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Research

The effect of bacteria causing urinary tract infections on male fertility in the city of Kut

Rania Sabri Hasan[1], Othman Hashem Mohammed[2], Wisam Basim Al-tmemy[3], Luma Hikmat Kareem Al-Bayati[4a,b], Alaa Abdalhadi Halboti[5]

[1]PhD, Microbiology- Wasit University
[2]PhD, Embryology- College of Health and Medical Techniques/ University of Kut, Wasit, 52001, Iraq.
[3]PhD Biology - college of Health and Medical Techniques/University of Kut, Wasit, 52001, Iraq
[4a]Department of Microbiology, Faculty of Medicine. University of Wasit, Wasit, Iraq
[4b]College of Health and Medical Techniques/University of Kut, Wasit, 52001, Iraq
[5]Msc, Genetics- College of Health and Medical Techniques/University of Kut, Wasit, 52001, Iraq.

Corresponding Author:
Rania Sabri Hasan

Email: *rHasan@uowasit.edu.iq, pad24.027@uokut.edu.iq, Mohammed.joudi@uokut.edu.iq, lumahakmat@uowasit.edu.iq, pad24.036@uokut.ed.iq, pad24.024@uokut.edu.iq*

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Abstract:

Background: We can use direct microscopic examination techniques of semen and urine, as well as semen and urine culture, for men aged 17 to 50 who are infertile and who suffer from bacterial infections in the reproductive system to detect the presence of inflammatory or bacterial cells in urine or semen samples in order to assess the extent of the impact of these infections on male fertility. **Objectives:** To determine the impact of bacteria infections in the men genitourinary system on the likelihood of men infertility in the city of Kut, by examining its effect on sperm in semen. **Materials and Methods:** Microorganisms that cause inflammation of the male reproductive tract and may affect male fertility were detected and identified in sample abtained from (semen and urine). These include E. coli, proteus, coagulase -ve, staphylococci, Staph aureus, Klebsiella spacies, Neisseria gonorrhoeae, Pseudo- aeruginosa, and Enter- faecalis. **Results:** A strong correlation (correlation coefficient = 0.1) was detected between the isolates in urine and seminal fluid samples. It has been shown that this relationship may lead to the possibility of infection being transmitted from the urinary tract to the reproductive system and therefore to the semen. Gent, Ciprofl, Rif, Ceft (Amox and Clavulanic acid), and Aug – these antibiotics has proven affective in traeting moderate to sever infections. The spectrum broad of activity of these potent antibiotics confirms their effectiveness and ability to combat diseases resulting from bacterial infections. Among the patients evaluated, 80 patients suffered from oligospermia, representing 62%, and 37 individuals had azoospermia, representing 28% of the total cases; Representing 10% of the samples, 13 patients showed that their sperm count was within the normal range. **Conclusion:** The resultse of this stady demonstrated that one of the causes of male infertility is infection of the male reproductive tract with bacteria. Therefore, it is crucial to emphasize the importance of considering multiple factors when evaluating male infertility.

Keywords: Male infertility; Genitourinary tract infections; Bacterial infections; Semen analysis; Urine culture; Semen culture; Oligospermia; Azoospermia; Sperm count; Reproductive tract inflammation; Uropathogenic bacteria; Antibiotic susceptibility; *Escherichia coli*; *Staphylococcus aureus*; *Klebsiella* spp.

Introduction: Infertility refers to the failure to conceive or sustain a pregnancy after 1 year of continuous unprotected sexual intercourse. Within this time frame, approximately 80–90% of couples

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who are capable of reproduction are expected to achieve pregnancy (1,2).Male infertility can sometimes result from structural or anatomical defects in the reproductive system. [3,4] The role of the microbiome in male reproductive disorders differs according to the type of microorganism, the severity of infection, and the degree of statistical association. These effects may appear in several forms. Infections of the lower genital tract are usually mild, except in uncommon cases associated with severe complications.[5] Moreover, other regions of the male genitourinary system may become involved, allowing bacteria to adhere to or colonize sperm cells.[6,7] Infection and fibrosis can interfere with sperm transport, damage or immobilize spermatozoa, and alter the biochemical composition of seminal plasma. Colonization of the male reproductive tract by microorganisms is common and has been strongly associated with sperm abnormalities and repeated infertility cases.[9]

Virul infection also frequenty involve the male reproductive organs. Therefore, this study was designed to investigate the impact of urogenit infection on men infertility and to evaluate the antimicrobial resistance patterns of isolated organisms against commonly used antibiotics.[10,11]

