Eosinophils count correlating with cystitis in Nineveh Governorate

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Abstract

The study dealt with studying the effect of cystitis on eosinophils count in infected people of both sexes.
Urine and blood specimens were collected from infected (106) females and (74) males with cystitis, their ages ranged between few months to (80) years. Blood and urine specimens were also collected from (111) healthy persons (67) females and (44) males within the same age range mentioned above, were collected as control.
The results showed that the percentage of infection with cystitis was more among females of the age group (11 – 20) years (14.5) % while (12.7) % in males of the age group (51 – 60) years old preceded usually by prostatitis.
Comparing the numbers of eosinophils in the blood of infected and non infected people with cystitis showed no significant difference which shows that cystitis had no effect on the eosinophils count.
The results revealed that *Escherichia coli* dominated all other bacterial species causing cystitis (47.2) % , while other Enterobacteriaceae (*Klebsiella pneumoniae , Proteus mirabilis , Enterobacter aerogenes*) were isolated at rates (16.1) %, (10.5) % and (5.6) % respectively . While *Staphylococcus epidermidis, Staph. aureus* and *Pseudomonas aeruginosa* were isolated at rates (7.8) %, (7.2) % and (5.6) % respectively .

Introduction:

Cystitis is defined as an inflammation of the urinary bladder due to infection or irritation [1, 2], which is mostly preceeded by Urithitis, so they are referred to collectively as the lower Urinary Tract Infection or UTI [3, 4]. Typically cystitis doesn't pose serious health threats, although it is generally need to be treated with antibiotics, if left untreated, the infection may spread to the kidneys and may cause pyelonephritis [2].
Normal urine is sterile inside the bladder, it contains fluid, salts, and waste products, but it is free of bacteria, viruses and fungi. The largest intrinsic defense mechanism against bacterial infection and adherence to the bladder lining is urine. Invading bacteria stimulate micturation, voiding washes out bacteria from the bladder [5, 6, 7]. Urine dilutes bacterial concentrations, preventing adherence. Bacterial growth is impeded by low pH of urine (urine pH can range from 4.5 to 8.0). The high urea and organic acid concentrations and the extremes of high and low osmolality deter and inhibit bacterial colonization. The bladder also has its own defense mechanisms; these are uroepithelial cells which are coated with a urinary mucus called glycosaminoglycan, or uromucoid. This thin, hydrophilic and negatively charged surface layer of mucopolysaccharide attracts water molecules to form a barrier between the bladder and urine, discouraging bacteria from attaching and growing on the bladder wall [5, 8] .But in spite of all of the above mechanisms of the bladder defense, bacteria from the digestive tract, cling to the opening of the urethra and begin to multiply and cause the most common type of cystitis which is so called ascending infection [9].
This infection (cystitis) causes pain when passing urine, frequency , urgency, haematuria and suprapubic pain not associated with passing urine [10]. The frequency of bladder infections in humans varies significantly according to age and sex. Infection occurs when the following three things combine: an alteration that weakens the host's resistance of defense, pathogen virulence factors and sufficient quantity of the pathogen. For example, bacteria originating in the gastrointestinal tract must invade, adhere, colonize and multiply within the vagina, urethra or bladder to be uropathogenic [11].
This study aimed to investigate cystitis with its infecting bacteria and correlation with the blood eosinophils count in both sexes in Nineveh Governorate.

Materials and Method:

Samples of urine and blood were collected from (180) patients which they were divided in to (106) females and (74) males , suffering from symptoms of cystitis which include dysuria, frequent, and / or urgent urination even if they pass very little or no urine [12, 13], a stinging or burning sensation when urine is passed , urine that is cloudy or dark colored, and may have a strong smell, blood in urine, pain or tenderness in their lower back or lower abdomen and general feeling of being unwell [1], patients were also diagnosed by ultrasound as having cystitis. Urine and blood samples were also collected from (111) healthy persons (67) females and (44) males, to be used as control.
The samples of urine were marked with the relevant information then inoculated on Blood and MacConkey agar media and incubated at (37) C˚ for (24) hours and stored for diagnosis. Then the samples of urine were centrifuged and direct examination of the sediment was carried out [14].
Blood smears were prepared from the samples of blood which were collected in an anticlotting tubes, then the blood smears were stained with Leishman's stain inorder to find the percent of eosinophils [15].
Bacterial isolates were diagnosed by using some physiological and biochemical tests and determining its sensitivity against selective antibiotics.

