

Serum concentrations of CD4+ and CD8+ in patients infected with scabies caused by *Sarcoptes scabiei*

Ali A. Mohy, Ahmed Abduljabbar Jaloob Aljanaby*, Saleem Khteer Al-Hadraawy

Department of Biology, Faculty of science, University of Kufa, Iraq.

Correspondence: Ahmed Abduljabbar Jaloob Aljanaby, Department of Biology, Faculty of science, University of Kufa, Iraq. E-mail: ahmedaj.aljanabi @ uokufa.edu .iq

ABSTRACT

Background: Scabies is one of the most important epidemic diseases in developing countries infecting males and females especially in rural areas. Therefore, this study aimed to evaluate the cellular immune response in patients infected with scabies caused by *Sarcoptes scabiei* depended on the measurement serum concentration of T-helper cell (CD4+) and T-cytotoxic cell (CD8+). **Materials and Methods:** Sixty patients (30 male and 30 female) infected with chronic scabies were included in this study and 30 healthy individuals were considered as control group. CD4+ and CD8+ levels in serum of patients and healthy individuals were measurement by using ELISA device. **Results:** The results proved that there was a significant increase ($P < 0.05$) in serum concentrations of CD4+ and CD8+ as compared with control group. On the other hand, the results demonstrated that there was a positive correlation between CD4+ and CD8+ ($R2 = 0.0301$). Serum concentration of CD8+ was higher than CD4+ with significant increase ($P \text{ value} = 0.0001$). **Conclusion:** Human infected with *S. scabiei* lead to induce higher amounts of Th and Tc cells due to the high levels production of CD8+ and CD4+ in serum of patients.

Keywords: Scabies, *Sarcoptes scabiei*, T-helper, T-cytotoxic, CD4+, CD8+.

Introduction

Sarcoptes scabiei is one of the most important causative agents of scabies in worldwide. Scabies is a one of the most prevalent infection in all countries especially in developing countries [1-7]. Patients infected with chronic scabies suffering from very strong itching due to allergic and inflammatory reactions mounted by the host against the parasite and its product such as eggs [3,8-14]. The clinical features in patients infected with scabies were characterized between mild to severe destructive [4,15-17]. The immune and inflammatory response features in patients are remaining not fully understood [5,18,19-25]. T-lymphocyte (T-cell) CD4+ T-helper (Th) and CD8+ T-cytotoxic (Tc) have an important role in immune response in scabies due to cytokines secreted such as interferon- γ (INF- γ), tumor necrotic factor- α (TNF- α) and interleukine-2 (IL-2) [6, 7,20,26]. T-helper cell secretes

IL-13, IL-5 and IL-4 and mediated humoral immunity by inducing antibody production to fight extracellular parasite [8]. T-helper 2 cells are also dominant effector cells in the pathogenesis of IgE-mediated hypersensitivity in scabies and other allergic inflammatory infections [9,21-24,27]. Peripheral blood mononuclear cells isolated from patients infected with scabies secreted increased levels of Th2 cytokines include IL-13, IL-5 and IL-4 but decreased secretion of the Th1 cytokines INF- γ [10,25-38]. Cellular immune response in patients infected with scabies is still unclear. In Iraq, there are no studies focusing on the rule of T-cells (Th and Tc) in patients infected with scabies. Therefore, in this study we aimed to evaluate the cellular immune response in patient infected with scabies caused by *S. scabiei* due to the measurement serum concentration of CD4+ and CD8+ in these patients.

Materials and Methods

Patients: Sixty patients (30 males and 30 Female, ages range 18 to 40 years old) infected with chronic scabies cause by *Sarcoptes scabiei* (duration of infection 6 weeks) were included in this study, admitted to Al-Najaf general hospital in Al-Najaf City, Iraq, during the period from March to December 2017. Thirty healthy persons (15 Males and 15 females, ages range 18

Access this article online

Website: www.japer.in

E-ISSN: 2249-3379

How to cite this article: Ali A. Mohy, Ahmed Abduljabbar Jaloob Aljanaby, Saleem Khteer Al-Hadraawy. Serum concentrations of CD4+ and CD8+ in patients infected with scabies caused by *Sarcoptes scabiei*. J Adv Pharm Edu Res 2018;8(1):121-126.

Source of Support: Nil, Conflict of Interest: None declared.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

to 40 years old), included in the current study were considered as the control group.

Detection of patients infected with chronic scabies cause by *Sarcoptes scabiei*:

Sarcoptes scabiei was diagnosed in patients according to physical exam and inspecting the affected area of skin or removing a *S. scabiei* from the skin with a needle, taking a scrape off a small section of skin to obtain a tissue sample and examining this sample under a microscope to confirm the presence of scabies mites or their eggs [11,39-48].

