

Incidence and Management of Allergy and Hypersensitivity Reactions in a Dental Institution

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Abstract

Introduction: Hypersensitivity reactions are an important hazard in healthcare. Modern dentistry depends on the use of drugs and materials widely known to elicit them. Such reactions are either immediate or non-immediate. The former carries the risk of anaphylaxis, whereas the latter includes potentially fatal severe cutaneous adverse reactions. This study aims to find out the incidence and management of allergy and hypersensitivity reactions.

Materials and Methods: All the cases reported for allergy and hypersensitivity reactions between June 2019 and Feb 2021 were considered in this study. The details of the patients who had allergy and hypersensitivity was retrieved from Dental Information Archiving System, SDC, SIMATS. All the radiographs were assessed, data recorded in excel and was subjected to statistical analysis.

Results: Out of 25 patients with allergy and hypersensitivity, 32% were male and 68% were female. About 32% of patients were at the age group of 40-50 years old. About 52% of patients were reported with type 1 hypersensitivity and about 56% of patients with allergy and hypersensitivity were prescribed with both antihistamines and corticosteroids.

Conclusion: The highest number of patients with allergy and hypersensitivity reported were females of age group 40-50 years old. Most of them reported a type 1 hypersensitivity reaction and most of them were prescribed with both antihistamines and corticosteroids.

Key words: Allergy • Hypersensitivity • Antihistamine • Corticosteroids • Innovative technique

Introduction

Practice of modern dentistry relies on the use of multiple drugs and different dental materials either with or without prosthetic purposes. Hypersensitivity reactions may arise from the use of both drugs and materials, being categorized according to Gell and Coombs hypersensitivity classification [1-2]. Dentists daily prescribe analgesics [paracetamol, NSAIDs and opioids] and antibacterial, which rival each other for the drug hypersensitivity reactions [3].

The incidence of severe allergy in the UK is increasing, with a reported increase in hospital admissions for severe allergy from one to seven cases per 100,000 populations per year between 1992 and 2012 [4]. This 700% increase is fortunately not associated with an increase in mortality rates, which are still very rare [5].

Although less frequently than drugs, dental materials are known to elicit hypersensitivity reactions. Although drugs can induce all 4 types of hypersensitivity, materials are mostly elicitors for type IV hypersensitivity. Metals are the most frequent allergen, but acrylates, epoxy resins, and others have also been found to elicit hypersensitivity reactions in the oral cavity [6].

In the case of nonmetallic dental materials, one should keep in mind that many compounds elicit inflammatory, rather than hypersensitivity reactions, these are irritant contact dermatitis/mucositis [7]. Also, ill-fitted dentures and irregular dental restorations/obturations may produce irritative mucositis that is unrelated to the material. Metal hypersensitivity (eg, nickel, cobalt) seems to manifest more often as oral lichenoid reactions, nonspecific stomatitis, and perioral dermatitis, other manifestations such as gingivitis or lip angioedema may occur for other materials [7-8]. Moreover, hypersensitivity reactions may

also involve distal regions of the body (eg, palmoplantar pustulosis, genital lichenoid reactions) [9]. Other oral manifestations such as recurrent aphthous ulcers, burning mouth syndrome, and benign migratory glossitis have also been linked to contact allergy to dental materials [7].

The management of allergy and hypersensitivity was Adrenaline, bronchodilators, antihistamines and corticosteroids [10]. Other adjunctive therapies for anaphylaxis include supplemental oxygenation, IV fluids for volume resuscitation, glucagon or vasopressors for refractory hypotension, and/or atropine for bradycardia. During and post severe allergy, the following should be ideally monitored: blood pressure, respiratory status, oxygenation, urine output, cardiac function, and heart rate at continuous intervals or frequently [11]. Our team has extensive knowledge and research experience that has translated into high quality publications [12-31]. The aim of the present study was to evaluate the incidence and management of allergy and hypersensitivity reactions in a dental institution.

