

**The Republic of Iraq Ministry of Higher
Education and Scientific Research
University of Al-Qadisiya
College of Nursing**



**Urinary tract infections among pregnant women in
Al-Diwaniyah city**

*Research project submitted
by*

Zainab Hammadi Aweez
Nada Jassim Mohammad
Fatima abdullah rayh
Ghasaq Aqil Hamza
Fatima Sameer Talib

To

**The College of Nursing/University of Al-Qadisiya
Partial Fulfillment of the Requirement of the Bachelor's Degree in
Nursing Science**

Supervised by

Assistant Lecturer. Khetam Ibrahim Mohammed

2023 A.D

1444 A.M

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ
وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ). "

صدق الله العلي العظيم

سورة المجادلة آية ١١

الإهداء

إلى نبي امة اقرأ ... نبينا محمد عليه أفضل الصلاة وأزكى السلام

إلى إمام زماننا ... الحجة المنتظر (عج) أرواحنا له الفداء

إلى عائلاتنا الكريمة ... الذين بذلوا الغالي والنفيس في سبيل إيصالنا إلى ما نحن عليه الآن

إلى كل من ساعدنا في إتمام هذا البحث إن إنهائنا عملنا لم يكن ليتم لولا دعمكم، ونتمنى أن ينال رضاكم .

طلبة البحث

شكر وتقدير

قال تعالى {إِنَّ هَذَا كَانَ لَكُمْ جَزَاءً وَكَانَ سَعْيُكُمْ مَشْكُورًا}
{٢٢ الانسان}

وقال عليه أفضل الصلاة والسلام نبي هذه الأمة (من لم يشكر الناس، لم يشكر الله عز وجل)

نحمد الله حمداً طيباً مباركاً ونشكره على ما أمدنا به من الصحة والعافية ووفقنا إلى إتمام بحثنا هذا

نتقدم بجزيل الشكر والاحترام لأستاذتنا الفاضلة { م.م ختام ابراهيم } على كل الجهد الذي بذلته لمساعدتنا وإمدادنا بالمعلومات لإنهاء بحثنا

كما نشكر أستاذتنا الفاضلين الذين قدموا لنا يد العون طيلة رحلتنا في كلية التمريض وعميدها الأستاذ الدكتور { رحيم جبار الحمزاوي }

ولا ننسى أن نختم شكرنا ختام مسك بأن نشكر أبطالنا وقدوتنا دائماً وابدأً { والدينا الأعزاء } فشكراً لكم جميعاً
دمتم لنا سالمين

Abstract

The current study included collecting data on pregnant women who suffer from urinary tract infections by 70 patients from the Women's and Children's Teaching Hospital in the city of Al-Diwaniyah for the period from October 2022 to February 2023.

The distribution of the severity of the injury for the studied cases was divided into four severity cases (mild +, moderate ++, severe +++, and very severe ++++). The most cases admitted to the hospital were from the severity (+), and the least was(++++). As for the number of cases studied according to the month of pregnancy, the most frequently recorded months were the fourth and fifth months among pregnant women suffering from a urinary tract infection, As for the frequency of urinary tract infections in women before pregnancy, the results showed that 22 (31.43 %) of the investigated cases had urinary tract infections before pregnancy, while 48 (68.57%) of the cases were not. We also studied the relationship between the severity of the injury and the age period. There were no statistically significant differences at $P < 0.05$. Women whose ages ranged between 17-25 were the largest number compared to the rest of the cases, so the percentage 52.85 of recording the severity of urinary tract infection As for the least recorded cases they were for ages between 35-44. As for when studying the relationship between severity of infection and present of symptoms, There were significant differences at a $P < 0.05$ There are 44 cases that did not suffer from symptoms, and about 20 cases of them suffer from urinary tract infection from the severity mild (+),

while only 3 cases of them suffer from urinary tract infection from the severity (+++)When we investigated the association between the month of pregnancy and the severity of the infection, we discovered that there was no significant difference at P 0.05. This might be because there weren't many samples taken from pregnant women who were infected in the later stages of their pregnancies. When we investigated the association between the month of pregnancy and the severity of the infection, we discovered that there was no significant difference at P 0.05. This might be because there weren't many samples taken from pregnant women who were infected in the later stages of their pregnancies.