Serum collection: Two ml of serum were collected from patients and healthy individuals as follow: 5 ml of blood were collected from two groups and centrifugation (Memmert Company, Germany) was done at 3000rpm for 5min. Serum was collected in sterile tube and stored at -15C until use [2,32,33,49,50].

Measurement of human CD4+ and CD8+:

Human CD4 and CD8 kits were provided from Elabscience Company, Bulgaria. CD4+ and CD8+ levels in serum of patients and healthy individuals were measurement by using ELISA device (Human Reader Company, Germany) according to instructions of the manufacturer.

Statistical Analysis: T-test was used in the current study for comparison between the samples by using SPSS V.10 computer software. P value less than 0.05 was considered statistically significant [12, 13,51-58].

Results

The results of the current study proved that there was a significant increase (P value= 0.0018) in serum concentration of CD4 in total patients infected with chronic scabies (1744.3 ± 199.13 pg/ml) as compared with control (841.80 ± 47.452 pg/ml) (Figure 1). Also, the results demonstrated that there was a significant increase in serum concentration of CD4 in male (1926.8 ± 328.99 pg/ml) and female (1561.9 ± 225.45 pg/ml) infected with chronic scabies as compared with control with P value; 0.0308 and 0.0197, respectively (Figure 2). Serum concentration of CD8 in total patients infected with chronic scabies (4046.2 ± 97.963 pg/ml) was higher than in total control (3464.9 ± 131.25 pg/ml) with high significant increase (P=0.0007) (Figure 3). On the other hand, serum concentration of CD8 in male patients was in high level (4082.6 ± 135.34 pg/ml) as compared with male control (3483.8 ± 191.21 pg/ml) with significant increase (P value= 0.0138). The same serum concentration of CD8 was increased in female patients (4009.7 ± 143.74 pg/ml) as compared with female control (3446.1 ± 186.43 pg/ml) with significant increase (P value= 0.0241) (Figure 4). On the other hand, there was a highly significant increase in serum concentration of CD8+ (4078.7 ± 97.399 pg/ml) in total patients (P value=< 0.0001) as compared with serum concentration of CD4+ (1734.6 ± 192.65 pg/ml) (Figure 5). But there was a positive correlation between CD4+ and CD8+ (R²=0.0301) (Figure 6).

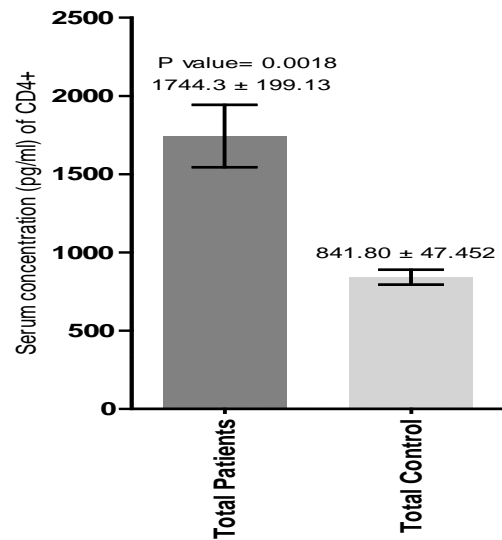


Figure 1: Serum concentration (pg/ml) of CD4+ in total patients infected with scabies

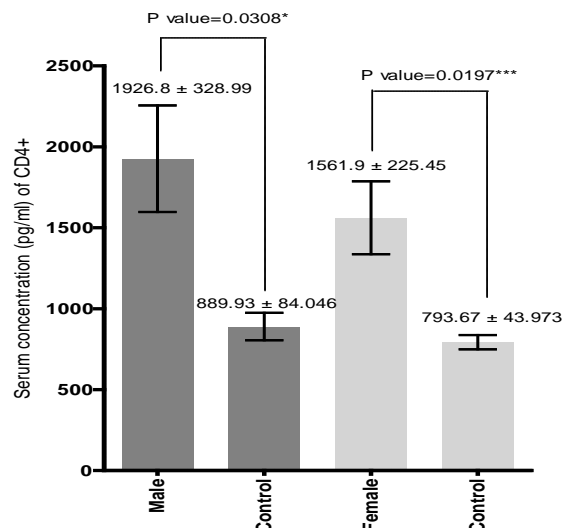


Figure 2: Serum concentration (pg/ml) of CD4+ in male and female infected with scabies

