Abstract: Background and Objectives: Interferon-gamma (IFN-γ)/interleukin-4 (IL-4) ratio may indicate a change in the immune response with a potential pathological effect presented in oral lichen planus (OLP) patients. Herein, this meta-analysis evaluated the role of serum and salivary interferon-gamma/interleukin-4 ratio in the severity and development of OLP. Materials and Methods: The Scopus, Cochrane Library, PubMed, and Web of Science databases were systematically searched to retrieve the relevant studies published up from the database inception to March 2019. The crude mean difference (MD) and 95% confidence interval (CI) were calculated by RevMan 5.3 software using a random-effects model. A sensitivity analysis was performed on the results using the CMA 2.0 software. A total of 98 studies were retrieved from the databases, of which at least seven studies were included in this meta-analysis. Results: The findings showed that the pooled MDs of serum and salivary IFN-γ/IL-4 ratio were −0.22 (95% CI: −1.16, 0.72; p = 0.64) and 0.17 (95% CI: −1.50, 1.84; p = 0.84) in OLP patients compared to controls, respectively. In addition, the pooled MDs of serum and salivary IFN-γ/IL-4 ratio were −0.15 (95% CI: −0.53, 0.23; p = 0.43) and −0.39 (95% CI: −0.63, −0.15; p = 0.001) in patients with erythematous/ulcerative subtype compared to patients with reticular subtype, respectively. Conclusions: In conclusion, the results of meta-analysis demonstrated that serum and salivary IFN-γ/IL-4 ratio cannot play a major role in OLP development and severity.

Keywords: oral lichen planus; ratio; interferon-gamma; interleukin-4; meta-analysis
1. Introduction

Oral lichen planus (OLP) is a chronic inflammatory disorder of oral mucosa that affects 0.5% to 4% of the general population [1], two to three times more frequently in females than in males [2], especially in females over the age of 40 years [3]. The OLP etiology is still unclear [3,4], but additional evidence suggests an immune response to T cells against epithelial cells [4]. OLP is associated with various other systemic diseases and conditions [5]. This disease has several clinical manifestations including reticular, plaque-like, papular, bullous, erythematous, and erosive/ulcerative forms [6]. The reticular is the most common type of OLP and yet it is characterized by low/moderate immune response compared with other forms, whereas the erosive and erythematous are less common and cause more serious symptoms [7]. T helper (Th) cells are classified into two subtypes (Th1 and Th2) according to cytokine production [8]. Interferon-gamma (IFN-γ) is a soluble dimer cytokine, also called active macrophage factor [9], which causes an inflammatory response and apoptotic cell death [10]. This cytokine plays an important role in consistent and inherent immunity, particularly against tumor control, viral infection, and intracellular bacteria [11]. Interleukin-4 (IL-4) is a major immunomodulatory cytokine that is mainly included in adaptive immunity [12]. This interleukin is involved in the activation of B and T cells, humoral immune response, and reduction of pathological inflammation [13]. IFN-γ and IL-4 are assessed to be the characteristic cytokines created by Th1 and Th2 cells, respectively [14]. As IFN-γ prevents the expression of Th2 cytokines such as IL-4 and vice versa, the IFN-γ/IL-4 ratio is considered to be a straightforward indicator of Th1/Th2 balance [15]. The variation of IFN-γ, IL-4, or IFN-γ/IL-4 ratio may indicate a change in the immune response with a potential pathological effect presented in OLP patients [8,16]. The purpose of this meta-analysis was to evaluate the role of serum and salivary interferon-gamma/interleukin-4 ratio in the severity and development of OLP.

2. Materials and Methods

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol was used to design the present meta-analysis [17].

2.1. Search Strategy

The Scopus, Cochrane Library, PubMed/Medline, and Web of Science databases were searched to retrieve the relevant studies published from the database inception to March 2019. The search terms were (“oral lichen planus” OR “OLP”) AND (“interleukin-4” OR “IL-4”) AND (“Interferon-gamma” OR “IFN-gamma” OR “IFN-γ” OR “Interferon-γ” OR “IFN” OR “Interferon”) without any restriction. In addition, we searched the references of the retrieved studies related to the topic to make sure no study was missed.

2.2. Study Selection

One author (M.S.) retrieved the articles in the databases. He assessed the titles and abstracts of the relevant articles and uploaded and screened the full-texts of the articles that met our eligibility criteria. After the full-text screening, the reason for exclusion was mentioned for any study excluded. Another author (H.R.M.) independently re-investigated the full-texts. The disagreements between the two authors were resolved by discussion.