Results & Discussion:

The frequency of cystitis in humans varies significantly according to age and sex, any one can get cystitis but it is most common in females, the shorter urethra allows the bacteria to reach the bladder quicker, in addition the urethral, vaginal and anal opening which are closely located, making it easy for bacteria to be transferred from one to another [16].
So the poor personal hygiene following urination and defecation can be considered to be the most important reason for cystitis in females under study in the age group (1 – 10) years as shown in Table (1), in which the vagina and urethra are exposed to bacteria originating

from gastrointestinal tract while wiping back to front after urination [17, 18, 19].

Table (1) shows the percentages of infected and non infected females with cystitis according to age group.

Age group / Year	Infected females with cystitis		Non infected females with cystitis		Total	
	No.	%	No.	%	No.	%
<1-10	١٢	٦,٩	٩	٥,٢	٢١	١٢,١
11-20	٢٥	١٤,٥	١٢	٦,٩	٣٧	٢١,٤
21-30	١٤	٨,١	١١	٦,٤	٢٥	١٤,٥
31-40	١٠	٥,٨	٩	٥,٢	١٩	١١,٠
41-50	١٩	١١	٧	٤,٠	٢٦	١٥,٠
51-60	١٤	٨,١	٨	٤,٦	٢٢	١٢,٧
61-70	٨	٤,٦	٦	٣,٥	١٤	٨,١
71-80	٤	٢,٣	٥	٢,٩	٩	٥,٢
Total	١٠٦	٦١,٣	٦٧	٣٨,٧	١٧٣	١٠٠

Other products that irritate the bladder will increase the risk of acquiring UTI or cystitis in both sexes such as consuming large amounts of non buffered vitamin C, caffeine, acidic or spicy foods can cause irritation and disrupt the bladder's protection against bacterial adherence [17, 18], swimming in ponds, streams rivers and swimming pools can facilitate bacterial transfer from one person to another causing cystitis by the most common route which is called the ascending route [9].

While cystitis in boys less than (10) years old was (5.9) % as shown in Table (2) which is often caused by the lack of circumcision, the foreskin can harbor bacteria that cause cystitis which develops to UTI, also the congenital abnormalities (present at birth) of the urinary tract is considered as another risk factor for cystitis especially vesicourethral reflux which is a condition in which the child can not completely empty the bladder, it allows urine to remain in or flow backward (reflux) in the partially empty bladder [3, 19, 20].

Table (2) shows the percentages of infected and non infected males with cystitis according to age group.

Age group / Year	Infected males with cystitis		Non infected males with cystitis		Total	
	No.	%	No.	No.	%	No.
<1-10	٧	٥,٩	١٠	٨,٥	١٧	١٤,٤
11-20	١٠	٨,٥	٦	٥,١	١٦	١٣,٦
21-30	٨	٦,٨	٤	٣,٤	١٢	١٠,٢
31-40	١٥	١٢,٧	٨	٦,٨	٢٣	١٩,٥
41-50	١٣	١١,٠	٥	٤,٢	١٨	١٥,٢
51-60	١٤	١١,٩	٧	٥,٩	٢١	١٧,٨
61-70	٥	٤,٢	٢	١,٧	٧	٥,٩
71-80	٢	١,٧	٢	١,٧	٤	٣,٤
Total	٧٤	٦٢,٧	٤٤	٣٧,٣	١١٨	١٠٠

The most common contributing factor for cystitis is sexual activity [21], so many women begin their struggles with UTIs especially cystitis after their first sexual experience [4, 7, 22]. The peak incidence of cystitis occurs during the sexually active years, between (18 – 39) years of age [23], so the highest percent of cystitis was (14.5) % in the age group (11 – 20) years as shown in Table (1) due to the increase in sexual activity among the married females under study, this is why the condition is sometime referred to as honeymoon cystitis [4, 7].