Materials and Methods

In the present study, a total of 25 patients (n=25) of different age groups and gender who reported allergy and hypersensitivity reactions at Saveetha Dental College were included.

This is a retrospective study in which data of all patients from June 2019 to Feb 2021 were retrieved from dental information archiving systems, SDC, SIMATS. Approval from the ethical committee was taken before the start of the study. All the case sheets included in this study were approved and verified by the external reviewer. Also, cross verification of data was done by photographs to avoid errors. During data collection, patients of all age groups and gender who reported with allergy and hypersensitivity reactions were included and patients without any allergic and hypersensitivity reactions were excluded. Parametric and non-parametric correlations were made following which the graphs were made. Non parametric tests were done by running a chi-square test and the parameters considered were statistically analysed and interpreted.

Results

Out of these 25 patients reported with allergy and hypersensitivity reactions, 32% were male and 68% were female (Figure 1). About 20% were

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at the age group of 20-30 years, 28% were at the age group of 30-40 years, 32% were at the age group of 40-50 years, 16% were at the age group of 50-60 years and 4% were at the age group of 60-70 years (Figure 2). About 32% of the patients with allergy and hypersensitivity were prescribed with antihistamines, 12% with corticosteroids and 56% were prescribed both

antihistamines and corticosteroids (Figure 3). About 52% reported with type 1 hypersensitivity, 8% reported with type 2 hypersensitivity and 40% reported with type 4 hypersensitivity (Figure 4). The association of gender and type of hypersensitivity was shown in (Figure 5). The association of gender and treatment was shown in Figure 6.

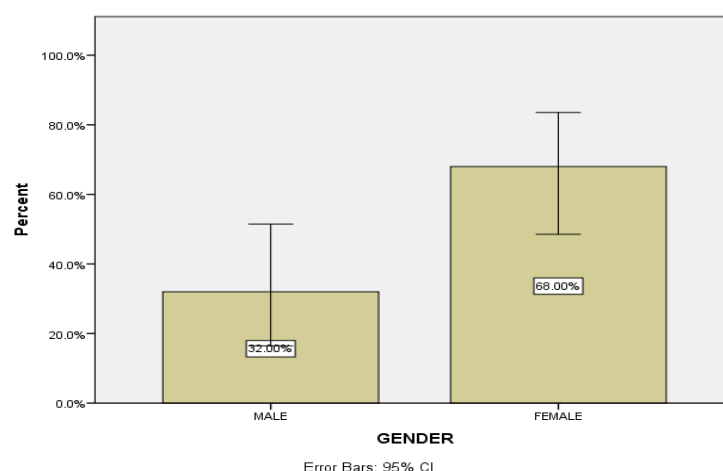


Figure 1. Bar graph representing the gender of the patients with allergy and hypersensitivity. X axis showing the gender and Y axis showing the percentage of patients in that gender. About 32% were male and 68% were female. From the bar graph, it was evident that the highest number of patients reported with allergy and hypersensitivity were female.

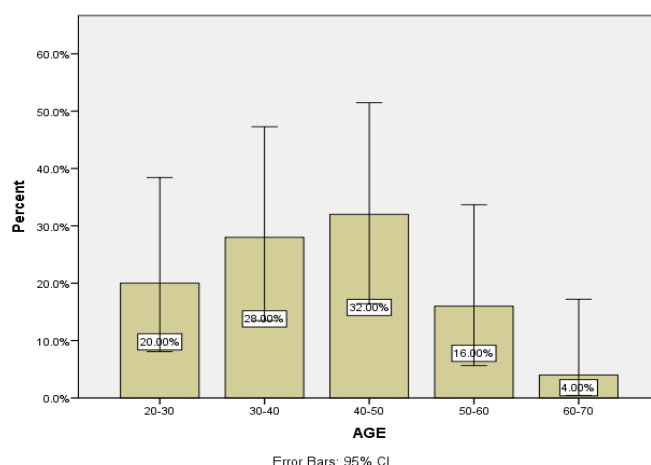


Figure 2. Bar graph representing the age of the patients with allergy and hypersensitivity. X axis showing the age and Y axis showing the percentage of patients in that age. About 20% were at the age group of 20-30 years, 28% were at the age group of 30-40 years, 32% were at the age group of 40-50 years, 16% were at the age group of 50-60 years and 4% were at the age group of 60-70 years. From the bar graph, it was evident that the highest number of patients reported with allergy and hypersensitivity were at the age group of 40-50 years.

