

Estimation of Interleukin-17A in Serum of Patients with Typhoid Fever in Babylon City in Iraq

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ABSTRACT— Typhoid is an infection caused by *Salmonella typhi*, these type of bacteria exist in the intestines of humans. When *Salmonella typhi* spreads from person to person by contact with an infected person or its feces. The present study is designed to determine the levels of interleukin-17A in Iraqi patients with typhoid fever infection in Babylon province. 50 clinical samples were collected from the blood of patients with typhoid fever who attended Al-Hillah Surgical Teaching Hospital and private laboratories in AL-Hillah/Babylon province during the period from February to August 2021. This study comprised 50 seemingly healthy control individuals who appeared healthy and disease-free individuals. The average age of the patients \pm standard deviation was 36.66 ± 12.32 years old, with a range of 15-65 years old. The study shows the percentage distribution of the two study groups based on gender that there were 32 cases for males and 18 cases for females. The mean interleukin-17A concentration in the serum of patients \pm standard deviation was 27.06 ± 8.76 pg/ml while the concentration in the serum of control \pm standard deviation was 13.41 ± 5.27 pg/ml. There were significant differences when compared with the control group.

KEYWORDS: Interleukin-17A, typhoid fever, Babylon, infection, concentration

1. INTRODUCTION

Typhoid fever is a public health issue in poor and middle-income nations, which causes gastroenteritis, enteric fever, and septicemia. The life of antibiotic remedy and advanced water best and sanitation represent last answers to this trouble is vaccination in high-danger regions is a ability manage strategy [1]. Typhoid fever is a potentially fatal infection of the digestive system and circulation caused by pathogenic bacteria. *Salmonella enterica* serotype *typhi* is a gram-negative, non-capsulated, non-sporulation, rod-shaped, facultative anaerobe of the enterobacteriaceae family that has flagella, somatic and outer coat antigens that only live in humans because it is an infectious illness that is spread orally through contact person-to-person or spread through contaminated food or impure water [2], [3]. This type of bacteria isolated not only from human also from animal like chicken [4]. This bacteria may infect food products of animal origin like poultry and dairy products [5]. Clinical research has demonstrated that this condition activates both the digestive mucosal and humeral responses, both of which are vital in pathogen management [6]. Proinflammatory cytokines play a vital role in host defense against a spread of pathogens, as well as bacterium and viruses. IL-17A was a predominance of pro-inflammatory cytokines in typhoid fever patients, and their levels were higher when put next to patients with alternative diseases [7]. The study aim to estimate interleukin-17A concentration in patients as marker for typhoid infection.

2. MATERIAL AND METHODS

2.1 Patients and control groups

The study was done on patients with typhoid fever who attended Al-Hillah Surgical Teaching Hospital and private laboratories in AL-Hillah/Babylon province during the period from February to August 2021. This

included 50 patients infected with typhoid fever and positive for Widal test and positive for culturing *Salmonella typhi* and 50 individuals apparent healthy and negative for Widal test and culturing *Salmonella typhi* that are selected as a control groups.

2.3 Blood Samples

In the current investigation, five ml of blood was collected from typhoid fever patients and health individuals, the samples were placed in tubes containing a gel and then the blood was separated by centrifuge at 3000 rpm for 15 minutes, the serum was putted in Eppendrof tubes and then stored in a deep freeze at -20°C until used [8]. IL-17A was measured in patients and controls using an Enzyme-Linked Immunosorbent Assay (ELISA) based on the manufacturing company's principle.

3. RESULTS AND DISCUSSION

3.1 Demographic Information

For the current study, fifty clinical samples were collected from the blood of typhoid fever patients. The demographic data included the age and gender distribution of typhoid fever patients. This study comprised 50 seemingly healthy control individuals who appeared healthy and disease-free.