Different infections of the reproductive system may contribute to infertility. Epididymitis is often caused by sexually transmitted pathogens sach as gonorrhea, Ureaplasma urealyticum, Chlamydia trachomatis, and Trichomonas vaginalis. Inflammation of the saminal vasicles may be associated with trichomoniasis or tuberculosis, whereas orchitis is commonly linked to tuberculosis or mumps infection.[5-12] Urethritis caused by Neisseria gonorrhoeae can occasionally impair fertility, particularly when infection extends to both the testes and urethra. However, the incidence of gonococcal infections in the male genital tract has markedly decreased in many Western countries because of improved sexual health awareness and preventive measures introduced during (HIV) epidemic.[7-10].

Chlemydia trachometis infection affects both males and females, although its complications are often more severe in women. Chlamydial infections are frequently asymptomatic and therefore remain undiagnosed.[13,14] It is considered one of the most widespread saxually trensmitted nfections worldwide. Lawer ganital tract infections caused by chlamydia can seriously affect reproductive health and may lead to infertility. It has been estimated that chlamydia contributes to approximately 45% of cases of tubal infertility.[14,15]

Fungal infections caused by Candida albicans are also common in the urinary and reproductive systems and may negatively influence fertilization and male fertility. In some cases, prastatitis, nan-gonococcal urethritis, and other condidal nfections may contribute to infertility. Seminal candidiasis is regarded as one of the most severe forms of sexually transmitted candidal infection. Studies conducted in vitro have investigated the effects of Candida albicans, Candida glabrata, and their soluble products on sperm function and reproductive health.[16,17]

Protozoal infections of the men genital tract, including those caused by Toxaplasma gandii and Trachomonas vaginalis, are relatively rare. Only a limited number of parasitic organisms have been implicated in such infections. These pathogens may directly affect the reproductive tract or indirectly contribute to hypogonadism and impaired fertility.(18,19)

Materials and Methods

- **Patients:** From January 2024 to December 2025, a total of 130 patients between the ages of 17 and 50 underwent infertility treatment at Al-Jazeera Specialized Laboratory in Kut and Al-Zahraa Teaching Hospital in Wasit Governorate. Detailed sexual and medical histories were obtained from all participants, with emphasis placed on genitourinary tract infections. Particular consideration was also given to any history of sexually transmitted diseases, epididymitis, testicular trauma, mumps occurring after puberty, as well as previous viral and bacterial infections.
- **Sample collection:** The samen specimen was obtained in a sterile container after a (3-day) abstinence pariod. The sample volame averaged between (2–5 mL). After complete liquefaction of the semen, sperm counting was performed according to the standard procedures recommended by the World Health Organization.

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- **Bacterial culture:** The samples was cultured on specific medi and incubated at (37°C) for (24) hours under both anaerobic and aerobic conditions. Meanwhile, urine specimens were also cultured, and microbial growth was carefully observed. The resulting colonies were then subcultured onto solid media for further examination. After incubation and isolation, several biochemical assays were performed to identify and confirm the bacterial isolates. These tests included triple sugar iron (TSI), Sammons catrate, citalase, ureas, motility, oxadase, and ceagulase tests. The procedures were carried out under both aerobic and anaerobic conditions at 37°C for 48–72 hours.[19,20] In addition, antibiotic susceptibility testing was conducted using the standard disk diffusion method with various antibiotics, including (AMP), (ER), (AML), (AK), (AUG), (STX), (GM), (RD), (CFR), and (CP).[21]
- **Statistical analysis:** A one-way analysis of variance ANOVA was performed to evaluate the study outcomes using SPSS software version 16.0. The results were considered statistically significant when the probability value was less than 0.05 ($P < 0.05$). Furthermore, Pearson's correlation test was applied to determine the degree of association among the isolates using the same statistical software.

Results

A total of (130) infertile male were diagnosed, mainly due to inflammation epididymal. Among them, (111) patiants 83.59% showed a hagh number of pus cells in the semen, whereas (19) patients 16.4% had no detectable bacterie or pas cells. Regarding sperm count, (37) cases 27.34% were azoospermic, showing a sperm count of zero, whale (80) cases 62.5% were identified as oligospermic, with sperm counts below 39 m/mL. In contrast, 12 cases 10.1% had sperm counts within the normal reference rang .

Table 1 illustrates the distribation of different infactions. Infections caused by Candida spp. were observed less frequently than bacterial infections, while the growth of anaerobic bacteria was relatively low. The table also summarizes the bacterial species isolated from urine samples.

