Review
JOURNAL OF UNIVERSITY OF BABYLON
For Pure and Applied Sciences (JUBPAS)
Vol.33; No.1.| 2025

Statistical Study of Bacterial Urinary Tract Infections for the Period 2019 to 2023

Omar Sinan Sadiq Hussain Al-Zaidi[1*] Luma abdulhady Zwain[2] Estabraq A. Mahmoud[3]

[1] National Center of Hematology, Mustansiriyah University, Baghdad, Iraq..

[2,3] Department of Biology/ College of Education For Pure Science Ibn Al-Haitham/University of Baghdad/Iraq

***Corresponding author email:** Omar.s94@uomustansiriyah.edu.iq

دراسة احصائية لإصابات المسالك البولية البكتيرية للفترة من 2019-2023

عمر سنان صادق حسين الزيدي[1]، لمى عبدالهادي زوين[2]، استبرق عزالدين محمود[3]

1،2،3 قسم علوم الحياة، كلية التربية للعلوم الصرفة/ابن الهيثم، جامعة بغداد، بغداد، العراق.

1 المركز الوطني لبحوث وعلاج امراض الدم، الجامعة المستنصرية، بغداد، العراق.

Accepted: 27/12/2024 **Published:** 31/3/2025

ABSTRACT

The current review analyzed bacterial urinary tract infections (UTIs) in Iraq from 2019 to 2023 by highlighting the prevalence of gram-positive and gram-negative Bacteria among UTIs. *Escherichia coli* was the main pathogen, with 1430 bacterial isolates from UTI cases, followed by *Klebsiella pneumonia* with 721 isolates, and *Pseudomonas sp*. with 182 isolates. The current study showed that the gram-positive bacteria, represented by *Staphylococcus aureus*, were the dominant pathogen in UTI cases, with 229 isolates. The distribution of these pathogens varied annually, indicating changes in infection trends. The dominance of *E.coli* and its multi-drug resistance were consistent with global findings, confirming its clinical importance. The study highlighted other bacterial species responsible for UTIs, which were *Proteus sp*., *Enterobacter sp*., and *Enterococcus sp*., confirming the complexity of the pathogenesis of UTIs. This statistical study provides critical insights into bacterial epidemiology and guides future research for the management of UTIs in Iraq.

Conclusions: The present review provides a comprehensive analysis of bacterial UTIs in Iraq from 2019 to 2023, emphasizing the prevalence and distribution of pathogens. *E. coli* was the most commonly causative agent, followed by *K. pneumonia* and *Pseudomonas sp*., with significant multi-drug resistance patterns noted, mirroring global trends. Gram-positive bacteria, S. aureus was predominant. Variability in pathogen distribution highlights evolving infection trends and complexities in UTI pathogenesis. The findings underscore the critical need for ongoing epidemiological surveillance and antibiotic stewardship to manage UTIs effectively and mitigate resistance. This data is pivotal for improving healthcare strategies and patient outcomes in Iraq.

Key words: Urinary tract infection; Cystitis; Pyelonephritis; Urosepsis; Catheter Associated Urinary Tract Infections (CAUTIs).

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

INTRODUCTION

1. Urinary tract infection

Urinary tract infection is classified as one of the major diseases widespread among humans as a society, as well as its outbreak in hospitals all over the world. These infections are a serious health problem affecting millions of people annually. These infections occur as result of a person infected with many pathogens, including Gram-negative bacteria represented by *Escherichia coli*, which ranks first in causing urinary tract infections [1,2], as well as other bacterial species represented by *Klebsiella* bacteria. *Proteus*, *Enterobacter*, *Enterococcus*, *Pseudomonas*, and Gram-positive bacteria represented by *Staphylococcus* bacteria [3] in addition to the presence of other cases that result from a person infected with fungi [4]. Urinary tract infection is more common in females compared to males [5,6], as the infection rate in female's ranges from approximately (25-30) % when they reach an age group ranging between (20-40) years. While the infection rate in elderly females of approximately age's ranges from approximately (4-43) % of people aged 60 years and over. In addition to infants among the target groups for this disease [7,4]. Due to the presence of anatomical differences between females and males, represented by the shortness of the urethra, which is shorter in females compared to males [8], females are considered more susceptible to infection. In addition to other factors, including the environment surrounding the urethra, which is moist in females, as infection begins after Pollution of the periurethra by urinary pathogens that colonize the intestines and then colonize the urethra because of their migration by flagella and pili, causing diseases of the kidneys and urinary bladder [4].