2.3. Eligibility Criteria

The eligibility criteria were: (I) studies including both case (OLP patients) and healthy control groups and (II) studies reporting IFN-γ/IL-4 ratio in saliva and/or serum. Studies including just case group, trials, commentaries, letters to the editor, case reports, reviews, systematic reviews, and conference papers did not meet the eligibility criteria.
2.4. Data Extraction

The data was extracted from each study by one author (M.S.) and analyzed in the meta-analysis are presented in Table 1. Another author (M.M.) independently re-checked them and if there was an error, he corrected it.

2.5. Quality Assessment

The quality assessment of each study was performed by the Newcastle–Ottawa scale (NOS) [18]. A study with a score ≥7 had high quality. The quality evaluation was independently carried out by two authors (M.S. and M.M.I.) and the results of both authors were similar.

Table 1. Characteristics of the studies included in the meta-analysis (n = 7).

| The First Author, Year | Country | Mean Age (OLP/Control) | Male:Female (OLP/Control) | No. of OLP Patients | No. of Controls | Method | Sample |
|------------------------|---------|------------------------|---------------------------|---------------------|----------------|--------|--------|
| Tao, 2008 [19]         | China   | 46.5/26.9              | 12:7/4:3                  | 19                  | 7              | ELISA kit (eBioscience Inc., San Diego, CA, USA) | Saliva |
| Liu, 2009 [20]         | China   | 46/41                  | 37:42/20:21               | 79                  | 41             | ELISA kit (R&D Systems Inc., Minneapolis, MN, USA) | Saliva |
| Ding, 2014 [21]        | China   | 45/43                  | 15:21/7:12                | 36                  | 19             | ELISA kit (BioLegend, Inc., San Diego, CA, USA) | Serum |
| Liu, 2014 [22]         | China   | 45/42                  | 25:35/19:21               | 60                  | 40             | ELISA kit (R&D Systems Inc., Minneapolis, MN, USA) | Serum and Saliva |
| Malekzadeh, 2015 [23]  | Iran    | 41.5/37                | 25:38/30:33               | 63                  | 63             | ELISA kit (eBioscience Inc., San Diego, CA, USA) | Saliva |
| Wang, 2015 [13]        | China   | 53/54                  | 4:31/4:31                 | 35                  | 35             | ELISA kit (R&D Systems Inc., Minneapolis, MN, USA) | Serum |
| Wei, 2018 [4]          | China   | 56.3/51.2              | 9:32/6:8                  | 41                  | 14             | BD™ CBA Human Enhanced Sensitivity Flex Sets | Saliva |

Abbreviations: OLP, oral lichen planus; ELISA, enzyme-linked immunosorbent assay; CBA, cytometric bead array.

2.6. Statistical Analysis

The crude mean difference (MD) and 95% confidence interval (CI) were obtained for each study by Review Manager 5.3 (RevMan 5.3; The Cochrane Collaboration, Oxford, UK) to show the strength of the results. A Z test was applied to assess the significance of the pooled MD, with a p-value (2-tailed) of less than 0.05. Heterogeneity was estimated using the chi-squared ($\chi^2$, or Chi$^2$) test, the Tau$^2$ (the variance of the true effect sizes), and the $I^2$ statistic such that $p < 0.1$ ($I^2 > 50\%$) showed a significant heterogeneity; therefore, we used the random-effects model. The funnel plot analysis was done using the Comprehensive Meta-Analysis version 2.0 (CMA 2.0; Biostat Inc, Englewood, NJ, USA) software using both Egger’s and Begg’s tests, $p < 0.05$ (2-tailed) being considered the significance degree of publication bias. We used the removal of one study, cumulative analysis, and omission of an outlier to evaluate the stability/consistency of the results.
3. Results

3.1. Study Selection

A total of 98 studies were retrieved from the databases (Figure 1). After excluding the duplicate studies, 42 studies were screened. Out of all screened studies, 30 non-relevant studies were excluded, among which the full-texts of 12 studies were assessed. Five studies were excluded with reasons during the full-text assessment (one study was without a control group, one study was merely an abstract, one study included IFN-γ mRNA/IL-4 mRNA ratio, one study reported the ratio in peripheral blood mononuclear cells, and one study reported the ratio in exosomes). At last, seven studies were analyzed in the present meta-analysis. In addition, we checked the references of original and review articles related to the subject in order to find possible missed studies.