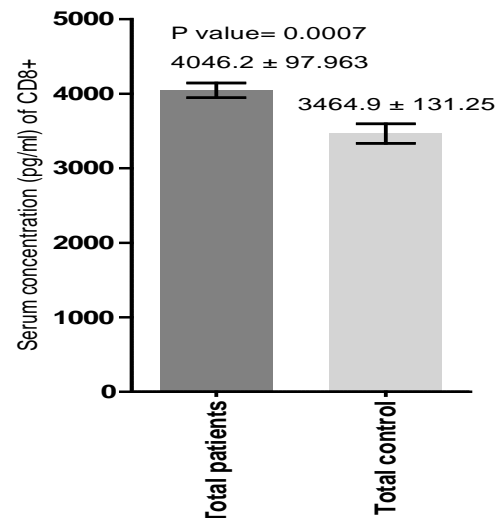


Figure 3: Serum concentration (pg/ml) of CD8+ in total patients infected with scabies

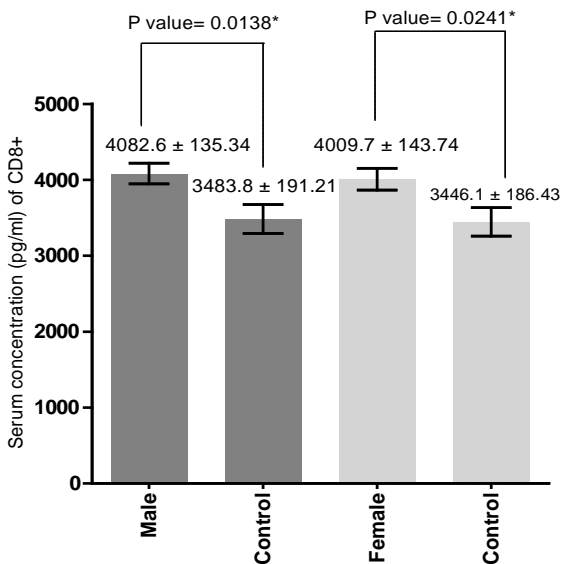


Figure 4: Serum concentration (pg/ml) of CD8+ in male and female infected with scabies

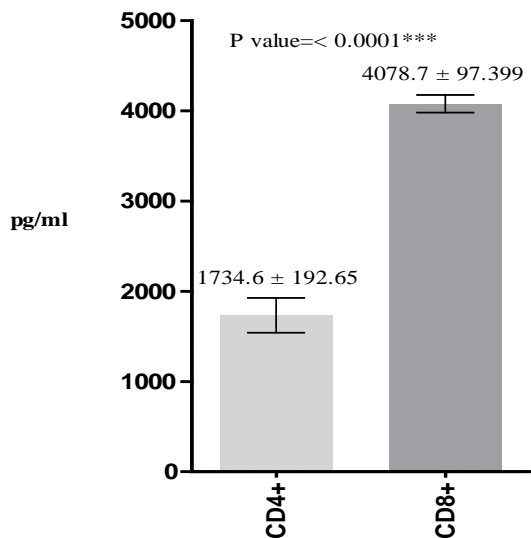


Figure 5: Serum concentration (pg/ml) of CD4+ and CD8+ in total patients infected with scabies

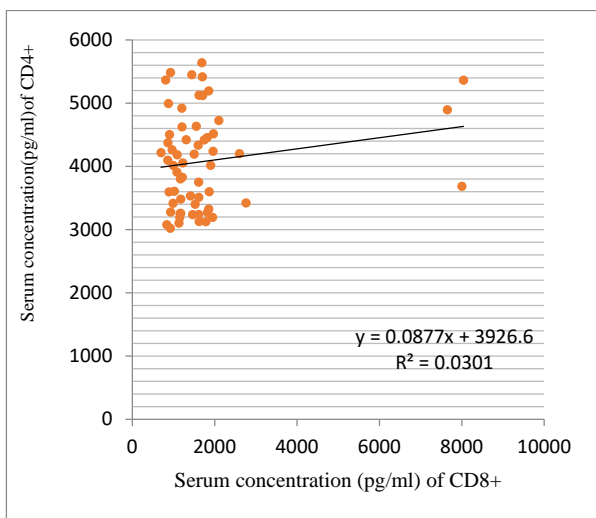


Figure 6: Correlation between serum concentration of CD4+ and CD8+ in patients infected with scabies