Urinary tract infections newly classified based on clinical symptoms, risk factors, and severity scale. Risk factors categorized ostensibly according to the ORENUC system. The letter O indicates no known risk factors. The letter R indicates the risk of recurrent urinary tract infections but without risk of a more severe outcome. The letter E indicates extraurogenital risk factors, the letter N indicates relevant nephropathic diseases, the letter U indicates urologic resolvable (transient) risk factors and the letter C indicates permanent external urinary catheter and unresolved urologic risk factors. Urinary tract infection accompanied by symptoms of Symptomatic Urinary tract infection, which represented by infection of both the kidney and its pelvis, Pyelonephritis, Cystitis, and urinary tract infection, or also called Urosepsis, which represents the most serious form of urinary tract infection, followed by nephritis, then urinary bladder infection. The classification presented by both the European Society of Urology and the Infection Section of the same society suggested the importance of differentiating between uncomplicated urinary tract infections with low risk and complex urinary tract infections with high risk depending on the presence or absence of the general severity. As well as the classification of infections depending on the site of infection, severity of infection, stage of infection, symptoms, and the occurrence of complications during infection, as shown in Figure (1) [9].

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

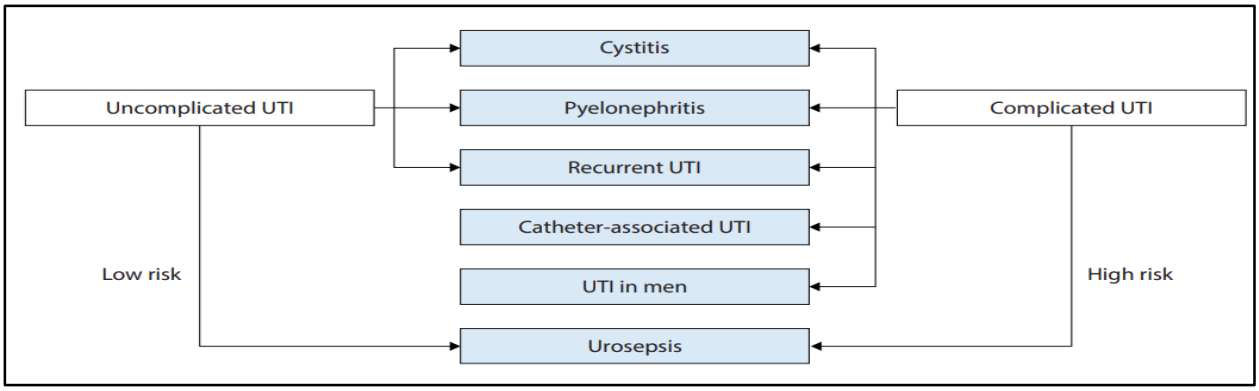

Figure (1) Complicated and uncomplicated urinary tract infections identified by the European Society of Urology using the ORENUC system: [9]

2. Cystitis

Cystitis refers to an infection of the lower urinary tract, specifically the urinary bladder. It is broadly classified into uncomplicated cystitis and complicated cystitis. Uncomplicated urinary cystitis refers to inflammation of the lower urinary tract in healthy, non-pregnant men or women. Acute Cystitis usually occurs due to a bacterial infection in the urinary bladder, as the bacteria reach the urinary bladder via the ascending route with the urethra [10]. On the other hand, complicated cystitis is associated with risk factors that increase the virulence of the infection or the likelihood of antibiotic treatment failure. Acute cystitis usually caused by a bacterial infection of the urinary bladder. Women are particularly vulnerable due to the proximity of the urethra to the anus and vagina, which often colonized by *Lactobacillus*. However, after infection it colonized by *Escherichia coli*, which are able to attach to the pili to attach themselves to the mucous membrane of the urethra and bladder, which leads to their multiplication, causing a leading inflammatory response. To the appearance of symptoms such as pain during urination, oliguria, oliguria, and the appearance of blood in the urine, hematuria, which is revealed laboratory by the presence of red blood cells in the urine in addition to the relatively short length of the urethra in females [11]. *E. coli* which belongs to the enterobacteriaceae [12], are the most common cause of urinary tract infections [13], especially urinary bladder infection, in addition to the presence of many other causative agents of the genera of Gram-negative bacteria, represented by both bacteria (*Klebsiella*, *Proteus*, *Pseduomonas*, *Acintobacter*, *Sphingomonas*), and genera of positive. Gram stains such as *Enterococcus* bacteria, *Streptococcus* bacteria, and *Staphylococcus saprophyticus* bacteria, which are responsible for infections in young women. In addition to the possibility of infection by fungi (*Candida*) and viruses [11].