*Figure 1.* Flow-chart of the present study.
3.2. Study Characteristics

We extracted the characteristics of seven studies involved in the meta-analysis (Table 1). The studies had been published from 2008–2018, from which six studies were from China [4,15,19–22] and one study from Iran [23]. Four studies [4,19,20,23] reported the ratio in saliva, two studies [15,21] in serum, and one study [22] in both saliva and serum. Out of all studies, the measurement method of IFN-γ and IL-4 for calculating the IFN-γ/IL-4 ratio was enzyme-linked immunosorbent assay (ELISA) in six studies [15,19–23] and cytometric bead array in one study [4].

3.3. Meta-Analysis Report

3.3.1. OLP vs. Control (Serum)

Figure 2 shows the pooled MD of serum IFN-γ/IL-4 ratio in 131 patients with OLP compared to 94 controls, which was −0.22 (95% CI: −1.16, 0.72; p = 0.64; I² = 95% (p < 0.00001)). Therefore, the results did not show a significant difference between the two groups.

![Figure 2. Forest plot of serum interferon-gamma/interleukin-4 (IFN-γ/IL-4) ratio in the patients with oral lichen planus compared to the controls.](image)

3.3.2. OLP vs. Control (Saliva)

Figure 3 shows the pooled MD of salivary IFN-γ/IL-4 ratio in 262 patients with OLP compared to 165 controls, which was 0.17 (95% CI: −1.50, 1.84; p = 0.84; I² = 99% (p < 0.00001)). Therefore, the results showed no significant difference between the two groups.

![Figure 3. Forest plot of salivary IFN-γ/IL-4 ratio in the patients with oral lichen planus compared to the controls. Patients with erythematous/ulcerative subtype vs. reticular subtype (serum).](image)

Figure 4 shows the pooled MD of serum IFN-γ/IL-4 ratio in 60 patients with erythematous/ulcerative subtype compared to 36 patients with reticular subtype. The pooled MD was −0.15 (95% CI: −0.53, 0.23; p = 0.43; I² = 85% (p = 0.009)). Therefore, the results showed no significant difference between the two subtypes.
confirmed that salivary IFN-γ ratio in patients with OLP compared to controls and also salivary IFN-γ ratio being higher in reticular patients than patients with erythematous/ulcerative subtype because there were less than three studies. In addition, we omitted one outlier of the salivary IFN-γ ratio in the patients with OLP compared to controls. Therefore, the results demonstrated a significant difference between the two subtypes, salivary IFN-γ/IL-4 ratio being higher in reticular subtype than erythematous/ulcerative subtype.

3.4. Sensitivity Analysis

Sensitivity analyses, including the removal of one study, and cumulative analysis were performed on the previous results, which did not change the results. Therefore, these sensitivity analyses showed the stability of the results. We could not do these sensitivity analyses on the serum IFN-γ/IL-4 ratio in the patients with OLP compared to controls and also salivary IFN-γ/IL-4 ratio in patients with erythematous/ulcerative subtype compared to patients with reticular subtype because there were less than three studies. In addition, we omitted one outlier of the salivary IFN-γ/IL-4 ratio in patients with OLP compared to controls and also salivary IFN-γ/IL-4 ratio in patients with erythematous/ulcerative subtype compared to patients with reticular subtype (Table 2). The results confirmed that salivary IFN-γ/IL-4 ratio was significantly higher in patients with reticular subtype than patients with erythematous/ulcerative subtype (p = 0.0009).

Table 2. Sensitivity analysis for the pooled random-effects mean difference (MD) estimates in the subgroups.

| Subgroup                         | Omitted Study | Removed Reason | Z    | p     | Heterogeneity | MD      | 95%CI (min, max) |
|----------------------------------|---------------|----------------|------|-------|---------------|---------|-----------------|
| OLP vs. Control (saliva)         | Wei, 2018     | Outlier study  | 0.17 | 0.86  | 99%           | 0.15    | -1.51, 1.80     |
| Erythematous/ulcerative vs. Reticular (saliva) | Tao, 2008      | Outlier study  | 3.31 | 0.0009 | 81%           | -0.40   | -0.64, -0.16    |

Figure 4. Forest plot of serum IFN-γ/IL-4 ratio in the patients with erythematous/ulcerative patients compared to reticular patients. Patients with erythematous/ulcerative subtype vs. reticular subtype (saliva).