Table (1) also shows that percents of cystitis decreased in the age groups (21 – 30) and (31 – 40) years which were (8.1) %, (5.8)% respectively which may be due to the decreasing sexual activity among females in these two age groups compared with the previous age group.

The relative risk of a UTI including cystitis among unmarried women increased from (1.0) for women who had not been sexually active during the previous week to (2.6) for women who had engaged in sexual intercourse three times a week, to (9.0) for women who had had intercourse seven times during the previous week [17] .

During sex bacteria can spread from the perineum to the urethral opening, in addition any form of vaginal penetration can cause rubbing or irritation to the urethra which is adjacent to the interior of the vagina. If a women's lubrication is inadequate the vaginal skin can become irritated or suffer from small abrasions, encouraging bacteria to grow, the bacteria in the vagina may then be transferred to the urethral opening so if bacteria are not removed by voiding or cleaning, they will colonize this area posing a risk of cystitis .

Evidence suggests that the use of spermicides increases the risk of cystitis, which may be considered as an important reason for cystitis in the age group (21 – 30) and (31- 40) years of the females especially those who have had many children as there is a decrease in the sexual activity in these age groups. Spermicides kill the benefit bacteria in the vagina and may also cause an allergic reaction, leading to an increase in harmful

bacterial growth. Diaphragms and condoms have also been linked to an increased risk of cystitis [16].

Diaphragms can alter urination patterns leading to bacteria not being flushed out of the bladder efficiently or the bladder not being completely emptied [16, 17], while condoms increase the risk of vaginal tears, allowing bacteria to invade and adhere to the mucosal lining of the bladder [24]. Also the use of spermicides and condoms by women leads them to menstruate and the use of tampons and sanitary pads which if they are not changed frequently may provide a favorable environment for bacteria to grow and colonize and then can also spread to the urethral opening and may ascend to the bladder and cause cystitis .

In addition, a dropping (prolapsed) of the uterus or bladder which is more common in women who have had many children may cause poor emptying of the bladder and predispose cystitis [17, 18].

Estrogen increases the blood supply to tissues around the bladder and helping to strengthen the urethra's natural defenses against bacteria, so after menopause as a result these women will have less blood supplied to the lining of the urethra than do women who menstruate, so the decrease in estrogen production leads to a thinning of the tissues around the bladder, reduction in vaginal elasticity and lubrication and an increase in the pH level of the vagina which normally contains low numbers of Gram negative enteric bacilli because of competition from the resident flora. Lactobacilli account for the low vaginal pH. they tend to be less abundant in menopausal women and after antimicrobial therapy [16, 25] , increasing the risk of cystitis , so the percent of cystitis increase in the menopausal women of the females under study as shown in Table (1) which starts from the age group (41–50) years as the menopausal period start at (45 – 50) years old [26].

It has been conventional to consider all UTIs in males as complicated because most of them occur in new born, infants or the elderly and are associated with urological abnormalities, bladder outlet obstruction or instrumentation [27].

Cystitis is less common in men, the large difference in prevalence between men and women is thought to be caused by a variety of factors, including the greater distance between the anus (the usual source of uropathogens) and the urethral meatus, the drier environment surrounding the male urethra, the greater length of the male urethra and the antibacterial activity of prostatic fluid. The reasons for such infections are not always clear, but risk factors include intercourse with an infected partner or with more than one partner, anal intercourse and lack of circumcision [28].

The etiological agents causing uncomplicated cystitis in men are similar to those in women [29]. So cystitis in men generally starts with an infection in the urethra that moves in to the prostate, then into the bladder. The most common cause of recurring cystitis in men is a persistent bacterial infection of the prostate.

Although antibiotics quickly clear bacteria from the urine in the bladder, most of these drugs can not penetrate well enough into the prostate to quickly cure an infection there. Usually antibiotics must be taken for weeks at a time. Consequently, if drug therapy is stopped prematurely, bacteria that remain in the prostate tend to reinfect the bladder [30, 31].

Table (3) shows that eosinophils count in the blood showed no difference between infected and non infected males and females with cystitis.