Discussion

Scabies is a one of the most important skin infections mainly caused by *Sarcoptes Scabiei*. There are over one hundred million infections all over the world [34,59-67]. Cellular immune response in human infected with chronic scabies is still not fully understood. In this study, we aimed to compare between serum concentration of CD4+ and CD8+ in patients infected with scabies caused by *S. Scabiei*. The results proved that there was a high significant increase in CD4+ and CD8+ as compared with control and there was a positive coloration between CD4+ and CD8+. On the other hand, serum concentration of CD8+ was higher than CD4+. T-cells play an important role in cell mediated immune response. CD4+ T-cell has been demonstrated as the most prevalent T-lymphocytes in skin lesions in human infected with scabies [35, 36,68-71]. These results are not in agreement with Akdis et al. (1999) [37] that they suggested that the corresponds to inflammatory cells in the skin lesions from patients with scabies have a significantly greater number of infiltrating CD4+ lymphocytes compared with CD8+. While the results of the current study are in agreement with Walton et al. (2008) [38] and Liu et al. (2014) [39] when they demonstrated that there was an increased number of infiltrating CD8+ T-cell as compared with CD4+cells according to immune-histology and flow cytometry study. Other studies by Roberts et al (2005) [40] and Walton et al (2008) [38] indicated that the number of T-cell and B-cell in the blood of patients infected with scabies have been within normal ranges. Bovenschen et al (2005) [41] and Walton et al (2010) [10] suggested that the greater number of CD8+ T-cell is due to a selective movement of CD8+ T-cell leading to epidermal hyper proliferation. Therefore, the cytotoxic T-cell is responsible for the imbalance of inflammatory response and may contribute to the failure of the skin immune system to induce an effective response resulting in uncontrolled growth of this mite [42-47]. Patients infected with *Sarcoptes scabiei* hurt from powerful inflammatory reactions itching and mediated through allergic mounted by the host against the mite and its products, a comprehensive range of clinical symptoms from acute destructive to minor occurs in scabies but despite the significant worldwide impact of the disease, the inflammatory and immune responses related with the diverse symptoms of this disease remain poorly understood [34,48-52]. This increase in serum concentration of CD4 and CD8 may be due to inflammation of skin and produce the gamma interferon (INF- γ) and interleukin-10 (IL-10) in the patients of scabies or may increase the eosinophil in skin of scabies' infection [44, 45,53-56]. In skin infection and inflammatory site high numbers of eosinophils are produced and for this reason, the concentration levels of IL-4 and IL-13 increased [46-48,57,58].

Conclusions and Future Recommendations

Infection by chronic scabies for 6 weeks caused by *Sarcoptes scabiei* in human leading to inducement of higher amounts of T-cytotoxic cell and T-helper cell due to the high levels production of CD8+ and CD4+ in serum of patients. It is recommended to evaluate other immune cells and other CD markers such as T-lymphocyte cell (CD3+), Granulocyte cell (CD15+) and Monocyte cell (CD14+) to provide complete and clear immune vision against *Sarcoptes scabiei*.

Significant Statements

This study discovered that T-cytotoxic and T-helper cells have an important role in immune response in patients infected with *Sarcoptes scabiei* which was not proved previously. This study will help researchers to discover more details about new mechanisms of immune response in individuals infected with scabies.