3. Pyelonephritis

The term Pyelonephritis refers to inflammation of the kidney, Pyelo refers to renal pelvis, and Nephritis refers to inflammation of the kidney. Nephritis is classified into complicated and uncomplicated, as uncomplicated refers to healthy women, while complicated nephritis refers to

other conditions that may include healthy men and diabetics. Clinical symptoms for patients with pyelonephritis include chills, fever, and pain in the flank on one or both sides of the body (radio). It is possible that the inflammation not accompanied by symptoms such as dysuria or hematuria [11].

Nephritis classified into two types: Acute Pyelonephritis and Obstructive Pyelonephritis. Acute nephritis is an inflammation of the kidney parenchyma caused by microorganisms. In general, bacteria arrive from the lower sections of the urinary tract. They can also reach the kidneys through the blood (Hematogenous spread) and can pose a danger to the organs and human life and lead to the appearance of Kidney Scar. As for obstructive nephritis, it arises from several pathological factors, such as contamination of the urinary tract with pathogenic flora, urinary congestion caused by obstructive factors. Also the effect of sub-atrophic and atherosclerotic changes in the urinary tract as a result of immune deficiency, which leads to a decrease in the ability of the epithelial layer of the kidney to resist. Infection and androgen deficiency (hypoandrogenic) in the elderly [14]. *E. coli* are considered one of the most common causes of nephritis and pyelonephritis, in addition to the possibility of infection by Gram-negative bacilli such as *Klebsiella*, *Proteus*, and *Pseudomonas*, which lead to cases of health care-associated nephritis or anatomical/neurological abnormalities that affect the urinary tract. Nephritis often accompanied by the formation of stones, especially Struvite stones. Nephritis is not limited to Gram-negative bacteria, but can occur because of infection with Gram-positive bacteria such as *S. aureus* or *Mycobacterium tuberculosis*, which transmitted through the body via blood route to the kidney [11].

4. Urosepsis

Urosepsis defined as sepsis caused by an infection in the genitourinary system. Its severity depends on the host response. It is more common in elderly patients and diabetics who suffer from weakened immunity, as well as organ transplant recipients and cancer patients receiving chemotherapy or corticosteroids. Those suffering from acquired immunodeficiency syndrome (HIV). However, all patients can be affected by bacterial species capable of causing inflammation within the urinary tract [15]. *E. coli* is the leading cause of urine poisoning and poses an enormous burden on healthcare systems worldwide, as well as multidrug resistance (MDR) on the rise, making the infection more troublesome and more expensive to treat [16]. In addition to the possibility of infection by *Staphylococcus aureus*, *Proteus mirabilis*, *Klebsiella pneumonia* and *Pseudomonas aeruginosa* [17].

5. Catheter Associated Urinary Tract Infections (CAUTIs)

Catheter-associated urinary tract infections (CAUTIs) are one of the most common healthcare-associated infections worldwide. CAUTIs are the cause of 40% of all hospital-acquired infections and 80% of all hospital-acquired urinary tract infections (UTIs). A high percentage of inpatients implanted with a urinary catheter at some point during their hospitalization. The urinary catheter, which is made of plastic materials, inhibits the natural

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

defense mechanisms in the urinary tract and promotes bacterial colonization or the formation of biofilms which are structurally complex systems comprising populations of microorganisms [18], on the catheter surfaces, which may cause CAUTI infection. It is associated with increased disease burden, mortality, hospital bills, and length of hospital stay. Therefore, to prevent this infection technological innovations must appear in catheter materials that prevent biofilm formation. Many health care practitioners are unclear about the exact indications for the use of bladder catheters, which can lead to unnecessary catheter use coupled with excessive use of antibiotics, leading to the spread of antibiotic-resistant microorganisms [19].

6. Statistical study of Bacterial urinary tract infection cases in Iraq from 2019-2023

The results obtained from some of the previous studies from 2019 to 2023 for patients whom suffer from urinary tract infections in different clinical cases showed that the main cause of urinary tract infections was bacteria that may be positive or negative Gram stain. According to the cases from 2019 to 2023, *E. coli* bacteria ranked first in causing urinary tract infections, followed by *K. pneumonia* in second place and then *Pseudomonas sp*. As for Gram-positive bacteria, *S. aureus* bacteria ranked first in being a cause of urinary tract infections. In addition to the presence of many other Gram-negative and Gram-positive species that are also responsible for urinary tract infections, they are represented by the following types of bacteria (*Acinetobacter bumanii*, *Micrococcus*, *Streptococcus sp*., *Enterococcus sp*., *Enterobacter sp*., *Citrobacter sp*., *Hemophilus sp*. and *Proteus sp*.) as shown in Table (1).