Table 1: Types and proportions of microorganisms isolated from urine and semen cultures

Bacterial spp	Urine culture		Semen culture	
	No	%	No	%
Escherichia coli	24	21.62	20	21.01
Proteus mirabilis	19	17.11	18	18.94
Staphylococcus aureus	16	14,41	16	16.84
Enterococcus faecalis	14	12.61	8	8.42
Klebsiella spp	14	12.61	14	14.73
Coagulase-negative staphylococcus	9	8.10	12	2.63
Pseudomonuas aeruginosa	7	6.30	3	3.15
Streptococcus agulactiae	6	5.40	3	3.15
Serraria spp	2	1.80	1	1.05
total	111	100%	95	100%

The findangs showed thit 16.41% of the infertility cases demonstrated no microbial grawth on culture media, whereas single or multiple bacterial isolates were detected in the remaining 83.59% of patiants. In addition, 3.12% of the samples exhibited mixed growth patterns. Out of the 130 patients included in the study, 111 individuals were diagnosed with infertility, as presented in Table 2

Table 2: Types bacterial insulated from distribution seminal samples

Bacterial	No	%

(Escherichia coli)	20	21.01
(Proteus mirabilis)	18	18.94
(Staphylococcus aureus)	16	16.84
(Enterococcus faecalis)	8	8.42
(Klebsiella spp)	14	14.73
(Coagulase-negative)	12	2.63
(staphylococcus)	3	3.15
(Pseudomonuas)	3	3.15
(aeruginosa)	1	1.05
total	95	100%

Moreaver, Table 3 demonstrates the relationships and statisticil significance of the effectiveness of commonly used antibiotics against a wide range of pathogens, with no significant differences observed ($P > 0.05$).

Table 3: Susceptibility of antibiotics alongside diverse isolated bacteria.

Bacterial spp	AK	AUG	AMP	AML	CFR	RD	ER	STX	GM	CP
Staphylococcus aureus	36	92	50	40	92	54	35	65	66	85
Escherichia coli	72	65	60	35	70	67	30	33	70	95
Coagulase-negative staphylococcus	55	70	54	45	75	60	32	55	80	75
Enterococcus faecalis	65	70	76	44	65	50	55	40	72	92
Streptococcus agulactiae	82	80	60	70	65	68	63	65	55	75
Pseudomonuas aeruginosa	60	55	75	55	60	35	58	38	77	85
Proteus mirabilis	75	55	70	45	55	55	55	75	73	82

Discussion:

In addition to the complications associated with infections, positive semen cultures were detected in approximately 83% of infertile men, demonstrating a substantial bacterial presence in sperm passing through the urethra. Infections affecting the male reproductive tract are considered an important contributing factor to male infertility. Among the isolated microorganisms, E. coli (21.01%), Proteus mir (18.94%), and Staph aureus (16.84%) were the most commonly identified Gram-negative and Gram-positive pathogens in semen samples, which agrees with findings from previous investigations. These observations emphasize the necessity of diagnosing and treating bacterial infections of the men reproductive system during infertility evaluation and management in men.[22,23]

Several studies has likewise reported that E. coli and Enterococcus species are the predominant pethogens isolated from the semen of infertile men. This recurring pattern highlights the potential role of these microorganisms in impairing male fertility. Recognition of the prevalence and significance of these pathogens is essential for establishing effective diagnostic and therapeutic strategies aimed at infertility associated with genitourinary infections. Further investigations into the machanisms through which these bacteria interfere with sperm function and fartility may provide important insights into reducing their detrimental effects on raproductive capacity.[24]

Members of the Enterobacteriaceae family was identified in nearly 90% of saminal fluid specimens, although detection rates varied depending on the sensitivity of the laboratory techniques employed. Among infertile men evaluated in (Tables 1 and 2), bacterial growth was observed in (75%) of urine cultures, while (25%) of urine samples showed no microbial growth. Nevertheless, E. coli, P. mirabilis, and S. aureus remained the most frequently isolated pathogens. In particular, E. coli and S. aureus were the predominant organisms recovered from urine

samples of patients with uragenital infactions. These findings are consistent with previous reports and underline the importance of understanding the prevalence and pathogenic role of these bacteria in order to establish effective strategies for the treatment of genitourinary infections and infertility. Additional studies focusing on detection techniques and therapeutic interventions for these common pathogens may contribute to improved management of male infertility associated with bacterial infections.[25]

