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Research Paper

Evaluation of some immunological parameters against streptococcus pyogenes in tonsillitis

Nebras Ayad Mohammed[1*], Sundus Jassim Muhammad[2], Abdulwadood Shakir Mahmood Alsoufi[3]
[1*,2,3]Department of Biology, College of Science, Tikrit University, Tikrit, Iraq.

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ABSTRACT

This study was designed to evaluate some immunological parameters in patients with chronic tonsillitis. Swabs were obtained from the tonsils of 120 patients with chronic tonsillitis to detect streptococcus pyogenes and. and blood samples collected to detect the immune parameters in the patient's serum. The results of culture showed that 60 samples (50%) were positive to streptococcus pyogenes. Significant differences were observed in ASO titer levels between the tonsillitis group (400 IU, interquartile range: 400-1600) and the control group (200 IU, interquartile range: 0), with a p-value <0.05. However, no statistically significant differences were observed in TNF-α levels between the two groups, with a median of 248 pg/ml (interquartile range: 125) in the tonsillitis group and 209 pg/ml (interquartile range: 112) in the control group (p>0.05). Nevertheless, a significant decrease in IL-10 levels was observed in the tonsillitis group (51.8 pg/ml, interquartile range: 29.4) compared to the control group (81.4 pg/ml, interquartile range: 36.4), with a p-value <0.05.

Corresponding Author:
Nebras Ayad Mohammed
Department of Biology, College of Science, Tikrit University, Tikrit, Iraq.
Email: nebras.a.mohammed.bio220@st.tu.edu.iq

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1. INTRODUCTION

The tonsils are a group of lymph nodes situated at the back of the throat, in a delicate area that is part of the upper respiratory system [1]. In the pharynx, the tonsils create a ring called the Waldeyer's ring. This ring serves as the body's first line of defense against a wide range of infectious agents, including viruses

and bacteria. It also plays a role in the production of antibodies, including IgA [2]. And this can be because of the lymphocytes being stimulated by the same antigens over and over again [3]. Staphylococcus aureus and Group a beta-hemolytic streptococci (GABHS) are the major culprits when it comes to acute and chronic tonsil inflammation [4], [5].

A delicate mechanical balance regulates the infection-specific immune responses by promoting the synthesis of the and the cytokines. A cell-mediated response is used to initiate an immune response by the cytokines generated from the (TNF-α). According to [6], the cells trigger a humoral response by secreting IL-10. It is possible to utilize clinical criteria, such as white blood cell total and differential counts, to diagnose bacterial infections [7]. Write Acute and chronic tonsillitis patients' immunological parameter levels were the focus of the current research, which also sought to isolate and diagnose streptococcus pyogenes in tonsillitis patients. One kind of bacteria, S. pyogenes, was gram-positive. According to [8], [9] streptococcus is a dangerous human pathogen that may infect the tonsils and skin, causing a wide range of illnesses, from non-communicable sore throat and fever to potentially fatal and infectious invasive infections. It was one among the top 10 infectious diseases that caused human mortality [10]. Eleven of these virulence agents have been designated as super antigens, as is typical of most pathogens [8].

2. RELATED WORK

A study [11] found that tonsillitis patients had increased levels of TNF-α, indicating that the tumor necrosis agent stimulates blood vessel linings and increases permeability, leading to enhanced immunity. Additional studies have demonstrated that IL-10 has a variety of anti-inflammatory properties and plays an important function in infection as a regulator of primitive immunity. IL-10, which is produced in reaction to bacteria and their products, plays an important part in the pathogenic process [12].

3. METHODOLOGY

A total of 120 samples of chronic tonsillitis patients were collected at the Tikrit Teaching Hospital in Tikrit city. For the period from the beginning of October (1/10/2023) to the end of December (24/12/2023) and for different age groups (5-15 years) for both genders. The samples were taken with a swab from the tonsils. Were cultured on blood agar and incubated at 37°C for 24-48 hours. The growth diagnosed using biochemical tests and Vitek 2. 5ml venous blood was collected from all patients and healthy people as control group, and put in a jel tube and Centrifuged. The serum was immediately stored in an Eppendorf tube and frozen at -20C° until assayed for immunological parameters. ASO titer was measured by serial dilution assay test. The level of interleukin-10 and tumor necrosis factor-alpha was assayed by Elisa kits accordance with the instructions of the Chinese company sun long biotech.