Table (1) Epidemiology of Gram Negative and Gram Positive Bacteria in UTI patients

Bacteria	2019	2020	2021	2022	2023
Escherchia coli	338	257	358	162	315
Klebsiella pneumonaie	49	239	80	161	192
Staphylococcus aureus	78	0	80	27	44
Psedumonas sp.	86	18	35	26	17
Acinetobacter bumanii	6	0	23	0	0
Micrococcus sp.	2	0	0	0	0
Streptococcus sp.	29	0	0	0	0
Staphylococcus sp.	12	68	14	23	0
Enterococcus sp.	8	0	16	12	0
Enterobacter sp.	0	0	28	0	3
Citrobacter sp.	2	0	0	0	0
Hemophilus sp.	1	0	0	0	0
Proteus sp.	21	10	28	35	70

The results of the current statistics showed that *E. coli* recorded the highest rate in terms of causing urinary tract infections, as the number of *E. coli* isolates isolated from cases of urinary tract infections and in various clinical cases amounted to approximately 1430 isolates since the year 2019-2023. During 2019, the number of *E. coli* from urinary tract infection reach 338 isolates from different genders and cases. Several studies, including [20], which conducted on different genders and ages of patients suffering from urinary tract infections, indicated that *E.*

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

coli with (46) isolates was the main cause of urinary tract infections. In other studies, conducted by [21], indicated that Multi-drug resistance *E. coli* are also responsible for urinary tract infections and the number of *E. coli* isolates was (166). As for [22], their results indicated that the prevalence of *E. coli* in patients with urinary catheters reached (46). For the year 2020, the *E. coli* number decreased to 257 isolates compared to the previous year. This decreased in number may be came from the differences of clinical cases and the focus of researches on different cases of urinary tract infection or specific ages and genders, also the localization of sampling according to the hospital may also effect among different regions of Iraq. In Kurdistan Region, a study of [23] indicated that *E. coli* recorded the highest rate, it was (191) isolates in different cases of urinary tract infections. Followed by [24] whom refer that the number of *E.coli* was (50) after isolation of it from different hospitals in Baghdad. The results of the statistical study showed that during the year 2021, the number of *E. coli* isolates reached (358) isolates in various governorates of Iraq and in different clinical disease cases. The study of [25] indicated that the number of *E. coli* isolates which isolated from children of different sexes suffering from urinary tract infection reached (31) isolates, at a rate of (41.9)%. In another study of children suffering from Thalassemia presented by [26], the number of *E. coli* isolates was (20) isolates, at a rate of (43)%. In 2022, the number of *E. coli* isolates which isolated from urinary tract infections reached (162) isolates [27-30]. During 2023, the number of *E. coli* isolated from cases of urinary tract infection from various governorates of Iraq amounted to (315) isolates. The study of [31] indicated that the number of *E. coli* isolates amounted to (54) isolates, representing (30) %, while [32] indicated that the number of *E. coli* was (25) isolates, representing (28.7)%, while the study of [33] and [34] amounted to (91, 100) isolates, representing (49, 74.6)%, respectively.

The results of the current statistical study showed that *K. pneumonia* bacteria ranked second among Gram-negative bacteria in being responsible for causing urinary tract infections, as the number of *K. pneumonia* isolates reached (721) isolated from cases of urinary tract infections from 2019 to 2023. During 2019, according to the current statistical study showed that the number of *K. pneumonia* isolated from cases of urinary tract infection reached (49) isolates [20, 21]. In 2020, the number of *K. pneumonia* reached (239) isolates in the Kurdistan Region. The number of *K. pneumonia* isolates reached (65) with a percentage of (8.4)% according to [23]. As for the study of [35], *K. pneumonia* isolates reached (174) with a percentage of (16.7)% in cases of urinary tract infection. *K. pneumonia* during 2021 in many cases of urinary tract infection reached (80) isolates. The study of [36] reported that the number of *K. pneumonia* isolates reached (66) isolates. In 2022, the number of *K. pneumonia* isolates was approximately (161) from various governorates of Iraq, this was stated in [37, 27-30]. From cases of urinary tract infection in 2023, *K. pneumonia* isolates reached (192). Also [33] indicated that the number of *K. pneumonia* from cases of urinary tract infection reached (50) isolates, representing (27.8)%. As for the study by [39], it showed that the number of multi-drug resistance *K. pneumonia* reached (137) representing (93.43)%.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