3.1.1 Patients Distribution based on Age

The mean age of the patients \pm standard deviation was 36.66 ± 12.32 years old, with a range of 15-65 years old, and 50 control individuals were included in this study, with the mean for healthy control \pm standard deviation 34.84 ± 11.51 . According to the findings of the current study, the age group most likely to have typhoid fever infections was 25-35 years old, which was reached at 34%, followed by 15-25 years old, which was reached at 24%, and less that the group of 35-45 years old reached 20% and the group of (45-55) years old reached 12%. Finally, the group of 55-65 year olds reached 10% as can be seen in figure (1). The disease was more frequent in the patient group 25-35 years old in this study. Patients at these ages were more active and met more people, potentially predisposing them to infections, according to the findings of [9]. The results of this study was in agreement with [10], once they found the age bracket 21-30 was extremely plagued by typhoid fever infection.

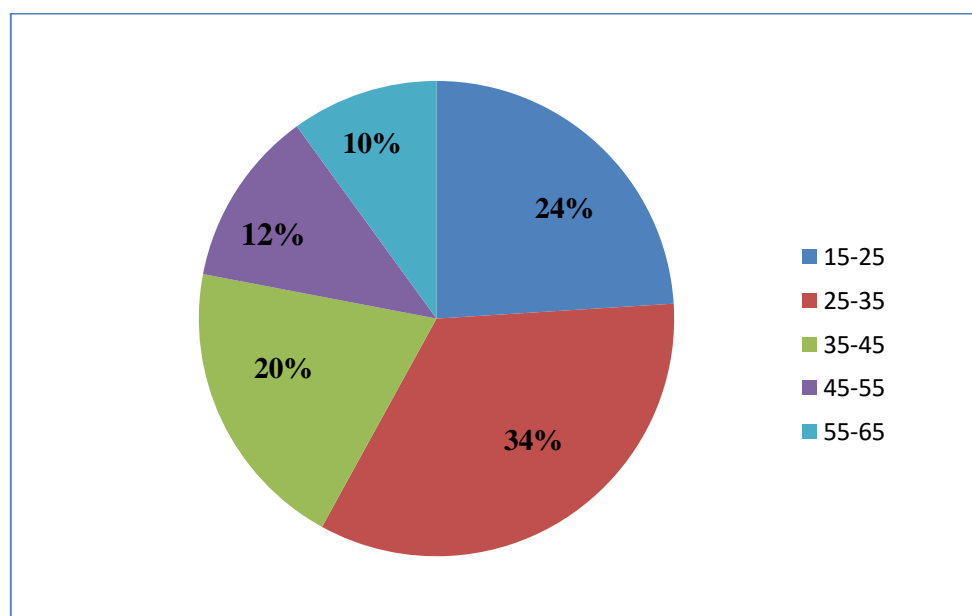


Figure (1): distribution of patients according to age

3.1.2 Patients Distribution based on Gender

The study shows the percentage distribution were 32 (64%) of cases for males and 18 (36%) of cases for females' susceptibility to typhoid fever infection, as shown in Figure (2).

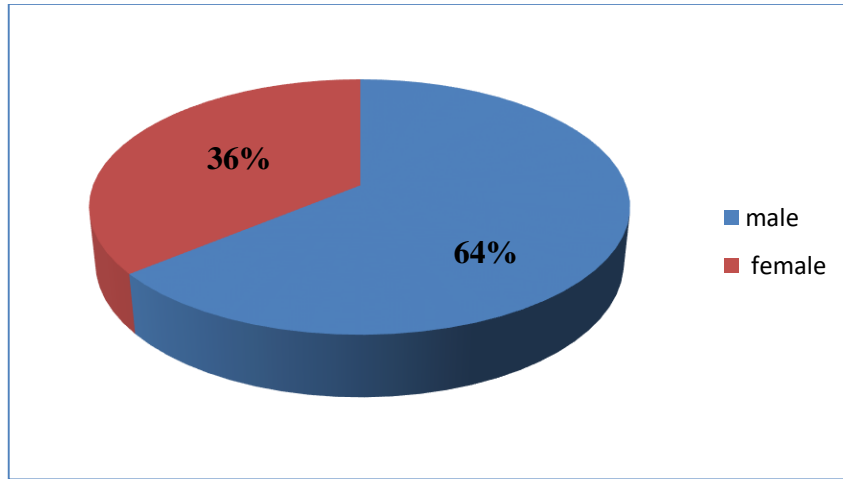


Figure (2): Distribution of patients according to gender

The explanations might be that most men were out-doored, in which case they could be viewed as food eating and handling or contact with other patients. Males were found to be more infected than females, which is consistent with prior findings [11].