References

- Hay RJ, Johns NE, Williams HC, Bolliger IW, Dellavalle RP, Margolis DJ, Marks R, Naldi L, Weinstock MA, Wulf SK, Michaud C. The global burden of skin disease in 2010: an analysis of the prevalence and impact of skin conditions. *J Invest Dermatol*. 2014 Jun 1; 134(6):1527-34.
- Al-Hadraawy SK, Hessen HB. Hematological and Epidemiological Study for Patients Infected with Scabies. *J Pharm Sci & Res*. 2017 Jun 1;9(6):897.
- Marotta M, Toni F, Dallolio L, Toni G, Leoni E. Management of a family outbreak of scabies with high risk of spread to other community and hospital facilities. *Am J Infect Control*. 17. 2018 Feb 1.
- Cohen PR. Scabies masquerading as bullous pemphigoid: scabies surrepticius. *Clin Cosmet Investig Dermatol*. 2017, 10.
- Morgan MS, Rider Jr SD, Arlian LG. Identification of antigenic *Sarcoptes scabiei* proteins for use in a diagnostic test and of non-antigenic proteins that may be immunomodulatory. *PLoS Negl Trop Dis*. 2017 Jun 12;11(6): e0005669.
- Romagnani S. T-cell subsets (Th1 versus Th2). *Annals of allergy, asthma & immunol*. 2000 Jul 1; 85(1):9-18.
- Kidd P. Th1/Th2 balance: the hypothesis, its limitations, and implications for health and disease. *Altern Med Rev*. 2003 Aug 1; 8(3):223-46.
- Rampton M, Walton SF, Holt DC, Pasay C, Kelly A, Currie BJ, McCarthy JS, Mounsey KE. Antibody responses to *Sarcoptes scabiei* apolipo protein in a porcine model: relevance to immunodiagnosis of recent infection. *PloS one*. 2013 Jun 6;8(6): e65354.
- Walton SF, Slender A, Pizzutto S, Mounsey KE, Opresecu F, Thomas WR, Hales BJ, Currie BJ. Analysis of IgE binding patterns to house dust mite allergens in scabies-endemic communities: insights for both diseases. *Clin Exp Allergy*. 2015 Dec 1;45(12):1868-72.
- Walton SF, Pizzutto S, Slender A, Viberg L, Holt D, Hales BJ, Kemp DJ, Currie BJ, Rolland JM, O'Hehir R. Increased allergic immune response to *Sarcoptes scabiei* antigens in crusted versus ordinary scabies. *Clin Vaccine Immunol*. 2010 Sep 1;17(9):1428-38.
- Chosidow O. Clinical practices. Scabies. *N Engl J Med*. 2006; 354(16).
- Aljanaby AA, Alhasnawi HM. Research Article Phenotypic and Molecular Characterization of Multidrug Resistant *Klebsiella pneumoniae* Isolated from Different Clinical Sources in Al-Najaf Province-Iraq. *Pak J Biol Sci*. 2017; 20 (5).
- Aljanaby AA, Medhat AR. Research Article Prevalence of Some Antimicrobials Resistance Associated-genes in *Salmonella typhi* Isolated from Patients Infected with Typhoid Fever. *J. Biol. Sci*. 2017; 17 (4).
- Saei Ghare Naz M, Kariman N, Ebadi A, Ozgoli G, Ghasemi V, Rashidi Fakari F. Educational interventions for cervical cancer screening behavior of women: A systematic review. *Asian Pac J Cancer Prev*. 2018 Apr 25;19(4):875-884.
- Shahrahmani H, Kariman N, Jannesari S, Rafieian-Kopaei M, Mirzaei M, Ghalandari S, Shahrahmani N, Mardani G. The effect of green tea ointment on episiotomy pain and wound healing in primiparous women: A randomized, double-blind, placebo-controlled clinical trial. *Phytother Res*. 2018 Mar;32(3):522-530. doi: 10.1002/ptr.5999.
- Alimoradi Z, Kariman N, Ahmadi F, Simbar M. Preparation for sexual and reproductive self-care in Iranian adolescent girls: a qualitative study. *Int J Adolesc Med Health*. 2017 May 17;30(1). pii: /j/ijamh.2018.30.issue-1/ijamh-2016-0094/ijamh-2016-0094.xml. doi: 10.1515/ijamh-2016-0094.
- Atarodi-Kashani Z, Kariman N, Ebadi A, Alavi Majd H, Beladi-Moghadam N. Sexual function and related factors in Iranian woman with epilepsy. *Seizure*. 2017 Nov;52:147-153. doi: 10.1016/j.seizure.2017.10.001. Epub 2017 Oct 5.
- Ghalandari S, Kariman N, Sheikhan Z, Mojab F, Mirzaei M, Shahrahmani H. Effect of Hydroalcoholic Extract of *Capsella bursa pastoris* on Early Postpartum Hemorrhage: A Clinical Trial Study. Effect of Hydroalcoholic Extract of *Capsella bursa pastoris* on Early Postpartum Hemorrhage: A Clinical Trial Study.
- Alimoradi Z, Kariman N, Simbar M, Ahmadi F. Empowerment of Adolescent Girls for Sexual and Reproductive Health Care: A Qualitative Study. *Afr J Reprod Health*. 2017 Dec;21(4):80-92. doi: 10.29063/ajrh2017/v21i4.9.
- Raei B, Ghadi A, Bozorgian AR. Heat integration of heat exchangers network using pinch technology. Heat integration of heat exchangers network using pinch technology.
- Araban M, Kariman N, Tavafian SS, Motesaddi S, Alavimajd H, Amin Shokravi F. Air pollution and low birth weight: A historical cohort study from Tehran | [Pollution atmosphérique et faible poids de naissance: Une étude de cohorte historique à Téhéran]. 2012. *Eastern Mediterranean Health Journal*. 18(6), pp. 556-560.
- Yazdkhasti M1, Keshavarz M2, Mahmoodi Z3, Hosseini AF4. Self-directed Learning and Its Impact on Menopausal Symptoms. *Iran Red Crescent Med J*. 2014 May;16(5):e13259. doi: 10.5812/ircmj.13259.
- Rezaee O, Sharifi, G, Samadian M, Haddadian K, Ali-Asgari A, Yazdani M. Endoscopic third ventriculostomy for treatment of obstructive hydrocephalus. 2007. *Archives of Iranian Medicine* 10(4), pp. 498-503.
- Samadian M, Vahidi S, Khormaee F, Ashraf H, Isolated, Primary Spinal Epidural Hodgkin's Disease in a Child. 2009. *Pediatric Neurology*. 40(6), pp. 480-482.