4. RESULTS AND DISCUSSION

Results

This study included 60 patients with tonsillitis and 30 individuals as a control group for comparison. Regarding age, there was no significant difference between the patient group (9 years, interquartile range: 6.25 years) and the control group (8.5 years, interquartile range: 7.5 years), with a p-value greater than 0.05. The gender distribution (male/female) was also similar between the two groups, with a male-to-female ratio of 25/35 in the patient group and 15/15 in the control group (p>0.05, Table 1).

Table 1. Demographic Characteristics of Study Participants

Parameter	Control (n= 30)	Tonsillitis (n= 60)	P-value
Age (years)	8.5 (7.5)	9 (6.25)	0.611
Sex (M/F)	15/15	25/35	0.453

Table 2 shows the difference in concentrations of immunological markers between patients and control group. Significant differences were observed in ASO titer levels between the tonsillitis group (400 IU, interquartile range: 400-1600) and the control group (200 IU, interquartile range: 0), with a *p*-value <0.05. However, no statistically significant differences were observed in TNF-α levels between the two groups, with a median of 248 pg/ml (interquartile range: 125) in the tonsillitis group and 209 pg/ml (interquartile range: 112) in the control group ($p>0.05$). Nevertheless, a significant decrease in IL-10 levels was observed in the tonsillitis group (51.8 pg/ml, interquartile range: 29.4) compared to the control group (81.4 pg/ml, interquartile range: 36.4), with a *p*-value <0.05.

Table 2. Levels of Immunological Biomarkers in Serum Samples of the Participants

Parameter	Control (n= 30)	Tonsillitis (n= 60)	P-value
ASO titer (IU)	200 (200, 200)	400 (400, 1600)	<0.001
TNF-α (pg/mL)	209 (179, 291)	248 (197, 321)	0.342
IL-10 (pg/mL)	81.4 (61.8, 98.1)	51.8 (40.2, 69.3)	<0.001

Data were presented as median (IQR).

In Table 3 and Figure 1, the concentrations of immunological biomarkers are presented by gender for both patients and healthy controls to assess the impact of gender on the described covariance. The results showed no statistically significant differences for all variables ($p>0.05$).

Table 3. Serum Levels of Immunological Biomarkers in of the Participants by Sex

Parameter	Control (n= 30)		P	Tonsillitis (n= 60)		P
	Male	Female		Male	Female	
ASO titer (IU)	200 (0)	200 (0)	0.999	1200 (800)	800 (400)	0.454
TNF-α (pg/mL)	210 (127)	190 (101)	0.321	248 (107)	247 (139)	0.652
IL-10 (pg/mL)	89.5 (33.6)	69.7 (24.6)	0.143	46.2 (31.7)	53.3 (25.4)	0.492

Data were presented as median (IQR).

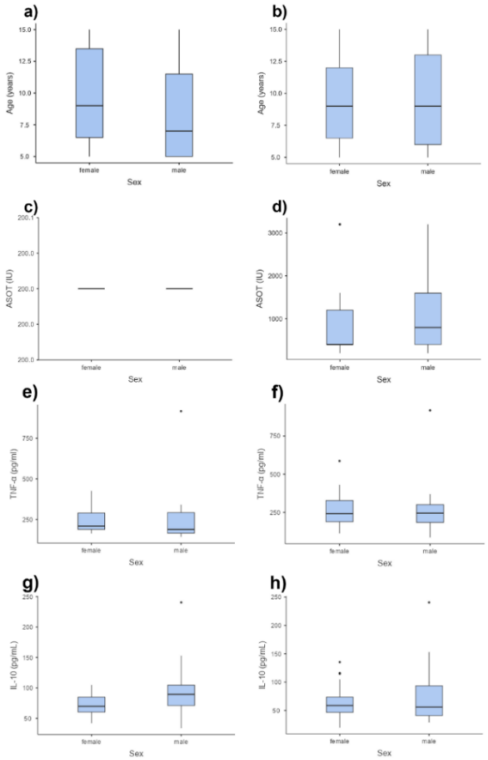


Figure 1. Concentrations of Immunological Markers in Study Participants by Gender

In Figure 1 a, c, e, and g the results of age, ASO titer, TNF-α, and IL-10 in the control group are shown, respectively; while the results of age, ASOT, TNF-α, and IL-10 are shown in Figure 1 b, d, f, and h respectively.