Table (3) shows eosinophils count in the blood of infected and non infected males and females with cystitis.

Age group / Year	Infected persons with cystitis		Non infected persons with cystitis	
	Males	females	Males	females
<1-10	٠,٣١ × ١٠^{٩}	٠,٢٨ × ١٠^{٩}	٠,٢٨ × ١٠^{٩}	٠,٣٦ × ١٠^{٩}
11-20	٠,٢٦ × ١٠^{٩}	٠,٣٤ × ١٠^{٩}	٠,٣٠ × ١٠^{٩}	٠,٢١ × ١٠^{٩}
21-30	٠,٢٤ × ١٠^{٩}	٠,٢٥ × ١٠^{٩}	٠,٢٦ × ١٠^{٩}	٠,٢٨ × ١٠^{٩}
31-40	٠,٢١ × ١٠^{٩}	٠,٢٨ × ١٠^{٩}	٠,١٨ × ١٠^{٩}	٠,٣ × ١٠^{٩}
41-50	٠,٢٧ × ١٠^{٩}	٠,٢٩ × ١٠^{٩}	٠,٢٤ × ١٠^{٩}	٠,٣١ × ١٠^{٩}
51-60	٠,٢٠ × ١٠^{٩}	٠,٣ × ١٠^{٩}	٠,٢٦ × ١٠^{٩}	٠,٢٤ × ١٠^{٩}
61-70	٠,٢٧ × ١٠^{٩}	٠,٢٨ × ١٠^{٩}	٠,٢٩ × ١٠^{٩}	٠,٢٥ × ١٠^{٩}
71-80	٠,١٩ × ١٠^{٩}	٠,٢٣ × ١٠^{٩}	٠,٢٧ × ١٠^{٩}	٠,٢ × ١٠^{٩}

The circulatory life span of eosinophils is (6 - 12) hours before they migrate into tissues which they may survive for week, so they are predominantly tissue-dwelling cells, several hundred times more eosinophils are found in tissues that have an epithelial in contact with environment such as respiratory, gastrointestinal and lower genitourinary tracts than in blood which they are effective as phagocytes of bacteria, parasites and viruses [32, 33].

The bladder is resemble to the small intestine in the sense that fast flow of contents is an important defense , thus the type of microbes able to colonize the small intestine might also be able to infect the bladder [34] .

Table (4) shows the bacterial species with their percentages which were responsible for cystitis, *E.coli* was the major causative agents of cystitis in this study which was isolated at rate of (47.2) %. More than (80) % of community – acquired infections of cystitis are caused by strains of *E.coli* which normally live harmlessly in the

bowel and called uropathogenic *E.coli* [20, 21, 34], other Gram negative enteric bacilli such as *Klebsiella pneumoniae* , *Proteus mirabilis* , *Enterobacter aerogenes* are also involved as common pathogens for cystitis [22, 35], in addition to *Staph.epidermidis* especially in sexually active young women [34], which were isolated at rates of (16.1) %, (10.5) %, (5.6) % and (7.8) % respectively, while *Pseu. aeruginosa* which is a prominent cause of hospital acquired cystitis [34, 36] was isolated at rate of (10) %.

Table (٤) shows bacterial percentages and their species causing cystitis in both sexes.

Bacterial / species	Infected males with cystitis		Infected females with cystitis		Total	
	No.	%	No.	%	No.	%
Escherichia coli	٣٢	٤٣,٢	٥٣	٥٠,٠	٨٥	٤٧,٢
Klebsiella pneumoniae	١١	١٤,٩	١٨	١٧,٠	٢٩	١٦,١
Proteus mirabilis	١٤	١٨,٩	٥	٤,٧	١٩	١٠,٥
Enterobocter aerogenes	٤	٥,٤	٦	٥,٧	١٠	٥,٦
Staphylococcus epidermidis	٢	٢,٧	١٢	١١,٣	١٤	٧,٨
Staphylococcus aureus	٥	٦,٨	٨	٧,٥	١٣	٧,٢
Pseudomonas aeruginosa	٦	٨,١	٤	٣,٨	١٠	٥,٦
Total	٧٤	١٠٠	١٠٦	١٠٠	١٨٠	١٠٠

During the past two decades, antimicrobial resistance among community - acquired uropathogens has increased [37], so Ciprofloxacin was still the most effective antibiotic against most of the isolated uropathogens caused cystitis in this study followed by Nalidixic acid, Nitrofurantoin and Norfloxacin respectively as shown in Table (5), while the other antibiotics had no effect.