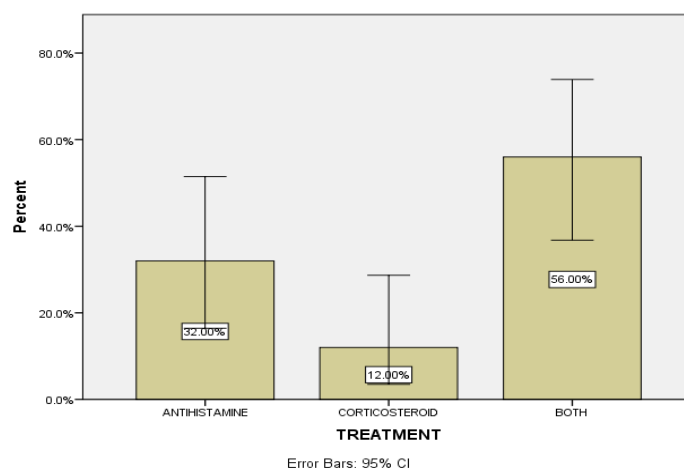


Figure 3. Bar graph representing the treatment of the patients with allergy and hypersensitivity. X axis showing the treatment and Y axis showing the percentage of patients underwent with that treatment. About 32% of the patients with allergy and hypersensitivity were prescribed with antihistamines, 12% with corticosteroids and 56% were prescribed both antihistamines and corticosteroids. From the bar graph, it was evident that the highest number of patients reported with allergy and hypersensitivity were prescribed with both antihistamines and corticosteroids.

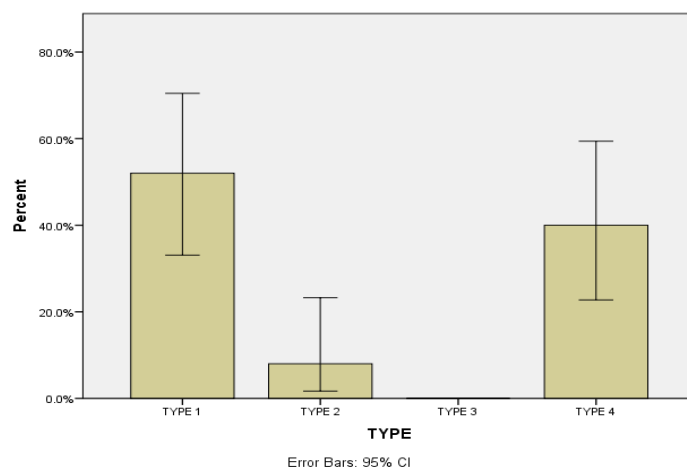


Figure 4. Bar graph representing the type of hypersensitivity of the patients with allergy and hypersensitivity. X axis showing the type of hypersensitivity and Y axis showing the percentage of patients reported with that type of hypersensitivity. About 52% reported with type 1 hypersensitivity, 8% reported with type 2 hypersensitivity and 40% reported with type 4 hypersensitivity. From the bar graph, it was evident that the highest number of patients reported with allergy and hypersensitivity were with type 1 hypersensitivity.