Attempts were also undertaken to evaluate the association betwaen sparm count and the pethogens asolated from semen samples. The analysis demonstrated a strong posative correletion (Cor = 0.89) betwean the namber of pethogens identified in urin and samen cultures. This observation corresponds with the findings of Mayorga and colleagues, indicating a close relationshap betwean genatourinary anfections and seminal pathogens. Understanding this association is important for the comprahensive assessment of male infertility and highlights the necessity of evaluating both uranary and reproductave tract infections in men undergoing fertility investigations.[26]

Genitourinary infections in men may contribute to infertility through several mechanisms, including disruption of spermatogenesis, deterioration of sperm quality, reduced sperm motility, abnormal semen morphology, and obstruction of reproductive ducts. Moreover, infected semen may serve as a reservoir for recurrent urinary tract infections (UTIs). Therefore, the management of these infections is essential nat only for anfertility treatment but also for preventing recurrent UTIs and their associated complications. Comprehensive therapeutic appreaches should address infections of both the urinary and reproductive tracts to enhance reproductive health and fertility outcomes.[26,27]

Certain bacterial species have also been implicated in urethritis, a condition that may extend to other reproductive organs such as the testes and consequently impair male fertility. Understanding the specific contribution of these bacteria to urethral inflammation and reproductive dysfunction is crucial for developing targeted prevention and treatment strategies. Furthermore, additional research into the pathogenic mechanisms underlying bacterially induced urethritis may provide valuable information for preserving male reproductive function and improving therapeutic approaches.[28,29]

According to the findings presented in Table 3, (ceftriaxone) and (ciprofloxacin) were identified as the most effective antibiotics against the isolated pathogens. (Gentamicin), (Rifampicin), and (Augmentin) (amoxicillin/clavulanic acid) were also considered highly effective agents for the treatment of severe Gram- +ve and Gram- -ve bacterial infections caused by major pathogens. In contrast, ampicillin and amikacin demonstrated moderate activity and were regarded as secondary therapeutic options. These findings highlight the importance of selecting antimicrobial agents according to the susceptibility profiles of the identified pathogens. Appropriate antibiotic selection can improve treatment efficacy and minimize the development of antimicrobial resistance. Additionally, the availability of secondary treatment options provides alternative therapeutic choices when first-line antibiotics are ineffective or contraindicated. Overall, the results summarized in Table 3 offer valuable guidance for clinical decision-making in the management of genatourinary anfections and the improvement of reproductive health outcomes.(30,31)

Conclusions: Infertility represents a major challenge for couples seeking to conceive, and infections affecting the male genitourinary tract may significantly contribute to male reproductive dysfunction. Accurate identification of the causative infectious organisms is essential before initiating treatment and is commonly achieved through microbial isolation techniques. Despite extensive scientific investigations aimed at clarifying the relationship between infections and male infertility, many uncertainties still remain. Therefore, further studies and improvements in diagnostic approaches are required to gain a deeper understanding of the complex association between infections and male reproductive health, ultimately improving fertility outcomes for affected men and couples.

References:

1. Rachel Guiton & Joël R. Drevet (2023).Viruses, bacteria and parasites: infection of the male genital tract and fertility.;58:385–99.