According to the current statistical study, *Pseudomonas sp*. ranked third among Gram-negative bacteria in causing urinary tract infections. This statistical study showed that the number of *Pseudomonas sp*. isolated from cases of urinary tract infections and within different clinical cases from 2019 to 2023 amounted to approximately (182) isolates. This statistical study showed that the number of *Pseudomonas sp*. isolates isolated from urine samples of urinary tract infections in 2019 in various governorates of Iraq reached (86) isolates. A study by [40] indicated that *Pseudomonas sp*. isolates from diabetic patients suffering from urinary tract infections reached (75) representing (71.42)%, while in [20, 35, 21] the number was (6, 1, 4) representing (4, 6.25, 2.4)%, respectively. As for the year 2020, *Pseudomonas sp*. isolates reached (75), representing (71.42)%, while it was (18) only in the study of [23] in Dohuk Governorate. In 2021, *Pseudomonas sp*. which isolated from cases of urinary tract infection in all governorates of Iraq, reached to (35) isolates according to [26]. In the year 2022, the number *Pseudomonas sp*. Isolates amounted to (26) in urinary tract infection patients [28-30]. *Pseudomonas sp*. isolates for the year 2023, from different disease cases of people suffering from urinary tract infection, was (17) isolates, as the numbers were distributed between the study of [33] and [38].

The current statistical study showed that *S. aureus* ranked first among Gram-positive bacteria in causing urinary tract infections. The number of *S. aureus* isolates isolated from cases of urinary tract infections and within different clinical cases from 2019 to 2023 amounted to approximately (223) bacterial isolates. The results of the current statistical study showed that *S. aureus* isolated from urinary tract infections in 2019 reached (78) isolates. Abdullah [30] indicated that *S. aureus* isolated from urinary tract infections in the Kurdistan Region reached (61) isolates representing (40.4)%. The current study also showed that *S. aureus* from urine samples in 2021 reached (80) isolates in various governorates of Iraq. As represented by [26], the number of *S. aureus* isolates reached (23) isolates. During 2022, the study of [28] and [30] indicated *S. aureus* isolated from urinary tract infections reached (16, 11) isolates at a rate of (14, 8.1)% respectively. *S. aureus* during 2023 were isolated from cases of urinary tract infection and the number reached (44) isolates as stated in [33].

CONCLUSIONS

This study highlighted and analyzed UTIs caused by bacteria in Iraq from 2019-2023, focusing on pathogen prevalence and distribution. *E. coli* was the most common cause of UTIs, followed by *K. pneumonia* and *Pseudomonas* sp. Gram-positive bacteria represented by *S. aureus*, which was predominant. These findings reveal how the infection patterns was evolved, emphasizing the urgent need for continuously surveillance and antibiotic stewardship to combat resistance and improve UTI management, healthcare strategies, and patient outcomes in Iraq.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

Conflict of interests.

There is no conflict of interests.

References

[1] M. S. Assafi, F. F. Ali, R. F. Polis, N. J. Sabaly, and S. M. Qarani, "An epidemiological and multidrug resistance study for *E. coli* isolated from urinary tract infection (three years of study)," *Baghdad Science Journal*, vol. 19, no. 1, pp. 7-15, Mar. 2022.

[2] M. A. J. Raoof and M. A. Fayidh, "Investigation of biofilm formation efficiency in ESβLs of pathogenic Escherichia coli isolates," *International Journal of Drug Delivery Technology*, vol. 12, no. 2, pp. 695-700, Apr. 2022.

[3] S. Thangavelu, R. Dhandapani, A. Arulprakasam, R. Paramasivam, A. Chinnathambi, S. Ali Alharbi, K. Durairaj, and A. Shrestha, "Isolation, identification, characterization, and plasmid profile of urinary tract infectious Escherichia coli from clinical samples," *Evidence-Based Complementary and Alternative Medicine*, vol. 2022, no. 1, pp. 1-10, Jan.2022.

[4] N. A. M. Al-Awkally, H. K. Ibrahim, M. D. Ali, F. M. Muthanna, A. M. Al-Awkally, and A. Yousuf, "Study of antibiotic sensitivity pattern in urinary tract infection," *International Journal of Health Sciences*, vol. 6, pp. 8896-8913, Jun. 2022.

