

The relationship between Interleukin-22 concentration and some types of bacteria that were isolated from wounds and surgical operations in Samarra city/ Iraq

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Abstract

The current study is conducted to estimate the level of the interleukin 22 concentration level and its relationship with some bacterial species in people who had wounds and surgeries. The study includes 40 samples of swabs and blood samples from patients with wound infections who attended Samarra General Hospital and some outpatient clinics, and their ages ranged between (12-68) years and of different sex, for the period from November 2021 to the end of March 2022. The information is recorded in a questionnaire for information about the person within the subject of the study. The samples are divided into wound infection samples for 30 surgical patients and control samples for the healthy 10 samples. The results of the current study show a significant decrease of $P \leq 0.01$ in the level of interleukin IL-22 concentration in patients who underwent surgical operations (13 pg/ml) compared to its level in control groups (37.13 pg/ml). The level of the concentration of the interleukin IL-22 decreases in the subjects with bacterial growth (*Staph.aureus*, *Pseudomonas*, *Proteus*, *Klebsiella*, *E. coli*) (14.66, 9.92, 17.08, 11.73, 11.67 pg/ml), respectively, and differently among people who had wounds and surgeries, as the results show that the level of IL-22 concentration decreases by different levels. Heterogeneous to those infected and according to the type of bacterial growth that appeared in them.

Introduction

The skin is one of the important organs that covers the human body, as well as protecting it from external influences. Therefore, the main function of the skin in humans is to protect the body and is one of the first lines of defense against germs. The skin protects the body through its physical properties, as it is almost completely resistant to wetness, and prevents the penetration of fluids that submerge the tissues of the body. However, microbes may be able to enter the body through inconspicuous cutaneous breaks [1]. Injuries and infections that occur in hospitals and health centers are among the difficult problems faced by many doctors who work in those hospitals, as they are in direct contact with these microbes, despite the good care, sterilization and hygiene within the halls of surgical operations and the attention of nurses to the sleeping patients. In the hospital, however, these infections are among the prominent and widespread

problems worldwide in terms of microbial infections in hospitals, as they cause material and economic damage as well as human damage [2].

Cytokines are represented as soluble mediators, as they direct and regulate the interaction between cells, and control communication between cells of the immune system. Structurally, cytokines are proteins (a group of peptides) or glycoproteins. Each type is secreted by one or more types of cells after activating those cells to secrete those interleukins [3]. Interleukin-22 is a member of the IL-10 family of cytokines, and is an important response molecule for activated T-cells (T-helper22, T-helper1, and T-helper17). Most of the functions of IL-22 are unique. It acts primarily on epithelial cells and liver cells, acts as an antimicrobial agent, protects tissues from damage and has a significant role in immunity [4].

The study aims to measure the level of (IL-22) concentration in a unit of measurement pg/ml in people who have had wounds and surgeries and comparison with the healthy ones, and isolate and diagnose bacteria in people suffering from wounds and surgeries, and then finding the relationship between the level of interleukin-22 concentration and the bacterial species that were diagnosed within the subject of the current study.

Materials and Method

The study included 40 samples of blood and swabs taking from patients with wound infections who attended Samarra General Hospital and some outpatient clinics, and their ages ranged between (12-68) years and of both sexes, for the period from November 2021 to the end of March 2022. The samples distributed into 30 samples from patients and 10 from healthy. The swabs for taking the bacterial sample included the various places of the wound infection and were placed directly in sterile tubes containing a transport media. 5 ml of venous blood samples were taken from both the infected and the uninfected, and the blood serum was obtained for each person, and the serum was placed in special tubes, which are Epindrof tubes, to be kept frozen at a temperature of -20 C° for evaluation later using an ELISA device to determine the level of concentration IL-22. Bacterial swabs were taken and cultured on nutrient agar medium and culture media (Blood agar, Macconkey agar, Mannitol salt agar) for purification. Then the bacterial diagnosis of those samples was carried out, which included microscopic diagnosis, observing the gram staining of those samples and distinguishing between gram-negative bacteria and gram-positive bacteria [5].