3.2 Concentrations of IL-17A in Serum of patients and control group

In this study, investigated the levels of IL-17A in the serum of patients and compared them with control. The mean IL-17A concentration in the serum of patients ± standard deviation was 27.06±8.76 pg/ml while the concentration of control ± standard deviation was 13.41±5.27 pg/ml there were significant differences (P ≤ 0.001) as shown in table (1) and figure (3).

Table (1): IL-17A levels in patients and control groups

Interleukins Type	Group	Mean	Std. Deviation	Std. Error Mean	t. test	P. value
IL-17A	Control	13.41	5.27934	2.13015	-5.403	0.000
	Patient	27.06	8.76541	2.85043		

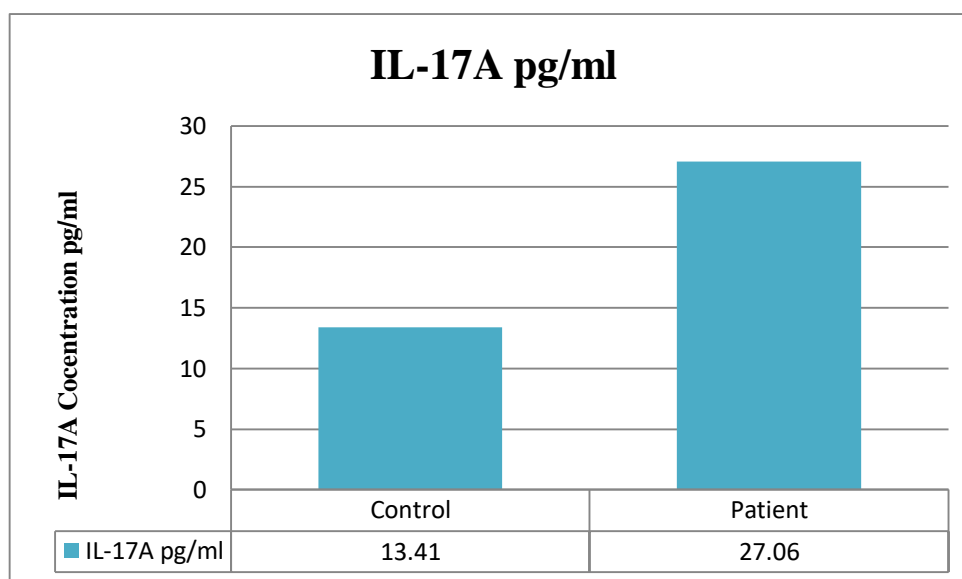


Figure (4-7): Compered of IL-17A in patients and control groups

It was important to start studies to work out whether or not IL-17A may play a job in *S.typhi* protection as a result of the channel membrane is that the initial purpose of contact for *S.typhi* and membrane immune responses are possible to play a role in protection. Th17 cells turn out IL-17, that acts as a negotiator within the inflammation related to host defense against microorganism and plant life pathogens, notably at mucosal surfaces [12], [13]. This microorganism has virulence issue alter bacteria to cause un wellness one in every of these factor lipopolysaccharide this factor settled in host as studies in rabbit model it result on blood parameters [14- 16]. It has been incontestable that IL-17A contributes to membrane immunity and protection against intracellular pathogens [17]. Ktsoyan showed elevated level of IL-17 in patients with acute food poisoning caused by 2 serotypes of *S.enterica*, *S.enteritidis* and *S.typhimurium* compared to healthy management subjects [18]. The findings of this study are in keeping with those of Bhuiyan who discovered a big increase in IL-17 throughout infectious disease infection [19]. The results believe those of Sivick who discovered that IL-17A deficient mice are additional at risk of *E. coli* infection [20]. Following cavum tying and puncture, IL-17R deficient mice showed shriveled leukocyte recruitment, magnified infection spread, and exacerbated inflammatory responses [21]. IL17A conjointly induces antimicrobial responses in animal tissue cells against intracellular microorganism appreciate *Salmonella typhimurium* [22]. In clinical studies, low IL-17A levels are related to impaired host immunity once infected with bacteria such as *Bordetella* respiratory disease and *Citrobacter rodentium* [23]. The expression of an antimicrobial peptide induced by IL-17A at the apical site of the intestinal mucosa led to the killing of invading pathogens at the epithelial surface immediately after infection with *Salmonella* [24].