Discussion

Antistreptolysin O titer (ASO) is a blood serum level of antistreptolysin O antibodies used to diagnose streptococcal infections or confirm previous exposure to streptococci. The ASOT guides antibiotic treatment and aids in the diagnosis of scarlet fever, rheumatic fever, and post-infectious glomerulonephritis. A positive streptococcal antibody test can indicate recent group A, C, and G streptococcal infection and support the diagnosis of post-infection complications. The antibodies level rises in 1-3 weeks after infection, peaks in 3-5 weeks, and returns to insignificant levels after 6-12 months. Rising titers over time are symptomatic of infection [13]. This study supports [14] finding that gender is not a risk factor for infection, but differs from [15] finding that females are more susceptible and respond to infection in a 3:1 ratio.

The variables of tumor necrosis factor alpha and interleukin 10 are consistent with these studies. The study found that patients with chronic and acute tonsillitis had higher serum levels of tumor necrosis factor-alpha. TNF-α stimulates the arterial lining and increases permeability, leading to increased immune cell entrance, complement proteins, and IgG and IgA levels. It also promotes fluid outflow to lymph nodes [16]. IL-10, a key regulator of innate immunity, has been demonstrated to have anti-inflammatory properties and play a role in infection, according to multiple research. According to [12], the reaction to microbes and their products triggers the production of IL-10, which is a key factor in pathogenesis [17].

5. CONCLUSION

The study found that Streptococcus pyogenes is the main reason of chronic tonsillitis. Immunologic markers found that TNF-α is not a sensitive marker for chronic tonsillitis, IL-10 is a sensitive marker, and ASOT index is a marker for infection severity.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Nebras Ayad Mohammed	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	
Sundus Jassim Muhammad		✓		✓		✓		✓	✓			✓		✓
Abdulwadood Shakir Mahmood Alsoufi	✓	✓		✓	✓		✓			✓		✓	✓	

C: **C**onceptualization
M: **M**ethodology
So: **So**ftware
Va: **Va**lidation
Fo: **Fo**rmal Analysis
I: **I**nvestigation
R: **R**esources
D: **D**ata Curation
O: Writing- **O**riginal Draft
E: Writing- Review& **E**diting
Vi: **Vi**sualization
Su: **Su**pervision
P: **P**roject Administration
Fu: **Fu**nding Acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

The study was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki and approved by the relevant institutional authorities.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

[1] Comparative study of some immunological aspects in children with tonsillitis and carriers of group a β-hemolytic Streptococci. Iraq, 2013.

[2] M. Gd, 'Study of common bacterial isolates in acute tonsillitis in India', Indian Journal of Basic and Applied Medical Research-Otorhinolaryngology special issue, vol. 6, no. 2, pp. 59-62, 2017.

[3] A. Barzinji, 'Estimation of Complement Components C3, C4 and Immunoglobulin's IgA, IgM and IgG among Patients with Tonsillitis', Diyala Journal of Medicine, vol. 10, no. 2, pp. 48-54, 2016.

[4] Z. N. Abidali, Immunological and molecular study of the bacteria that cause Tonsillitis. Iraq, 2014

[5] Babaiwa, UF1; Onyeagwara, NC and Akerele, JO. Bacterial tonsillar microbiota and antibiogram in recurrent tonsillitis. Bio. Med. Res., 2013; 24(3): 298-302.