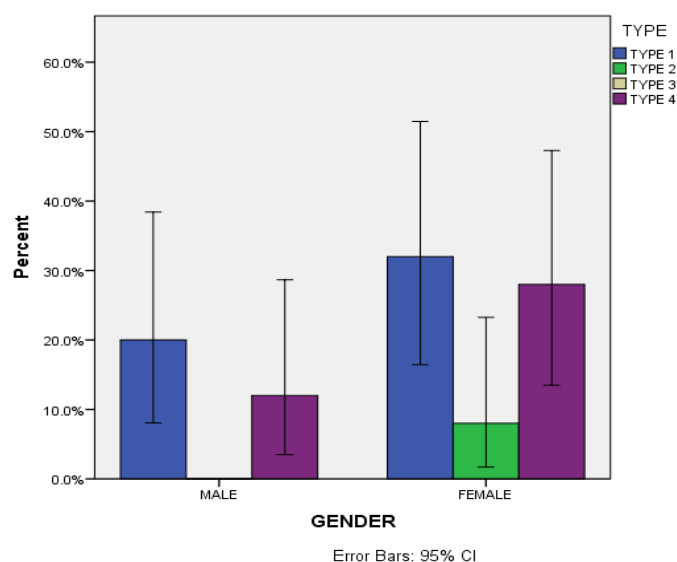


Figure 5. Bar graph representing the association of gender and the type of hypersensitivity of the patients with allergy and hypersensitivity. X axis represents gender and Y axis represents type of hypersensitivity. Here, the blue colour denotes type 1 hypersensitivity, green colour denotes type 2 hypersensitivity and violet colour denotes type 4 hypersensitivity. From the bar graph, it was evident that the highest number of patients reported with allergy and hypersensitivity were females with type 1 hypersensitivity. However, it was not statistically significant (Chi square test, p value- 0.6).

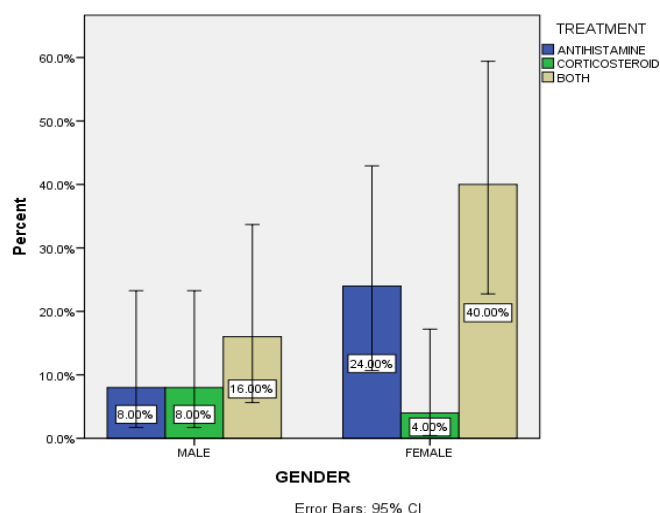


Figure 6. Bar graph representing the association of gender and the treatment for the patients with allergy and hypersensitivity. X axis represents gender and the Y axis represents treatment. Here, the blue colour denotes antihistamines, red colour denotes corticosteroids and green colour denotes both antihistamines and corticosteroids. From the bar graph, it was evident that the highest number of female patients reported with allergy and hypersensitivity were prescribed with both antihistamines and corticosteroids. However, it was not statistically significant (Chi square test, p value-0.2).

Discussion

Allergic reactions are becoming prevalent in the general population. Therefore, materials used for dental filling, orthodontic instruments etc. must satisfy the biocompatibility specifications since they are indicated for a long time in the oral cavity [32]. The first case of dental metal allergy occurred due to amalgam restorations in the oral cavity that resulted in stomatitis and dermatitis. The allergic reactions manifest in the form of urticaria, swelling, rash and rhinorrhea which can also cause life threatening conditions like laryngeal oedema, anaphylaxis and cardiac arrhythmias [33].