4. CONCLUSION

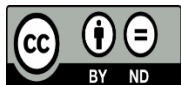
This study was performed to estimate the interleukin-17A concentration within the body fluid of patients with infectious disease infection and that we recorded a rise in the levels of interleukin-17A in the serum of patients with typhoid fever infection in comparison with the management group.

5. REFERENCES

[1] Antillón, M.; Warren, J.; Crawford, F.; Weinberger, D. Kürüm, E.; Pak, G.; Marks, F. and Pitzer, V. (2017). The burden of typhoid fever in low and middle income countries: A meta-regression approach. PLoS neglected tropical diseases. 11(2), e0005376.

- [2] Pouzol, S.; Tanmoy, A.; Ahmed, D.; Khanam, F.; Brooks, W.; Bhuyan, G.; Fabre, L.; Bryant, J.; Gustin, M.; Vanhems, P.; Carman, B.; Weill, F.; Qadri, F.; Saha, S. and Endtz, H. (2019). Clinical evaluation of a multiplex PCR for the detection of *Salmonella enterica* serovars typhi and paratyphi A from blood specimens in a high endemic setting. *Am. J. Trop. Med. Hyg.* 101(3): 513-520.
- [3] Phetsavanh, C.; Mayfong, M.; Phouthapanya, X.; Tamalee, R.; Sayaphet, R.; Manivanh, V.; Paul, N. and John, A. (2020). Estimation of incidence of typhoid and paratyphoid fever in Vientiane, Lao People's Democratic Republic. *Am. J. Trop. Med. Hyg.* 102(4), pp. 744-748.
- [4] Shaimaa Jassim AlSultany. (2021). Isolation of pathogenic bacteria from local chicken in Hillah and Diwaniyah markets and farms. *Biochem. Cell. Arch.* 21, 2575-2578. DocID: <https://connectjournals.com/03896.2021.21.2575>.
- [5] Alzwghaibi, A.; Yahyaraeyat, R.; Fasaee, B.; Langeroudi, A. and Salehi, T. (2018). Rapid molecular identification and differentiation of common *Salmonella* serovars isolated from poultry, domestic animals and foodstuff using multiplex PCR assay. *Arch. Microbiol.* 200(7): 1009-1016.
- [6] Alikhan, N.; Zhou, Z.; Sergeant, M. and Achtman, M. (2018). A genomic overview of the population structure of *Salmonella*. *PLoS. Genet.* 14(4):e1007261.
- [7] Ahmed, A.; Alvi, A.; Butt, A.; Nawaz, A. and Hanif, A. (2014). Assessment of dengue fever severity through liver function tests. *J. Coll. Physicians Surg. Pak.* 24(9):640-644.
- [8] Estridge, B. H.; and Reynolds, A. P. (2011). 'Basic clinical laboratory techniques' (Nelson Education).
9-Al-ameri, G., & Saif, N. (2013). A prevalence study of typhoid fever in Taiz and Al-Hodiedahcities in Yemen. *Microbiology Research. Journal International.* 4(2), 214-223.
- [10] Rasul, F.; Sughra, K.; Mushtaq, A.; Zeeshan, N.; Mehmood, S. and Rashid, U. (2017). Surveillance report on typhoid fever epidemiology and risk factor assessment in district Gujrat, Punjab, Pakistan. *Biomedical Research (India)*, 28(16), 6921-6926.
- [11] Ali Awad Obeis Abd. (2019). Genotypic and phenotypic characterization of *Salmonella typhi* isolated from typhoid patients in Babylon Province. MSc. Thesis, Babylon University.
- [12] Mangan, P. R.; Harrington, L. E.; O'Quinn, D. B.; Helms, W. S.; Bullard, D. C.; Elson, C. O. and Weaver, C. T. (2006). Transforming growth factor- β induces development of the TH 17 lineage. *Nature.* 441(7090), 231-234.
- [13] Ouyang, W.; Kolls, J. K. and Zheng, Y. (2008). The biological functions of T helper 17 cell effector cytokines in inflammation. *Immunity.* 28(4), 454-467.
- [14] Al-Sultany, S. J., & Jassim, Y. A. (2016). Physiological and Immunological Effect of lipopolysaccharide of *Escherichia coli* was Extracted by Hot Phenol-Water in Rabbits. *RESEARCH JOURNAL OF PHARMACEUTICAL BIOLOGICAL AND CHEMICAL SCIENCES*, 7(3), 1530-1535.
- [15] Al-Sultany, S. J., & Jassim, Y. A. (2016). Cryoglobulin Induction in Rabbits by Endotoxin Injection Experimentally. *International Journal of PharmTech Research*, 9(4), 394-398.