Then the culture characteristics of the bacterial colonies such as their shape, size, color and texture were observed, and then biochemical tests were performed for the isolated samples such as mannitol fermentation test, catalase test, oxidase test, clotting test and IMVIC test [6, 7]. was used the API (Analytical Profile Index System) to diagnose the types of bacterial isolates after confirming them with the aforementioned preliminary biochemical tests. This system includes (20) small tubes for biochemical tests, and the instructions of the bio meriux company were followed and based on [8].

Statistical analysis

The results were statistically analyzed by applying the statistical program Minitab according to the Anova analysis of variance test by T- test, and the arithmetic averages are compared with the Duncan polynomial test with a probability level of 0.01.

Results and Discussion

Interleukin -22 concentration

The results of the current study show a significant decrease at the level of $P \leq 0.01$ of interleukin concentration IL-22 (13 pg/ml) among people who had surgical operations compared to its level in control groups (37.13 pg/ml) as shown in Table (1).

Table (1): The concentration of IL-22 (pg/ml) for surgical patients compared with control.

Type of infection	Condition	IL-22 (pg/ml)
wounds and surgical operations	Patients	13 b
	Control	37.13 a
P-value	0.01	

The different letters indicate the presence of significant differences at the probability level of $P \leq 0.01$.

The relationship between bacterial species and the immune variable IL-22 in patients with surgical operations

The results show a significant increase at the level of $P \leq 0.01$ of concentration of IL-22 (17.08) in people who had bacterial growth of *E.coli* when compared with its level in people diagnosed with bacterial growth of (*Staph.aureus*, *Pseudomonas*, *Proteus*, *Klebsiella*), and at concentrations (14.66, 9.92, 11.73, 11.67) pg/ml, respectively. The high level of IL-22 concentration (14.66) in pg/ml in the subjects with bacterial growth of *Staph.aureus* is significant, $P \leq 0.01$ when compared with its concentration in the subjects with the bacterial growth of the bacteria (*Pseudomonas*, *Proteus*, *Klebsiella*) and at concentrations (9.92, 11.73, 11.67) pg/ml, respectively. There are no significant differences ($P \leq 0.01$) in the level of IL-22 concentration when comparing between people who have bacterial growth of *Pseudomonas* and people who have bacterial growth of *Proteus* as well as people who have bacterial growth of *Klebsiella*. As shown in Table (2).

Table (2): The relationship between bacterial species and the level of concentration of the immune variable IL-22 in patients with surgical operations

Type of isolation	IL-22 pg/ml
<i>Staph.aureus</i>	14.66 b
<i>Pseudomonas</i>	9.92 c
<i>E.coli</i>	17.08 a
<i>Proteus</i>	11.73 c
<i>Klebsiella</i>	11.67 c
P-Value	0.01

The different letters indicate the presence of significant differences at the probability level of $P \leq 0.01$.

Similar letters indicate that there are no significant differences at the probability level $P \leq 0.01$