The immune system plays an important role in maintaining health and protecting the human body against microbial invasions. However, this same system can lead to exaggerated immune and inflammatory responses that result in adverse outcomes known as hypersensitivity reactions. There are four traditional classifications for hypersensitivity reactions that include Type I, Type II, Type III, and Type IV reactions [34]. Type I hypersensitivity which is also known as an immediate reaction and involves immunoglobulin E (IgE) mediated release of antibodies against the soluble antigen. This results in mast cell degranulation and release of histamine and other inflammatory mediators. Type II hypersensitivity which is also known as cytotoxic reactions and engages IgG and IgM antibodies, leading to the complement system activation and cell damage or lysis. Type III hypersensitivity which is also known as immune complex reactions and involves IgG, IgM, and sometimes IgA antibodies. The build-up of these immune complexes results in complement system activation, which leads to polymorph nuclear leukocytes (PMNs) chemotaxis and eventually causing tissue damage [10]. The incidence of adverse reactions to dental treatment and dental drugs has been found to be difficult to estimate and also seems to be low considering the number of dental allergy and hypersensitivity reactions reported.

A study done by Demoly et al. [35] stated that type 1 and type 4 hypersensitivity reactions are more frequent. Also, a study done by Martins et al. [36] has been stated that immediate hypersensitivity (type I) is the most common immunological disease and represents the most widespread and fast growing chronic human health condition. Our study reported that about 52% and 40% of patients with allergy and hypersensitivity reactions reported with type 1 and 4 hypersensitivity reactions respectively. Our study findings are in concordance with the literature.

Several studies [37-41] reported that the allergy and hypersensitivity reactions have been more reported in females. Similarly, in our study 68% of females were reported with allergy and hypersensitivity reactions. Our study results are in concordance with the literature.

A study done by Sriram et al. [42] stated that the dentists are not fully aware of the various methods of management of the adverse reactions of allergy and hypersensitivity reactions. The study also concluded that it is important for Dental practitioners to be aware of allergic reactions due to dental drugs and materials in order to reduce the severity of the occurring reactions as well as promote the use of alternatives.

Conclusion

The highest number of patients with allergy and hypersensitivity reported were females of age group 40-50 years old. Most of them reported a type 1 hypersensitivity reaction and most of them were prescribed with both antihistamines and corticosteroids.

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Conflict of Interest

Author declares no potential conflict of interest.

References

1. Naisbitt DJ, Gordon SF, Pirmohamed M, Park BK. "Immunological principles of adverse drug reactions." *Drug Saf* 23 (2000): 483-507.
2. Castells M, Bonamichi-Santos R. "Drug hypersensitivity." *InClin Immunol* (2019) 649-667.
3. Rama TA, Cernadas J. "Insights into hypersensitivity reactions in dentistry." *Porto Biomed J* 5 (2020): e090.
4. Turner PJ, Gowland MH, Sharma V, and Ierodiakonou D, et al. "Increase in anaphylaxis-related hospitalizations but no increase in fatalities: an analysis of United Kingdom national anaphylaxis data, 1992-2012." *J Allergy Clin Immunol* 135 (2015): 956-963.
5. Council, Resuscitation, and Great Britain. "The emergency medical treatment of anaphylactic reactions for first medical responders and for community nurses." Resuscitation Council (UK), 2002.
6. Syed M, Chopra R, Sachdev V. "Allergic reactions to dental materials-a systematic review." *J Clin Diagn Res J Clin Diagn Res* 9 (2015): ZE04.
7. Minciullo PL, Paolino G, Vacca M, and Gangemi S, et al. "Unmet diagnostic needs in contact oral mucosal allergies." *Clin Mol Allergy* 14 (2016): 1-8.
8. Torgerson RR, Davis MD, Bruce AJ, and Farmer SA, et al. "Contact allergy in oral disease." *J Am Acad Dermatol* 57 (2007): 315-321.
9. Scalf LA, Fowler JF, Morgan KW, and Looney SW. "Dental metal allergy in patients with oral, cutaneous, and genital lichenoid reactions." *Am J Contact Dermat* 12 (2001): 146-150.
10. Abbas M, Moussa M, Akel H. "Type I hypersensitivity reaction." *StatPearls* (2021).
11. Lieberman P, Nicklas RA, Randolph C, and Oppenheimer J, et al. "Anaphylaxis—a practice parameter update 2015." *Annals Allergy Asthma Immunol* 115 (2015): 341-384.
12. Pc J, Marimuthu T, Devadoss P, and Kumar SM. Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study. *Clin Implant Dent Related Res* 20 (2018):531-534.
13. Wahab PA, Madhulaxmi M, Senthilnathan P, and Muthusekhar MR, et al. "Scalpel versus diathermy in wound healing after mucosal incisions: A split-mouth study." *J Oral Maxillofac Surg* 76 (2018): 1160-1164.
14. kiran Mudigonda S, Murugan S, Velavan K, and Thulasiraman S, et al. "Non-suturing microvascular anastomosis in maxillofacial reconstruction-a comparative study." *J Craniomaxillofac Surg* 48 (2020): 599-606.
15. Narayanasamy RK, Muthusekar RM, Nagalingam SP, and Thyagarajan S, et al. "Lower pretreatment hemoglobin status and treatment breaks in locally advanced head and neck squamous cell carcinoma during concurrent chemoradiation." *Indian J Cancer* 58 (2021): 62.
16. Wang H, Chinnathambi A, Alahmadi TA, and Alharbi SA, et al. "Phyllanthin inhibits MOLT 4 leukemic cancer cell growth and induces apoptosis through the inhibition of AKT and JNK signaling pathway." *J Biochem Mol Toxicol* 35 (2021): 1-10.