Figure 5 shows the pooled MD of salivary IFN-γ/IL-4 ratio in 141 patients with erythematous/ulcerative subtype compared to 80 patients with reticular subtype. The pooled MD was -0.39 (95% CI: -0.63, -0.15; p = 0.001; I² = 75% (pI² = 0.007)). Therefore, the results demonstrated a significant difference between the two subtypes, salivary IFN-γ/IL-4 ratio being higher in reticular subtype than erythematous/ulcerative subtype.

Table 3. Sensitivity analysis for the pooled random-effects mean difference (MD) estimates in the subgroups.
3.5. Quality Assessment

The quality assessment showed that all studies had high quality, with the mean quality of 7.7 (Table 3).

| The First Author (year) | Selection | Comparability | Exposure | Total Points |
|-------------------------|-----------|---------------|----------|--------------|
| Tao, 2008 [19]          | ***       | *             | ***      | 7            |
| Liu, 2009 [20]          | ****      | **            | ***      | 9            |
| Ding, 2014 [21]         | ***       | **            | ***      | 8            |
| Liu, 2014 [22]          | ***       | *             | ***      | 7            |
| Malekzadeh, 2015 [23]   | ***       | **            | ***      | 8            |
| Wang, 2015 [15]         | ***       | **            | ***      | 8            |
| Wei, 2018 [4]           | ***       | *             | ***      | 7            |

4. Discussion

Immunological mechanisms can play an important role in the pathogenesis of OLP [24]. Cytokine ratio is reviewed to be a straightforward indicator of Th1/Th2 balance [25]. The present study checked the serum ratio of IFN-γ/IL-4 in OLP patients compared to controls and also erythematous/ulcerative subtype compared to reticular subtype. The results showed no significant difference between groups except for the salivary ratio of IFN-γ/IL-4 in erythematous/ulcerative subtype compared to reticular subtype, the ratio being higher in reticular subtype than another subtype.

Out of three studies reporting the serum ratio of IFN-γ/IL-4 [15,21,22], two studies [21,22] showed a significantly decreased ratio and one study [15] a significantly elevated ratio in OLP patients compared to controls. Out of five studies reporting the salivary ratio of IFN-γ/IL-4 [4,19,20,22,23], two studies [20,22] showed a significantly decreased ratio and two studies [19,23] a significantly elevated ratio in OLP patients compared to controls. Comparing serum IFN-γ/IL-4 ratio between OLP subtypes in two studies [21,22], one study [22] showed a significantly decreased ratio in erythematous/ulcerative subtype compared to reticular subtype. Further, comparing salivary IFN-γ/IL-4 ratio between OLP subtypes in four studies [19,20,22,23], two studies [20,23] showed a significantly decreased ratio in erythematous/ulcerative subtype compared to reticular subtype. Therefore, some results indicated that Th1 cell is more dominant than the Th2 cell [23]. However, the meta-analysis showed no significant difference between groups except for the salivary ratio of IFN-γ/IL-4 in erythematous/ulcerative subtype compared to reticular subtype, the ratio being higher in reticular subtype than another. In addition, the analyses had a high heterogeneity and low studies included in each analysis could be one of the reasons for this heterogeneity. Therefore, the readers should pay attention to this point and further studies are needed to prove this difference.

Tao et al. [19] indicated the IFN-γ/IL-4 ratio could partly increase the IL-4 response, but the results did not support the hypothesis that Th1/Th2 imbalance is associated with the OLP development. However, the Th1 and Th2 responses coexist in OLP pathogenesis [26,27]. One study [21] identified that Golli-MBP (human Golli-myelin basic protein) was suspected to play a role in the etiology of autoimmune diseases and the gene expression ratio of IFN-γ/IL-4, and increased Golli-MBP was related to a lower ratio of IFN-γ/IL-4 in OLP patients.

A recent meta-analysis reported no significant differences in serum and salivary levels of IFN-γ between both OLP and control groups as well as erosive and non-erosive types in the saliva [28]. Zhou et al. [29] described the pathway of programmed death-1 (PD-1) and its ligand B7-H1, which may be implicated in OLP and have an important function in the negative modulation of T cell-mediated immune response, thus reducing serum IL-4 level in OLP. The Th1/Th2 cell imbalance may impact the OLP pathogenesis and elevate IL-4 level in OLP patients [23,30]. Malekzadeh et al. [23] suggested that Th1 cells were a dominant factor in cytokine secretion, but they could not be a causative agent.
and responsible for Th1/Th2 cell imbalance. Two studies [12,31] showed a correlation between polymorphism and cytokine secretion.