Impaired re-epithelialization, unbalanced expression of cytokines, and vascular disease contribute to impaired wound and wound healing. IL-22, an important cytokine in inflammatory processes and mediating mutual action between the immune system and epithelial cells, has been shown to play a significant role. Immunology and wound and tissue repair operations in infected persons. Several studies showed that the treatment of wounds with interleukin-22 has contributed to enhancing and accelerating the healing process and wound healing by promoting re-epithelialization, granulation tissue formation, and blood vessels. The improvement of epithelial remodeling is associated with increased proliferation of keratinocytes, and therefore treatment with IL-22 has an important role in the healing process of skin injuries and wounds [9]. IL-22 plays an important role in regulating inflammation and eliminating infectious pathogens, acting on a wide range of cell types such as T cells, macrophages, epithelial cells, dendritic cells, fibroblasts, and keratinocytes [10]. IL-22 acts to generate chemokines, inflammatory factors, and antimicrobial peptides (AMPs) [11]. Its action within mucosal defenses is mediated to subsequently reduce bacterial proliferation and facilitate pathogen clearance by enhancing the production and secretion of AMPs, as well as by enhancing the phagocytic activities of innate cells, and by inhibiting the autophagy processes of target cells. It has an important role in the immune processes in the event of an injury or bacterial infection [12]. The wound healing process is complex and permeates its work and is influenced by many cytokines, chemokines and growth factors. Interleukin IL-22 plays an important role in tissue regeneration and wound healing, stimulating the proliferation, migration and differentiation of cells involved in tissue repair, as well as the role of IL-22 in immune response processes and inflammatory processes as a result of infection, as it constitutes an important part during an injury or infection, as It participates in the defense against microbes and inflammatory infections, and has a major role in the healing and healing of wounds, as it stimulates the migration of cells to the site of injury or wounds and helps in tissue repair [13].

Conclusion

The study conclude that the level of IL-22 concentration is significantly decreased, in people who had wounds and surgeries, and its level also decreased in those who are diagnosed with bacterial growth, as the lowest concentration of Interleukin 22 was among people who are diagnosed with *Pseudomonas* bacteria, while the highest concentration is in people diagnosed with bacterial growth with *E.coli*, this indicates the importance of interleukin-22 within the immune system and its importance against bacterial infection, and therefore its level decreases as a result of its participation in the defense against bacterial infection, as well as its participation in the restoration and restoration of damaged tissues as a result of infection.

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العلاقة بين تركيز انتروكوكين 22 وبعض أنواع البكتيريا المعزولة من الجروح والعمليات الجراحية في مدينة سامراء / العراق

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معلومات البحث:	الخلاصة:
تاريخ الاستلام: 2022/09/07	اجريت الدراسة الحالية لتقدير مستوى تركيز المتغير المناعي انتروكوكين-22 وعلاقته مع بعض الانواع البكتيرية لدى الاشخاص الذين لديهم جروح وعمليات جراحية. شملت الدراسة 40 عينة اخذت بشكل مسحات وعينات دم من مرضى المصابين باخماج الجروح المراجعين لمستشفى سامراء العام وبعض العيادات الخارجية وباعمار تراوحت بين (12-68) سنة ومن كلا الجنسين، للفترة من تشرين الثاني 2021 والى نهاية اذار 2022. وقد سجلت المعلومات الخاصة بالبحث في استمارة استبيان خاصة بمعلومات عن الشخص ضمن موضوع الدراسة. وقسمت العينات الى عينات اخماج الجروح بالنسبة لمرضى العمليات الجراحية لـ 30 عينة وعينات السيطرة للافصاء وعددها 10 عينات. بينت نتائج الدراسة الحالية بوجود انخفاض معنوي $P \leq 0.01$ في مستوى تركيز الانتروكوكين IL-22 لدى الاشخاص الذين لديهم عمليات جراحية (13 بيكوكرام/ مل) مقارنة مع مستواه لدى مجاميع السيطرة (37.13 بيكو كرام/ مل). وانخفض مستوى تركيز المتغير المناعي IL-22 لدى الاشخاص الذين لديهم نمو بكتيريا (<i>Pseudomonas</i> , <i>Staph.aureus</i> , <i>E. coli</i> , <i>Klebsiella</i> , <i>Proteus</i>) (11.67, 11.73, 17.08, 9.92, 14.66) بيكوكرام/ مل) على التوالي وبشكل متفاوت بين الاشخاص الذين لديهم جروح وعمليات جراحية، اذ بينت النتائج ان مستوى تركيز IL-22 انخفض بمستويات متغايرة لدلى الاشخاص المصابين وحسب نوع النمو البكتيري الذي ظهر لديهم.
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