17. Li S, Zhang Y, Veeraraghavan VP, and Mohan SK, et al. "Restorative effect of fucoxanthin in an ovalbumin-induced allergic rhinitis animal model through NF- κ B p65 and STAT3 signaling." *J Environ Pathol Toxicol Oncol* 38 (2019).
18. Ma Y, Karunakaran T, Veeraraghavan VP, and Mohan SK, Li S. "Sesame inhibits cell proliferation and induces apoptosis through inhibition of STAT-3 translocation in thyroid cancer cell lines (FTC-133)." *Biotechnol Bioprocess Eng* 24 (2019): 646-652.
19. Bishir M, Bhat A, Essa MM, and Ekpo O, et al. "Sleep deprivation and neurological disorders." *Biomed Res Int* 2020 (2020).
20. Fan Y, Maghima M, Chinnathambi A, and Alharbi SA, et al. "Tomentosin reduces behavior deficits and neuroinflammatory response in MPTP-induced parkinson's disease in mice." *J Environ Pathol Toxicol Oncol* 40 (2021): 75-84.
21. Zhang C, Chen Y, Zhang M, Xu C, et al. "Vicenin-2 treatment attenuated the diethylnitrosamine-induced liver carcinoma and oxidative stress through increased apoptotic protein expression in experimental rats." *J Environ Pathol Toxicol Oncol* 39 (2020):113-323.
22. Gan H, Zhang Y, Zhou Q, and Zheng L, et al. "Zingerone induced caspase-dependent apoptosis in MCF-7 cells and prevents 7, 12-dimethylbenz (a) anthracene-induced mammary carcinogenesis in experimental rats." *J Biochem Mol Toxicol* 33 (2019): e22387.
23. Saravanakumar K, Park S, Mariadoss AV, and Sathiyaseelan A, et al. "Chemical composition, antioxidant, and anti-diabetic activities of ethyl acetate fraction of *Stachys riederi* var. *japonica* (Miq.) in streptozotocin-induced type 2 diabetic mice." *Food Chem Toxicol* 155 (2021): 112374.
24. Veeraraghavan VP, Hussain S, Papayya Balakrishna J, and Dhawale L, et al. "A comprehensive and critical review on ethnopharmacological importance of desert truffles: *Terfezia clavervyi*, *Terfezia boudieri*, and *Tirmania nivea*." *Food Rev Int* (2021): 1-20.
25. Wei W, Li R, Liu Q, and Seshadri VD, et al. "Amelioration of oxidative stress, inflammation and tumor promotion by Tin oxide-Sodium alginate-Polyethylene glycol-Allyl isothiocyanate nanocomposites on the 1, 2-Dimethylhydrazine induced colon carcinogenesis in rats." *Arab J Chem* (2021): 103238.
26. Sathya S, Ragul V, Veeraraghavan VP, and Singh L, et al. "An in vitro study on hexavalent chromium [Cr (VI)] remediation using iron oxide nanoparticles based beads." *Environ Nanotechnol Monit Manag* 14 (2020): 100333.
27. Chandrasekar R, Chandrasekhar S, Sundari KS, and Ravi P. "Development and validation of a formula for objective assessment of cervical vertebral bone age." *Progress Orthodont* 21 (2020): 1-8.