[6] J. Wang, Y. S. Chung, Y. W. Cho, J. S. Yi, J. S. Bae, and M. J. Shim, 'Palatine tonsil size in obese, overweight, and normal-weight children with sleep-disordered breathing". Otolaryngology--head and neck surgery: official journal of American Academy of Otolaryngology-Head and Neck Surgery', vol. 142, pp. 516-519, 2010. doi.org/10.1016/j.otohns.2010.01.013

[7] F. C. Ocal, R. Ocal, and F. Kuscu, 'Can McIsaac scores prevent the unnecessary use of antibiotics in tonsillitis?', B-ENT, vol. 13, no. 3, pp. 183-187, 2017.

[8] D. Bencardino, M. C. Di Luca, D. Petrelli, M. Prenna, and L. A. Vitali, High Degree of Virulence Gene Diversity in Streptococcus pyogenes Isolated in Central Italy. Camerino, Italy, 2016, pp. 165-185.

[9] Y. Terao, 'The virulence factors and pathogenic mechanisms of Streptococcus pyogenes', Journal of Oral Biosciences, vol. 54, pp. 96-100, 2012. doi.org/10.1016/j.job.2012.02.004

[10] M. Laabei and D. Ermert, 'Catch me if you can: Streptococcus pyogenes complement evasion strategies', Journal of Innate Immunity, vol. 33, pp. 1-10, 2018.

[11] Povoa, P. C-reactive protein: a valuable marker of sepsis. Intensive Care Med., 2002; 28: 235-243. doi.org/10.1007/s00134-002-1209-6

[12] Murphy, K., & Weaver, C. (2016). Janeway's immunobiology. Garland Science. doi.org/10.1201/9781315533247

[13] V. Kumar, N. Fausto, and R. N. Mitchell, Robbins Basic Pathology (8th Ed). Saunders Elsevier, 2007, pp. 403-406

[14] Saleh, M. S. (2009). Streptococcal throat infection among Yemeni children..Iraqi J. Sc., 50(1): 126 - 135.

[15] H. H. Al-Hababy, Bacteriological and immunological study on group a streptococcus pyogenes isolated from patients in Babylon province. 2010.

[16] M. M. Todorović and E. Z. Zvrko, 'Immunoregulatory cytokines and chronic tonsillitis', Bosnian journal of basic medical sciences, vol. 13, no. 4, 2013. doi.org/10.17305/bjbms.2013.2330

[17] A. Shet and E. L. Kaplan, 'Clinical use and interpretation of group A Streptococci among school - aged children: clinical characteristics and the carrier state', Pediatrics, vol. 114, pp. 1212-1219, 2002. doi.org/10.1542/peds.2004-0133

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BIOGRAPHIES OF AUTHORS

	**Nebras Ayad Mohammed,** is a researcher in the Department of Biology, College of Science, Tikrit University, Tikrit, Iraq. Her academic interests focus on immunology, microbiology, and infectious diseases, particularly the immunological response to bacterial pathogens such as Streptococcus pyogenes. She has contributed to research evaluating immunological biomarkers, including antistreptolysin O (ASO), TNF-α, and IL-10 in patients with chronic tonsillitis. Her work emphasizes laboratory diagnostics and the clinical significance of immune markers in disease severity and progression. Email: nebras.a.mohammed.bio220@st.tu.edu.iq
	**Sundus Jassim Muhammad,** is affiliated with the Department of Biology, College of Science, Tikrit University, Tikrit, Iraq. Her research interests include clinical microbiology, immunological assays, and the study of host immune responses in infectious diseases. She has participated in investigations assessing cytokine levels and serological markers in patients with chronic tonsillitis. Her contributions include laboratory analysis, data interpretation, and supporting the understanding of immune mechanisms involved in bacterial infections.
	**Abdulwadood Shakir Mahmood Alsoufi,** is a faculty member in the Department of Biology, College of Science, Tikrit University, Tikrit, Iraq. His academic expertise includes microbiological diagnostics, immunological techniques, and infectious disease research. He has been involved in studies focusing on the isolation and identification of Streptococcus pyogenes and the evaluation of immune biomarkers in tonsillitis patients. His work supports advancing laboratory-based research and improving the understanding of immunopathological responses in bacterial infections.