25. Pishgooie AH, Rahimi A, Khaghanizadeh M. Experiences of Iranian Nursing Faculty Members on Working in Conflict Climate. *Iran Red Crescent Med J.* 2016 Jan 2;18(1):e20319. doi: 10.5812/ircmj.20319. eCollection 2016 Jan.
26. Ghavimi MA, Taheri Talesh K, Ghoreishzadeh A, Chavoshzadeh MA, Zarandi A. Efficacy of tranexamic acid on side effects of rhinoplasty: A randomized double-blind study. *J Craniomaxillofac Surg.* 2017 Jun;45(6):897-902. doi: 10.1016/j.jcms.2017.03.001. Epub 2017 Mar 21.
27. Bozorgian A, Nasab NM, Mirzazadeh H. The overall effect of nano clay on the physical mechanical properties of epoxy resin. *World Academy of Science, Engineering and Technology International Journal of Materials and Metallurgical Engineering Vol:5, No:1, 2011.* P21-24.
28. Bozorgian A, Nasab NM, Mirzazadeh H. Overall effect of nano clay on the physical mechanical properties of epoxy resin. *World Academy of Science, Engineering and Technology International Journal of Materials and Metallurgical Engineering Vol:5, No:1, 2011.*
29. Afkar A, Mehrabian F, Shams M, Najafi L. Assessment of the preparedness level of administrators and State Hospitals of Guilan against Earthquake. *Life Science Journal.* 2013; 10(2 s).p 60-66.
30. Heidari T, Kariman N, Afrakhteh M, Alavi Majd H. The study of relationship between menorrhagia and gestational diabetes. *koomesh.* 2008; 9 (2) :147-154.
31. Nasimfar A, Sadeghi E, Amuzmehr A. Evaluation of knowledge, attitude, and practice of parents on the use of antibiotics for acute upper respiratory tract infections in children admitted to Motahari Hospital of Urmia in 2017–2018. *Asian Journal of Pharmaceutics, Apr-Jun 2018 (Suppl), 12 (2) , S558.*
32. Bhat SA, Mounsey KE, Liu X, Walton SF. Host immune responses to the itch mite, *Sarcoptes scabiei*, in humans. *Parasites & vectors.* 2017 Dec; 10(1):385.
33. Falk ES, Eide TJ. Histologic and clinical findings in human scabies. *Int J Dermatol.* 1981 Nov 1; 20(9):600-5.
34. Falk ES, Matre R. In situ characterization of cell infiltrates in the dermis of human scabies. *Am J Dermatopathol.* 1982 Feb; 4(1):9-15.
35. Akdis CA, Akdis M, Simon D, Dibbert B, Weber M, Gratzl S, Kreyden O, Disch R, Wüthrich B, Blaser K, Simon HU. T cells and T cell-derived cytokines as pathogenic factors in the nonallergic form of atopic dermatitis. *J Invest Dermatol.* 1999 Oct 1; 113(4):628-34.
36. Walton SF, Beroukas D, Roberts-Thomson P, Currie BJ. New insights into disease pathogenesis in crusted (Norwegian) scabies: the skin immune response in crusted scabies. *Br J Dermatol.* 2008 Jun 1; 158(6):1247-55.
37. Liu X, Walton SF, Murray HC, King M, Kelly A, Holt DC, Currie BJ, McCarthy JS, Mounsey KE. Crusted scabies is associated with increased IL-17 secretion by skin T cells. *Parasite immunolo.* 2014 Nov 1; 36(11):594-604.
38. Roberts LJ, Huffam SE, Walton SF, Currie BJ. Crusted scabies: clinical and immunological findings in seventy-eight patients and a review of the literature. *J Inf Secur.* 2005 Jun 1; 50(5):375-81.
39. Bovenschen HJ, Seyger MM, Van De Kerkhof PC. Plaque psoriasis vs. atopic dermatitis and lichen planus: A comparison for lesional T-cell subsets, epidermal proliferation and differentiation. *Br J Dermatol.* 2005 Jul 1; 153(1):72-8.