28. Ramakrishnan M, Dhanalakshmi R, Subramanian EM. "Survival rate of different fixed posterior space maintainers used in Paediatric Dentistry—A systematic review." *Saudi Dent J* 31 (2019): 165-172.
29. Felicita AS. "Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor—The sling shot method." *Saudi Dent J* 30 (2018): 265-269.
30. Su P, Veeraraghavan VP, Krishna Mohan S, and Lu W. "A ginger derivative, zingerone—a phenolic compound—induces ROS-mediated apoptosis in colon cancer cells (HCT-116)." *J Biochem Mol Toxicol* 33 (2019): e22403.
31. Wan J, Feng Y, Du L, and Veeraraghavan VP, et al. "Antiatherosclerotic activity of eriocitrin in high-fat-diet-induced atherosclerosis model rats." *J Environ Pathol Toxicol Oncol* 39 (2020) 61-75.
32. Ditrichova D, Kapralova S, Tichy M, and Ticha V, et al. "Oral lichenoid lesions and allergy to dental materials." *Biomedical Papers Med Faculty Palacky University Olomouc* 151 (2007) 333-339.
33. Karabucak B, Stoopler ET. "Root canal treatment on a patient with zinc oxide allergy: a case report." *Int Endod J* 40 (2007): 800-807.
34. Warrington R, Watson W, Kim HL, and Antonetti FR. "An introduction to immunology and immunopathology." *Allergy Asthma Clin Immunol* 7 (2011): 1-8.
35. Demoly P, Viola M, Gomes ER, and Romano A. "Epidemiology and causes of drug hypersensitivity." *Drug Hypersensitivity* (2007): 2-17.
36. De Martinis M, Sirufo MM, Ginaldi L. "Allergy and aging: an old/new emerging health issue." *Aging Dis* 8 (2017): 162-175.
37. Chen W, Mempel M, Schober W, and Behrendt H, et al. "Gender difference, sex hormones, and immediate type hypersensitivity reactions." *Allergy* 63 (2008): 1418-1427.
38. Afify SM, Pali-Schöll I. "Adverse reactions to food: the female dominance—A secondary publication and update." *World Allergy Organ J* 10 (2017): 1-8.
39. Ariza A, Fernández TD, Mayorga C, and Blanca M, et al. "Prediction of hypersensitivity to antibiotics: what factors need to be considered?." *Expert Rev Clin Immunol* 9 (2013): 1279-1288.
40. Goksel O, Aydın O, Atasoy C, and Akyar S, et al. "Hypersensitivity reactions to contrast media: prevalence, risk factors and the role of skin tests in diagnosis—a cross-sectional survey." *Int Arch Allergy Immunol* 155 (2011): 297-305.
41. Gomes ER, Gerales L, Gaspar Â, and Malheiro D, et al. "Hypersensitivity reactions to nonsteroidal anti-inflammatory drugs among adults: Clinical features and risk factors for diagnosis confirmation." *Int Arch Allergy Immunol* 171 (2016): 269-275.
42. Sriram K, Ganapathy D, Duraisamy R. "Awareness of Dental Students on the Application of PRF in dental practice-A Survey." *J Pharm Res Int* (2020): 101-113.

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