Therefore, genetic factors (polymorphisms), the subtype of OLP, and other cytokines can affect the IFN-γ/IL-4 ratio. Yet, future studies are needed to focus on these effects and their association with one another. None of the studies analyzed in the meta-analysis reported the association of age and sex with the IFN-γ/IL-4 ratio. The researchers need to pay more attention to this issue in the future. Nevertheless, the present meta-analysis had several limitations, including low study sample size, different percentages of subtypes of OLP between the studies, high heterogeneity in the analyses, and lack of publication bias with strong results due to a few studies included in each analysis. In contrast to these limitations, the meta-analysis had two strengths, including high-quality studies and the stability of the results.

5. Conclusions

The results demonstrated that the serum and salivary ratio of IFN-γ/IL-4 cannot play a pivotal role in OLP development and severity. However, more studies in the future are needed to confirm this result with an emphasis on the factors involved in IFN-γ/IL-4 ratio.

**Author Contributions:** Conceptualization, H.R.M. and M.S. (Mohsen Safaei); Methodology, M.S. (Mohsen Safaei); Software, H.R.M. and M.S. (Mohsen Safaei); Validation, P.L.-J.; Formal Analysis, M.S. (Mohsen Safaei); Investigation, M.M.; Writing—Original Draft Preparation, M.S. (Mohsen Safaei); Writing—Review and Editing, M.M.I., M.S. (Masoud Sadeghi), R.S., H.M., A.G., and L.J.; Visualization, P.L.-J.; Supervision, H.R.M.; Project Administration, H.R.M. and M.M.I.

**Funding:** The authors gratefully acknowledge the Research Council of Kermanshah University of Medical for the financial support (grant number: 980122).

**Acknowledgments:** This work was performed in partial fulfillment of the requirements for the degree of general dentistry by “Maryam Molavi” at the Faculty of Dentistry, Kermanshah University of Medical Sciences, Kermanshah, Iran.

**Conflicts of Interest:** The authors declare no conflict of interest.

**References**

1. Sugerman, P.B.; Savage, N.W.; Walsh, L.J.; Zhao, Z.Z.; Zhou, X.J.; Khan, A.; Seymour, G.J.; Bigby, M. The pathogenesis of oral lichen planus. Crit. Rev. Oral. Biol. Med. 2002, 13, 350–365. [CrossRef] [PubMed]
2. Alrashdan, M.S.; Cirillo, N.; McCullough, M. Oral lichen planus: A literature review and update. Arch. Dermatol. Res. 2016, 308, 539–551. [CrossRef] [PubMed]
3. Lodi, G.; Scully, C.; Carrozzo, M.; Griffiths, M.; Sugerman, P.B.; Thongprasom, K. Current controversies in oral lichen planus: Report of an international consensus meeting. Part 2. Clinical management and malignant transformation. Oral. Surg. Oral. Med. Oral. Pathol. Oral. Radiol. Endod. 2005, 100, 164–178. [CrossRef] [PubMed]
4. Wei, W.; Sun, Q.; Deng, Y.; Wang, Y.; Du, G.; Song, C.; Li, C.; Zhu, M.; Chen, G.; Tang, G. Mixed and inhomogeneous expression profile of Th1/Th2 related cytokines detected by cytometric bead array in the saliva of patients with oral lichen planus. Oral. Surg. Oral. Med. Oral. Pathol. Oral. Radiol. Endod. 2018, 126, 142–151. [CrossRef] [PubMed]
5. Krupa, R.J.; Sankari, S.L.; Masthan, K.M.; Rajesh, E. Oral lichen planus: An overview. J. Pharm. Bioallied. Sci. 2015, 7, S158–S161. [CrossRef] [PubMed]
6. Georghe, C.; Mihai, L.; Parlatescu, I.; Tovaru, S. Association of oral lichen planus with chronic C hepatitis. Review of the data in literature. Maedica (Buchar) 2014, 9, 98–103. [PubMed]
7. Salgado, D.S.; Jeremiah, F.; Cappella, M.V.; Onofre, M.A.; Massucato, E.M.S.; Orrico, S.R.P. Plaque control improves the painful symptoms of oral lichen planus gingival lesions. A short-term study. J. Oral. Pathol. Med. 2013, 42, 728–732. [CrossRef] [PubMed]
8. Rhodus, N.L.; Cheng, B.; Ondrey, F. Th1/Th2 cytokine ratio in tissue transudates from patients with oral lichen planus. Mediators Inflamm. 2007, 2007, 19854. [CrossRef] [PubMed]
9. Gray, P.W.; Goeddel, D.V. Structure of human immune interferone gene. Nature 1982, 298, 859–863. [CrossRef]
10. Lee, S.H.; Kwon, J.Y.; Kim, S.Y.; Jung, K.; Cho, M.L. Interferon-gamma regulates inflammatory cell death by targeting necroptosis in experimental autoimmune arthritis. *Sci. Rep.* 2017, 7, 10133. [CrossRef]