40. Orkin M. Scabies in AIDS. *Semin Dermatol.* 1993; 12(1).
41. Fuchs BS, Sapadin AN, Phelps RG, Rudikoff D. Diagnostic dilemma: crusted scabies superimposed on psoriatic erythroderma in a patient with acquired immunodeficiency syndrome. *SKIN med: Dermatology for the Clinician.* 2007 Mar 1; 6(3):142-4.
42. Shi M, Pan W, Tabel H. Experimental African trypanosomiasis: IFN-gamma mediates early mortality. *Eur J Immuno.* 2003; 33(1).
43. Williams M, Oldenhove G, Noel W, Hérin M, Brys L, Loi P, Flamand V, Moser M, De Baetselier P, Beschin A. African trypanosomiasis: naturally occurring regulatory T cells favor trypanotolerance by limiting pathology associated with sustained type 1 inflammation. *J Immunol.* 2007 Sep 1;179(5):2748-57.
44. Prussin C, Metcalfe D D. IgE mast cells, basophils, and eosinophils. *J Allergy Clin Immunol.* 2006. 117 (Suppl 2 Mini-Primer): S450–6.
45. Aljanaby AAJ. Antibacterial activity of an aqueous extracts of *Alkanna tinctoria* roots against drug resistant aerobic pathogenic bacteria isolated from patients with burns infections. *romj.*2018 (7):1; 1-6.
46. Aljanaby AAJ and aljanaby IAJ. Profile of Antimicrobial Resistance of Aerobic Pathogenic Bacteria isolated from Different Clinical Infections in Al-Kufa Central Hospital–Iraq During period from 2015 to 2017. *Research J. Pharm. and Tech.*2017; 10(10):3264-3270.
47. Sadeghi, E., Nasimfar, A., Madadi, M.H. Prevalence of methicillin-resistant staphylococcus aureus colonization in children admitted to Motahari hospital of Urmia. 2017, *Journal of Advanced Pharmacy Education and Research.* 7(4), pp. 464-468.
48. Mojtaba Miladinia, Amir Hosein Pishgooie , Shahla Aliyari , Elham Mousavi Nouri. The Comparison of the Effect of Two Complementary Medicine Methods (Music Therapy and Massage Therapy) On Postoperative Acute Pain After Abdominal Surgery: A Randomized Clinical Trial Study. *Iran Red Crescent Med J.* 2017 ;19(6):e14974. doi: 10.5812/ircmj.14974.
49. Pishgooie AH, Shorakie HZ, Zareiyani A, Shoorideh FA, Forghani M. Evaluation of quality of life and its effective factors in military patients and relatives with coronary artery disease in Tehran, Iran, 2016– a cross sectional study. *Journal of Military Medicine.* 2018, Volume20, Issue 2. Pages:212-221.
50. Talesh KT, Motamedi MH, Yazdani J, Ghavimi A, Ghoreishzadeh A. Prevention of relapse following intraoral vertical ramus osteotomy mandibular setback: can coronoidotomy help?. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2011 May;111(5):557-60. doi: 10.1016/j.tripleo.2010.06.019.
51. Samiei M, Shahi S, Abdollahi AA, Eskandarinezhad M, Negahdari R, Pakseresht Z. The Antibacterial Efficacy of Photo-Activated Disinfection, Chlorhexidine and Sodium Hypochlorite in Infected Root Canals: An in Vitro Study. *Iran Endod J.* 2016 Summer;11(3):179-83. doi: 10.7508/iej.2016.03.006.
52. Afkar AH, Mahbobubi M, Neyakan Shahri M, Mohammadi M, Jalilian F, Moradi F. Investigation of the relationship between illogical thoughts and dependence on others and marriage compatibility in the Iranian Veterans exposed to chemicals in Iran-Iraq War. *Glob J Health Sci.* 2014 May 8;6(5):38-45. doi: 10.5539/gjhs.v6n5p38.