[5] S. B. Alwindy, "Urinary tract infection incidence in college students," *Baghdad Science Journal*, vol. 6, no. 4, pp. 640-645, Dec. 2009.

[6] N. K. Younus, "Phenotypic and genotypic characterization of multidrug-resistant Escherichia coli and Klebsiella pneumoniae isolated from women with urinary tract infections in Mosul City," *Iraqi Journal of Science*, vol. 65, no.1, pp. 24-35, Jan. 2024.

[7] M. Buettcher, J. Trueck, A. Niederer-Loher, U. Heininger, P. Agyeman, S. Asner, C. Berger, J. Bielicki, C. Kahlert, L. Kottanattu, and P. M. Meyer Sauteur, "Swiss consensus recommendations on urinary tract infections in children," *European Journal of Pediatrics*, vol. 180, pp. 663-674, Mar. 2021.

[8] A. S. Schneider, P. A. Szanto, A. M. Mills, S. I. Kim, and T. A. Swanson, *Board Review Series Pathology,* 5th ed. Lippincott Williams and Wilkins, Inc., 454p, 2014.

[9] L. Rodriguez-Mañas, "Urinary tract infections in the elderly: a review of disease characteristics and current treatment options," *Drugs in Context*, vol. 9, Jan. 2020.

[10] B. Q. Al-Saadi, S. J. Kadhum, and S. H. Muhaiesen, "Isolation of uropathogens from pediatric-associated UTI, with special focus on the detection of Proteus vulgaris," *Iraqi Journal of Biotechnology*, vol. 14, pp. 77-84, 2015.

[11] W. Levinson, P. Chin-Hong, E. A. Joyce, J. Nussbaum, and B. Schwartz, *Review of Medical Microbiology and Immunology,* 17th ed. McGraw-Hill Education, Inc., 848 p., 2022.

[12] M. A. J. Raoof and M. A. Fayidh, "Molecular study to detect blaTEM and blaCTx-M genes in ESβL Escherichia coli and their antimicrobial resistance profile," *Journal of Physics: Conference Series,* vol. 1879, no. 2, pp. 1-10, , May. 2021.

[13] A. A. Muhaimeed and A. M. Ghareeb, "Prevalence of multi-antibiotic resistance marA and quorum sensing luxS genes and evaluation of biofilm formation in uropathogenic Escherichia coli," *Iraqi Journal of Biotechnology*, vol. 22, no. 1, pp. 252-261, Mar. 2023.

[14] Y. Sharapatov, Y. Turgunov, and A. Lavrinenko, "Pathogenic mechanisms of acute obstructive pyelonephritis," *Macedonian Journal of Medical Sciences*, vol. 9, no. F, pp. 124-128, Feb. 2021.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

[15] F. M. Wagenlehner, A. Pilatz, W. Weidner, and K. G. Naber, "Urosepsis: overview of the diagnostic and treatment challenges," Urinary Tract Infections: Molecular Pathogenesis and Clinical Management, pp. 135-157, Jan. 2017.

[16] M. M. Walker, J. A. Roberts, B. A. Rogers, P. N. Harris, and F. B. Sime, "Current and emerging treatment options for multidrug resistant Escherichia coli urosepsis: a review," *Antibiotics*, vol. 11, no. 12, p. 1821, Dec. 2022.

[17] S. O. Ibrahim, E. M. Mohammed, S. M. Taha, S. M. Yousif, H. Omer, O. Omer, M. Seif-Elnasr, S. Yassin, Y. A. Mohammed, O. A. Elhasan, and M. Taj-Eldin, "Incidence of Oxa23 and Oxa51 genes associated with bacterial isolated from patients with urosepsis: single centre perspective," *American Journal of Molecular Biology*, vol. 12, no. 3, pp. 85-96, Jul. 2022.

[18] D. R. Hamady and S. K. Ibrahim, "The study on ability of Escherichia coli isolated from different clinical cases to biofilm formation and detection of csgD gene responsible for produce curli (fimbriae)," *Biochemical & Cellular Archives*, vol. 20, no. 2, Sep. 2020.

[19] R. Venkataraman and U. Yadav, "Catheter-associated urinary tract infection: an overview," *Journal of Basic and Clinical Physiology and Pharmacology*, vol. 34, no. 1, pp. 5-10, Jan. 2023.

[20] I. M. Abdullah, "Multiple drugs resistance among urinary tract infection patients in Duhok City–Kurdistan Region–Iraq," *Duhok Medical Journal*, vol. 13, no. 1, Jan. 2019.