- [16] Shaimaa Jassim AlSultany. (2021). Effect of extracted lipopolysaccharide on some blood parameters in rabbit model. *Biochem. Cell. Arch.* 21, 1663-1665. DocID: <https://connectjournals.com/03896.2021.21.1663>.
- [17] McArthur, M. A. and Sztein, M. B. (2012). Heterogeneity of Multifunctional IL-17A Producing S.typhi-Specific CD8+ T Cells in Volunteers following Ty21a Typhoid Immunization. *PLoS ONE* 7(6): e38408.
- [18] Ktsoyan, Z.; Ghazaryan, K.; Manukyan, G.; Martirosyan, A.; Mnatsakanyan, A.; Arakelova, K. and et al. (2013). Inflammatory responses to Salmonella infections are serotype-specific. Hindawi Publishing Corporation International Journal of Bacteriology, Article ID 168179, 7.
- [19] Bhuiyan, M. S.; Sayeed, M. A.; Khanam, F.; Daniel, T.; Bhuiyan, T. R.; Sheikh, A.; Salma, U. and et al. (2014). Cellular and cytokine responses to Salmonella enterica serotype typhi proteins in patients with typhoid fever in Bangladesh. *Am. J. Trop. Med. Hyg.* 90(6):1024-1030.
- [20] Sivick, K. E.; Schaller, M. A.; Smith, S. N; Mobley, H. L. (2010). The innate immune response to uropathogenic Escherichia coli involves IL-17A in a murine model of urinary tract infection. *J. Immunol.* 184:2065-75.
- [21] Zhao, Y.; Zhang, X.; Song, Z.; Qi, D.; Deng, X.; Xia, J. and et al. (2016). Rapamycin attenuates acute lung injury induced by LPS through inhibition of Th17 cell proliferation in mice. *Sci. Rep.* 6:20156.
- [22] Broz, P.; Ohlson, M. B. and Monack, D. M. (2012). Innate immune response to Salmonella typhimurium, a model enteric pathogen. *Gut Microbes.* 3:62-70.
- [23] Almashhadani, H. A. (2021). Synthesis of a CoO–ZnO nanocomposite and its study as a corrosion protection coating for stainless steel in saline solution. *Int. J. Corros. Scale Inhib.* 10(3), 1294-1306.
- [24] Levy, R.; Okada, S.; Beziat, V.; Moriya, K.; Liu, C.; Chai, L. Y. A. and et al. (2016). Genetic, immunological, and clinical features of patients with bacterial and fungal infections due to inherited IL-17RA deficiency. *Proc. Natl. Acad. Sci. U.S.A.* 113:E8277-85.
- [25] Mayuzumi, H.; Inagaki-Ohara, K.; Uyttenhove, C.; Okamoto, Y. and Matsuzaki, G. (2010). Interleukin-17A is required to suppress invasion of Salmonella enterica serovar typhimurium to enteric mucosa. *Immunology*, 131(3), 377-385.



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