53. Kariman, N., Afrakhte, M., Hedayati, M., Fallahian, M., Alavi Majd, H. Diagnosis of premature rupture of membranes by assessment of urea and creatinine in vaginal washing fluid. 2013. *Iranian Journal of Reproductive Medicine*. 11(2), pp. 93-100.
54. Ghazavi, A., Abbasi, E., Nikibakhsh, A., Sadeghi, E., Sadeghimanesh, J. Comparison of prophylactic effect of clobazam and diazepam in children with simple febrile convulsion (SFC). 2016. *International Journal of Tropical Medicine*. 11(2), pp. 21-23.
55. Khalatbari MR, Borghei-Razavi H, Samadian, M, Moharamzad Y, Schick U. Isolated primary craniopharyngioma in the cerebellopontine angle. 2012. *Journal of Clinical Neurosciences*. 19(11), pp. 1516-1519.
56. Gholamzadeh S, Heshmati B, Manni A, Petramfar P, Bagheri Z. The prevalence of Alzheimer's disease; its risk and protective factors among the elderly population in Iran. *Shiraz E Medical Journal*. Volume 18, Issue 9, September 2017, Article number e57576.
57. Bozorgian A, Nasab NM, Mirzazadeh H. Overall effect of nano clay on the physical mechanical properties of epoxy resin. *World Academy of Science, Engineering and Technology*. Volume 73, January 2011, Pages 208-211.
58. Nasiri M, Fayazi S, Jahani S, Yazdanpanah L, Haghhighizadeh MH. The effect of topical olive oil on the healing of foot ulcer in patients with type 2 diabetes: a double-blind randomized clinical trial study in Iran. *J Diabetes Metab Disord*. 2015 Apr 29;14:38. doi: 10.1186/s40200-015-0167-9. eCollection 2015.
59. Hosseini MM, Hassanpour A, Manaheji F, Yousefi A, Damshenas MH, Haghpanah S. Percutaneous nephrolithotomy: is distilled water as safe as saline for irrigation?. *Urol J*. 2014 Jul 8;11(3):1551-6.
60. Damshenas MH, Kalani N. Determining retelling of events during general anesthesia in open-heart surgery patients in the hospitals affiliated to shiraz university of medical sciences. *IIOAB Journal*. Volume 7, October 2016, Pages 329-332.
61. Mansouri E, Abedi HA, Damshenas MH, Jahromi HK. Antioxidant effects of hydro-alcoholic extract of Pomegranate (*Punica granatum L.*) on some of tissues. *Biosciences Biotechnology Research Asia*. Volume 11, Issue 2, 1 August 2014, Pages 441-447.
62. Ashtari, F., Shayegannejad, V., Saberi, A., Rabiee, E. Relationship between *Helicobacter pylori* immunoglobulin G antibody and thrombotic ischemic stroke. 2008, *Acta Medica Iranica*. 46(4), pp. 303-306.
63. Saberi A, Nemati S, Sabnan S, Mollahoseini F, Kazemnejad E. A safe-repositioning maneuver for the management of benign paroxysmal positional vertigo: Gans vs. Epley maneuver; a randomized comparative clinical trial. *Eur Arch Otorhinolaryngol*. 2017 Aug;274(8):2973-2979. doi: 10.1007/s00405-016-4235-7. Epub 2016 Aug 3.
64. Saberi A, Salehi Z, Naderinabi B, Ansari SH, Mashayekhi S. Genetic Dimension of Intervertebral Disc Degeneration: Polymorphism of Matrix Metalloproteinase 1 and 3 in the North Iranian Population. *Turk Neurosurg*. 2018;28(3):447-453. doi: 10.5137/1019-5149.JTN.19978-17.0.
65. Mosarrezai A, Kargar K. Frequency of depression in patients with seizure referring to the Urmia neuromedical clinic. *Journal of Advanced Pharmacy Education and Research*. 2018. 8(2), pp. 16-20.
66. Faramrza Zadeh R, Shahabi Rabori V. Relationship between TIMI myocardial perfusion grade and ST resolution in evaluating the coronary reperfusion. *Journal of Advanced Pharmacy Education and Research*. 2018. 8(1), pp. 23-31.
67. Khalkhali HR, Samareh R, Kazem Alilu S, Habibzadeh H, Rezaei S. Modeling factors influence stay duration in unit due to maxillofacial fracture. *Journal of Advanced Pharmacy Education and Research*. 2018. 8(1), pp. 36-40.
68. Sadeghi E, Nasimfar A, Haghiri Madadi M. Prevalence of methicillin-resistant staphylococcus aureus colonization in children admitted to Motahari hospital of Urmia. *Journal of Advanced Pharmacy Education and Research*. 2017. 7(4), pp. 464-468.
69. Mosarrezai A, Hedayati Asl A, Asghar Ghafouri A. Assessment of prevalence of MRI findings in epileptic patients of imam Khomeini hospital, Urmia, Iran during 2010-2011. *Journal of Advanced Pharmacy Education and Research*. 7(4), pp. 473-478.
70. Shahabi Raberi V, Faramrza Zadeh R, Ezati E. The relationship between the hematologic indices after thrombolysis in patients with myocardial infarction. *Journal of Advanced Pharmacy Education and Research*. 7(4), pp. 491-498.
71. Ebrahimzadeh, F., Hajizadeh, E., Baghestani, A.R., Nazer, M.R. Effective factors on the rate of growth failure in children below two years of age: A recurrent events model. Effective factors on the rate of growth failure in children below two years of age: A recurrent events model. Volume 47, Issue 3, March 2018, Pages 418-426.