In fact antimicrobial resistance has become such a problem in the management of many infections [38].

Table (٥) shows the sensitivity results of the isolated bacterial species against some antibiotics.

Antibiotics	*E. coli*		*K. pneumoniae*		*Pr. mirabilis*		*En. aerogenes*		*Stap. epidermidis*		*Stap. aureus*		*P. aeruginosa*	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Trimethoprim	٤	٤,٧	٠	٠	٠	٠	١	١٠	٠	٠	٠	٠	٠	٠
Nitrofurantoin	١١	١٢,٩	٣	١٠,٣	٠	٠	٤	٤٠	١	٧١	٠	٠	٢	٢٠
Nalidixic acid	١٣	١٥,٣	٦	٢٠,٧	١	٥,٣	١	١٠	٠	٠	٠	٠	٢	٢٠
Ciprofloxacin	٩	١٠,٦	١٠	٣٤,٥	٣	١٥,٨	٥	٥٠	٤	٢٨,٦	٦	٤٦,٢	١	١٠
Norfloxacin	٥	٥,٩	٦	٢٠,٧	٠	٠	١	١٠	٣	٢١,٤	١	٧,٧	٠	٠
Cefotaxime	١	١,٢	٢	٦,٧	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠
Refadin	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠
Tobramycin	٢	٢,٤	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠	٠

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دراسة علاقة تعداد حمضات الدم بإصابات التهابات المثانة في محافظة نينوى

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الملخص

تعرضت الدراسة لحالات التهابات المثانة و محاولة معرفة تأثيرها على تعداد حمضات الدم لدى الأشخاص المصابين بها من كلا الجنسين .

إذ جمعت نماذج البول والدم من (١٠٦) أنثى مصابة و(٧٤) ذكر مصاب بالتهابات المثانة تراوحت أعمارهم ما بين أقل من سنة و لغاية (٨٠) سنة. ولنفس الغرض جمعت عينات الإدرار والدم من(١١١) شخص سليم غير مصاب بالتهابات المثانة توزعوا بين(٦٧) أنثى و(٤٤) ذكر ضمن نفس المدى العمري والتي اعتبرت كمجموعة ضابطة لأجل المقارنة .

سادت نسبة الإصابة بالتهابات المثانة لدى الإناث بشكل عام وبالتحديد في الفئة العمرية (١١ – ٢٠) سنة إذ بلغت (١٤,٥) % في حين بلغت نسبة إصابة الذكور بها أقصاها (١٢,٧) % في الفئة العمرية (٥١ – ٦٠) سنة والتي تكون مسبوقة بالتهابات البروستات .

ومن خلال مقارنة أعداد حمضات دم المصابين و غير المصابين بالتهابات المثانة وجد أنها كانت ضمن المستويات الطبيعية لها مما يشير إلى انعدام تأثر أعدادها بهذه الالتهابات .

وكالمعتاد فقد سادت جرثومة *Escherichia coli* على بقية أنواع الجراثيم المسببة لهذه الالتهابات إذ عزلت بنسبة (٤٧,٢) % في حين كان لبقية أنواع العائلة المعوية Enterobacteriaceae المتمثلة بـ (*Klebsiella pnumoniae, Proteus mirabilis, Enterobacter aerogenes*) دور لا يستهان به في أحداث هذه الالتهابات فقد كانت السبب في(١٦,١)%، (١٠,٥)% و(٥,٦)% منها على التوالي. كما عزلت كل من جرثومتي *Staphylococcus epidermidis* و *Staph. aureus* بنسبة (٧,٨)% و(٧,٢) % على التوالي، بينما كانت جرثومة *Pseudomonas aeruginosa* السبب في (٥,٦) % من هذه الالتهابات.