11. Schoenborn, J.R.; Wilson, C.B. Regulation of interferon-gamma during innate and adaptive immune response. *Adv. Immunol.* 2007, 96, 41–101. [PubMed]

12. Anovazzi, G.; Medeiros, M.C.; Pigossi, S.C.; Finoti, L.S.; Souza Moreira, T.M.; Mayer, M.P.; Zanelli, C.F.; Valentini, S.R.; Rossa-Junior, C.; Scarel-Caminaga, R.M. Functionality and opposite roles of two interleukin 4 haplotypes in immune cells. *Genes Immun.* 2017, 18, 33–41. [CrossRef] [PubMed]

13. Hershey, G.K.; Friedrich, M.F.; Esswein, M.A.; Thomas, M.L.; Chatila, T.A. The association of atopy with systemic lupus erythematosus: Is tumor necrosis factor alpha protective? *Semin. Arthritis Rheum.* 2004, 33, 404–413. [CrossRef] [PubMed]

14. Moher, D.; Liberati, A.; Tetzlaff, J.; Altman, D.G.; PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PloS Med.* 2009, 6, e1000097. [CrossRef]

15. Wells, G.A.; Shea, B.; O’Connell, D.; Peterson, J.; Welch, V.; Losos, M.; Tugwell, P. The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Non-Randomised Studies in Meta-Analyses; Ottawa Hospital Research Institute: Ottawa, ON, Canada, 2011. Available online: http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp (accessed on 12 January 2016).

16. Moza

17. Malekzadeh, H.; Robati, M.; Yousefimanesh, H.; Ghafourian Boroujerdnia, M.; Nadripour, R. Salivary interferon-gamma and interleukin-4 in patients with oral lichen planus. *Oral. Dis.* 2014, 20, 205–211. [CrossRef]

18. Liu, W.Z.; He, M.J.; Long, L.; Mu, D.L.; Xu, M.S.; Xing, X.; Zeng, X.; Liao, G.; Dan, H.X.; Chen, Q.M. Interferon-γ and interleukin-4 detected in serum and saliva from patients with oral lichen planus. *Hippokratia* 2008, 12, 230–235. [PubMed]

19. Mozdafar, H.R.; Sharifi, R.; Hayati, M.; Imani, M.M.; Lopez-Jornet, P.; Golshah, A.; Moradpoor, H.; Rezaei, R.; Sadeghi, M. Evaluation of serum and salivary interferon-γ levels in patients with oral lichen planus: A systematic review and meta-analysis of case-control studies. *Oral. Surg. Oral. Med. Oral. Pathol. Oral. Radiol.* 2019, 127, 210–217. [CrossRef]
29. Zhou, G.; Zhang, J.; Ren, X.W.; Hu, J.Y.; Du, G.F.; Xu, X.Y. Increased B7-H1 expression on peripheral blood T cells in oral lichen planus correlated with disease severity. *J. Clin. Immunol.* 2012, 32, 794–801. [CrossRef]

30. Pekiner, F.N.; Demirel, G.Y.; Borahan, M.O.; Ozbayrak, S. Cytokine profiles in serum of patients with oral lichen planus. *Cytokine* 2012, 60, 701–706. [CrossRef]

31. Haukim, N.; Bidwell, J.L.; Smith, A.J.; Keen, L.J.; Gallagher, G.; Kimberley, R.; Huizinga, T.; McDermott, M.F.; Oksenberg, J.; McNicholl, J.; et al. Cytokine gene polymorphism in human disease: On-line databases, supplement 2. *Genes Immun.* 2002, 3, 313–330. [CrossRef]