2. Mary E. Georgiou et al. (2026). Epidemiology of Acute Cystitis or Afebrile Urinary Tract Infection in Adult Men:;37:1029–34.
3. Á Vives Suñé & M. Cosentino (2026). Infection and inflammation of the seminal tract: A review of its relationship to male fertility;13:47.
4. Marco-Jose Rivero, Nikhil Kulkarni, Nannan Thirumavalavan & Ranjith Ramasamy (2023). Evaluation and management of male genital tract infections in the setting of male;197:134–44.
5. Morgan R. Timm, Seongmi K. Russell & Scott J. Hultgren (2025). Urinary tract infections: pathogenesis, host susceptibility and emerging therapeutics;1:1–10.
6. Mazen Tajjour & Wolfgang Weidner(2022). Genitourinary infections and male infertility: impact, diagnosis and treatment;16. 2:9
7. Signe Altmäe, Jason M. Franasiak & Reet Mändar (2019).The seminal microbiome in health and disease. 15.5.
8. Néha Sihra et al. (2018). Nonantibiotic prevention and management of recurrent urinary tract infection;53:201–17.
9. Tajudeen O. Yahaya et al. (2021). Genes predisposing to syndromic and nonsyndromic infertility.;12:1205–8.
10. Yejia Zhang et al. (2022). Improving Human Sperm Head Morphology;3:000214.
11. Chibuike E. Ugwu et al. (2025). Clinician-in-the-Loop Smart Home System to Detect UTI Flare-Ups;17:323–6.
12. Kexin Fan et al. (2025). Urinary Tract Infection Detection in Digital Remote Monitoring;100:37–53.
13. Ghrelin TL. A metabolic signal affecting the reproductive system. Cytokine Growth Factor Rev 2009;20:137–52.
14. Liu J, Wang Q, Ji X, Guo S, Dai Y, Zhang Z, et al. Prevalence of Ureaplasma urealyticum, Mycoplasma hominis, Chlamydia trachomatis infections, and semen quality in infertile and fertile men in China. Urology 2014;83:795–9.
15. Puerta Suárez J, Villegas Castaño A, Serna Quintana GJ, Martínez A, Romero Palacio J, Giraldo M, et al. Spermoculture: Bacterial growth in ejaculation and its relationship with the seminal parameters. Rev Chil Obstet Ginecol 2015;80:33–40.
16. Aridogan IA, Izol V, Ilkit M. Superficial fungal infections of the male genitalia: A review. Crit Rev Microbiol 2011;37:237–44.
17. Alzaidi JR, Hussien FH, Al-Charrakh AH. The effect of Vaginal Bacillus (Lactobacillus acidophilus) Towards Candida spp. Isolated from Women with Candidiasis. New Armenian Medical Journal 2021;15:77–83.
18. Poole DN, McClelland RS. Global epidemiology of Trichomonas vaginalis. Sex Transm Infect 2013;89:418–22.
19. Condorelli RA, Calogero AE, Duca Y, Condorelli RA, La Vignera S. Male accessory gland inflammation, infertility, and sexual dysfunctions: A practical approach to diagnosis and therapy. Andrology 2017;5:1064–72.
20. Puerta Suárez J, Villegas Castaño A, Serna Quintana GJ, Martínez A, Romero Palacio J, Giraldo M, et al. Romero Palacoculture: Bacterial growth in ejaculation and its relationship with the seminal parameters]. Rev Chil Obstet Ginecol 2015;80:33–40.
21. Giuliano C, Patel CR, Kale-Pradhan PB. A guide to bacterial culture identification and results interpretation. P & T : A peer-reviewed journal for formulary management 2019;44:192–200.
22. Mayorga-Torres BJ, Cardona-Maya W, Cadavid A, Camargo M. [Evaluation of sperm functional parameters in normozoospermic infertile individuals]. Actas Urol Esp 2013;37:221–7.
23. Claire B, David G, Hos-Mayorga-Torres BJ, Cardona-Maya W, Cadavid A, Camargo M. [Evaluation of sperm functional parameters in normozoospermic infertile individuals]. Actas Urol Esp 2013;37:221–7.
24. Prabha R, Sandhu S, Kaur K. Mechanism of sperm immobilization by Escherichia coli. Advan. Urol. Arti 2010;240268:6.
25. Akhi MT, Esmailkhani A, Sadeghi J, Niknafs B, Farzadi L, Akhi A, et al. The Frequency of Staphylococcus aureus Isolated from Endocervix of Infertile Women in Northwest Iran. Int J Fertil Steril 2017;11:28–32.

26. Ibadin KO, Osemwenkha AP, Ibeh IN. Urogenital tract infection in asymptomatic male patients with infertility in the University of Benin Teaching Hospital, Benin City, Edo State. Malaysian J Microbiol 2012;8:289–92.
27. Wagenlehner FM, Brockmeyer NH, Discher T, Friese K, Wichelhaus. The presentation, diagnosis, and treatment of sexually transmitted infections. Dtsch Arztebl Int 2016;113:11–22.
28. Salih A, Abbas Al-Kelaby K, Al-Zaidi JR. Review on therapeutic trials for coronavirus disease-19. Medical Journal of Babylon 2021;18:155–9.
29. Pilatz A, Wagenlehner F, Bschleipfer T, Schuppe H-C, Diemer T, Linn T, et al. Acute epididymitis in ultrasound: Results of a prospective study with baseline and follow-up investigations in 134 patients. Eur J Radiol 2013;82:e762–8.
30. Peterson E, Kaur P. Antibiotic resistance mechanisms in bacteria: Relationships between resistance determinants of antibiotic producers, environmental bacteria, and clinical pathogens. Front Microbio 2018;9:2928.
31. Alzaidi JR. Prevalence of OXA genes responsible for carbapenem-resistance among Acinetobacter baumannii Isolated from clinical samples in Iraq. Med J Babylon 2023;20:632–7.

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