[21] H. Y. Hassan and S. T. H. Aka, "Extended-spectrum beta-lactamases (ESBLs) detection in some uropathogenic bacteria and their correlation with biofilm formation," *Zanco Journal of Medical Sciences*, vol. 23, no. 3, pp. 375-382, Sep. 2019.

[22] A. Hussain and M. Saleh, "Determination of phylogenetic groups and antimicrobial susceptibility patterns for Escherichia coli isolated from patients with urinary tract infection," *Journal of College of Education for Pure Science*, vol. 9, no. 1, pp. 71-81, Mar. 2019.

[23] M. S. Ibrahim, H. M. Khalid, and W. M. Mero, "Molecular characterization of some virulence genes and antibiotic susceptibility pattern among uropathogenic Escherichia coli isolated from patients in Zakho City/Iraq," *Zanco Journal of Pure and Applied Sciences*, vol. 32, no. 2, pp. 167-177, May. 2020.

[24] H.Q. Nasser and A. H. Hammadi, "Phenotype detection of genetic enzymes B- Lactamase isolation of patients with urinary tract infections bacteria Escherichia Coli from some hospitals in Baghdad" *Journal of Education and Scientific Studies*, vol. 3, no. 15, Jan. 2020.

[25] A. H. Hammadi, "Phenotype detection of genetic enzymes B-lactamase isolation of patients with urinary tract infections bacteria Escherichia coli," *Indian Journal of Forensic Medicine & Toxicology*, vol. 14, no. 4, pp. 1790-1796, Dec. 2020.

[26] M. N. Maarof and L. M. I. Al-Douri, "Genetic detection of some virulence factors for urinary tract infections isolated from diuresis for people with thalassemia," *Journal of Education and Scientific Studies*, vol. 3, no. 17, Sep. 2021.

[27] S. S. AL-Jubouri and A. M. Shami, "Molecular detection of cephalosporin resistance genes in Escherichia coli isolated from urinary tract infections in Baghdad hospitals," *Iraqi Journal of Biotechnology*, vol. 21, no. 2, pp. 145-152, Mar. 2022.

[28] Z. H. Aboud, A. M. M. Shami, and B. A. A. Ridha, "Detection of blaOXA-48 and blaVIM-1 genes among carbapenem-resistant Klebsiella pneumoniae isolated from urinary tract infections in Baghdad hospitals," *Iraqi Journal of Biotechnology*, vol. 21, no. 2, pp. 276-287, Mar. 2022.

[29] L. A. Ismael, S. H. Aubaid, and H. M. Nasir, "Estimating the level of interleukin-22 in sera of patients with uropathogenic Escherichia coli infection in Mosul City," *Rafidain Journal of Science*, vol. 31, no. 2, 2022.

[30] H. M. Mousa, "Bacteriuria with unusual uropathogens in diabetics in Thi-Qar Province," *University of Thi-Qar Journal of Science*, vol. 9, no. 1, pp. 43-48, Mar. 2022.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

[31] Z. S. Ali and A. M. Shami, "Molecular study of siderophore genes in carbapenem-resistant Klebsiella pneumoniae isolated from urinary tract infection patients," *Iraqi Journal of Biotechnology*, vol. 22, no. 1, Jun. 2023.

[32] W. A. Kadhim and K. I. Mubarak, "Detection of gene expression of efflux pumps in Escherichia coli isolated from children with urinary tract infections" *Academic Science Journal*, vol. 1, no. 1, pp. 48-59, Mar. 2023.

[33] M. Atif, D. S. Al-Rubaye, and H. R. Al-Hraishawi, "Plasmid profiling of extended spectrum β-lactamases producing Escherichia coli in some hospitals in Baghdad," *Iraqi Journal of Agricultural Sciences*, vol. 54, no. 2, pp. 360-368, Mar. 2023.

[34] A. H. Alqaisi and M. A. Al Aubydi, "Some characteristic of microbial indole extracted from pathogenic *E. coli* in comparable with standard one," *Iraqi Journal of Agricultural Sciences*, vol. 54, no. 5, pp. 1193-1201, May. 2023.

[35] R. F. Polse, S. M. Qarani, M. S. Assafi, N. J. Sabaly, and F. Ali, "Incidence and antibiotic sensitivity of Klebsiella pneumonia isolated from urinary tract infection patients in Zakho Emergency Hospital/Iraq," *Journal of Education and Science*, vol. 29, no. 3, pp. 257-268, Mar. 2020.

