it has been proposed that bacterial infection influences inflammation and promotes cancer development[5]. Periodontitis is characterized by sub gingival biofilm dysbiosis, inflammation and tissue destruction and can stimulated inflammatory disease by microbe. Periodontitis is chronic form is one of the most common human inflammatory diseases in oral cavity. The hallmark of periodontitis is immune-mediated destruction of tooth supporting structures. Cytokines can respond to improvements in clinical status for this disease [6,14]. Some of the wound can heal or recover. Oral mucosal wound healing follows a well described pathway of hemostasis, infammation, proliferation and remodeling, regulated by a complex network of growth factors, cytokines and chemokines [15]. IL-1 and IL-2 showed potential as natural immunostimulants. Clinical and experimental studies supported the hypothesis that immunestimulant cytokines could be helpful in neutralizing the immunesuppression of cancer and AIDS. But in this study reported that that was effects for TNF-α for cancer patients. However, the disturbing inflammatory response of cytokines like IL-1, IL-2, IL-3, IL-4, IL-6, IL-12 or TNF-α in human resulted in the side lining of such therapy[16]. In many diseases cytokines can be biomarkers of inflammation and recently many studies use cytokines as one of the biomarkers in additional examination for their parameter.

4. CONCLUSION

Based on finding review oral inflammation can cause of many factors and one of the marker for this case if cytokine. One of the immune response in intercellular messengers is cytokine, they will in they integrate function of several cell types in various body compartments into a coherent immune response. The development of science is one of the efforts to further study of the role of cytokines. Research on oral inflammation and association with many cytokines needs to be developed.

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