[36] M. Q. Yahya, S. H. Azba, and M. I. Al-Hayali, "Effect of antibiotic misuse on the emergence of microbial resistance among urologic patients," *Iraqi Journal of Pharmacy*, vol. 18, no. 1, pp. 44-56, Mar. 2021.

[37] H. H. Nasser, T. R. Abdulrahman, and A. S. Malik, "Klebsiella pneumoniae in hospital-acquired and community-acquired urinary tract infections in an Iraqi cohort: frequency, antibiotic susceptibility and the percentage of blaKPC resistance gene," *Iraqi Journal of Medical Sciences*, vol. 20, no. 1, pp. 121-131, Mar. 2022.

[38] F. H. Omar and A. H. Ibrahim, "The prevalence of integron class I and II among multi-drug resistance producing Klebsiella pneumoniae," *Iraqi Journal of Agricultural Sciences*, vol. 54, no. 3, pp. 619-629, Mar. 2023.

[39] R. L. Chelab and H. J. Taima, "Genotypic and phenotypic diagnosis of Pseudomonas aeruginosa associated with urinary tract infection in diabetic patients and their resistance to certain antibiotics," *Journal of College of Education for Pure Science*, vol. 9, no. 2, Mar. 2019.

[40] L. J. Mahmood and S. S. Anwer, "Detection of vancomycin resistant gene in Staphylococcus aureus isolated from different clinical samples in Erbil City," *Journal of University of Babylon for Pure and Applied Sciences*, pp. 1-10, Mar. 2021.

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

ISSN: 2312-8135 | Print ISSN: 1992-0652
info@journalofbabylon.com | jub@itnet.uobabylon.edu.iq | www.journalofbabylon.com

الخلاصة

المقدمة: تمثل المراجعة الحالية احصائية لاصابات المسالك البولية البكتيرية في العراق من عام 2019 الى 2023 من خلال تسليط الضوء على انتشار البكتيريا الموجبة والسالبة لصبغة كرام بين التهابات المسالك البولية البكتيرية. بينت الاحصائية الحالية أن بكتيريا *E. coli* كانت الممرض الرئيسي، اذ بلغ عددها 1430 عزلة بكتيرية معزولة في المرضى المصابين بالتهابات المسالك البولية، تليها بكتيريا *K. pneumonia* التي بلغ عددها 721 عزلة ثم بكتيريا *Pseudomonas sp.* والبالغة 182 عزلة. اما البكتيريا الموجبة لصبغة كرام فكانت بكتيريا *S. aureus* ، كانت الممرض السائد في حالات التهابات المسالك البولية البكتيرية، اذ بلغ عددها 229 عزلة. وتباين توزيع هذه الممرضات سنويًا، مما يشير إلى تغيرات في اتجاهات العدوى. وكانت هيمنة بكتيريا *E.coli* ومقاومتها المتعددة للمضادات الحيوية متسقة مع النتائج العالمية، مما يؤكد أهميتها السريرية. وقد سلطت الاحصائية الضوء على أنواع بكتيرية أخرى مسؤولة عن التهابات المسالك البولية، وهي *Proteus sp.* ، *Enterococcus sp.* و *Enterobacter sp.* مما يؤكد تعقيد التسبب في التهابات المسالك البولية. توفر هذه الإحصائية رؤى حاسمة في علم الأوبئة البكتيرية وتوجه البحوث المستقبلية لإدارة اصابات المسالك البولية في العراق.

الاستنتاجات:

تقدم الاحصائية الحالية تحليلاً شاملاً لاصابات المسالك البولية البكتيرية في العراق من عام 2019 إلى عام 2023، مع التركيز على انتشار وتوزيع مسببات الأمراض. كانت بكتيريا *E. coli* هي العامل المسبب الأكثر شيوعًا تليها *K. pneumoniae* و *Pseudomonas sp.* كانت بكتيريا *S. aureus* الموجبة لصبغة كرام هي السائدة. ان التباين في توزيع مسببات الأمراض يسلط الضوء على اتجاهات العدوى المتطورة والتعقيدات في مسببات التهاب المسالك البولية. اكدت نتائج الاحصائية الحالية الى الحاجة الماسة للمراقبة الوبائية المستمرة وإدارة المضادات الحيوية لإدارة التهابات المسالك البولية بشكل فعال وتخفيف المقاومة. هذه البيانات محورية لتحسين استراتيجيات الرعاية الصحية ونتائج المرضى في العراق.

الكلمات المفتاحية: التهاب المسالك البولية، التهاب المثانة، التهاب حويض الكلية، تعفن البول، التهابات المسالك البولية المرتبطة بالقثطرة البولية.