After culturing 20 specimens from 70 cases collected for Women`s and Children`s Teaching Hospital in Diwaniyah, the following results were obtained : 15 cases (75% of them contain *Escherichia coli* bacteria) and 5 cases (25% of them contain *Klebsiella* bacteria). *Escherichia coli* appeared as pink-colored colonies on MacConkey Agar, and under a microscope, Gram-negative bacilli or red bacilli were visible. On MacConkey agar, *Klebsiella* bacteria appeared as pink mucus colonies.

Contents

No.	Subject	Pages
	Abstract	I-II
	Contents	III
Chapter oneIntroduction		
1.1	Introduction	1-2
1.2	Aim of study	
Chapter twoLiteratures Review		
2.1	Urinary system	3
2.2	Part of Urinary system	3
2.3.	Some of the most common urologic disease	5
2.3.1.	Urinary tract infections	5
2.3.2.	Urinary tract infections during pregnancy	6
2.4.	The pathogens of urinary tract infections	8
2.4.1.	Bacterial urinary tract infections	8
2.4.2.	Fungal urinary tract infections	10
Chapter three.....Material and Methods		
3.1.	The materials and apparatuses	12
3.2.	Methods	12
3.2.1.	Patients and specimens	12
3.2.2.	Identification of pathogen	13
3.2.2.1.	Culture of specimens	13
3.3	Statistical analysis	14
Chapter fourResults and Discussion		
4.1	Results	15
4.1.1	Relationship of between severity of infection and age interval	17
4.1.2.	Relationship between severity of infection and presents of infection before pregnancy	18
4.1.3.	Relationship between severity of infection and presents of symptoms	18
4.1.4.	Relationship between severity of infection and month of pregnancy	18
4.1.5.	The type of pathogen	19
4.2.	Discussion	20

Chapter FiveConclusions and Recommendations		
5.1.	Conclusions	26
5.2.	Recommendations	26
Chapter Six.....References		
References		27-32

Figures

No.	Subject	Pages
4-1	<i>Escherichia coli</i>	19
4-2	<i>Klebsiella sp.</i>	

Chapter one

Introduction

1.1: Introduction

Urinary tract infection affects the urinary tract as a whole. When it affects the upper urinary tract, it is known as kidney infection (pyelonephritis), and when it affects the lower urinary tract, it is known as cystitis.(**Lane, D. R, 2011**) . According to the study by **Shaheen et al,2016**, more than 50% of women experience at least one incident of UTI in their lifetime.

Urinary tract infections UTI are common in pregnancy and can be asymptomatic and symptomatic, which complicates the diagnosis process and is important for obstetricians because of its association with mothers and the perinatal period.(**McCormick et al, 2008**). Pregnancy-related UTIs have been linked to poor maternal and perinatal outcomes. The correlation between UTI and preterm labor, low birth weight, low perinatal mortality, neonatal heart abnormalities, mental retardation, delayed infant development, maternal hypertension, preeclampsia, maternal anemia, amniotic fluid infection, and endometritis has been reported in a number of studies (**Taghavi et al , 2020**)

The pathogens of urinary tract infection can be bacterial or fungal, UTIs may be caused by a range of bacterial pathogens, but the most common are *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Enterococcus faecalis*, and *Staphylococcus saprophyticus* (**Flores-Mireles et al 2015; Mohammed et al 2022**) Most fungal

UTIs are caused by Candida species. Other fungi, including yeasts, such as Cryptococcus neoformans and Trichosporon asahii, and molds, such as Aspergillus species and Mucorales members, can infect the kidneys during transmission, but rarely cause symptoms that can be referred to in the urinary tract. (Kauffman,2014).

1.2: Aim of study

In our study , aimed to:

- 1- Studying the relationship between urinary tract infection during pregnancy of the patient through the relationship between (the severity of the infection and the age of the patient, the relationship between the severity of the infection and its presence before pregnancy, the severity of the infection and the presence of symptoms, the severity of the infection and the month of pregnancy)
- 2- Studying its pathogens and finding out the most frequent pathogen.

Chapter two

Literature Review

2. Literature Review

2.1.1. Urinary system

The urinary system works as a filter, removing toxins and wastes from a body through urine. It uses a series of tubes and ducts to pass this waste. These tubes are connected to the blood vessels and digestive system. a urinary system helps the rest of body work properly.) **Marieb, E. N. et al 2006**). The urinary system is responsible for a variety of physiologic processes, including osmoregulation, blood pressure and volume regulation, red blood cell production, calcium absorption, toxin metabolism, and excretion .(**Treuting, P. M., & Kowalewska, J. 2012**).

2.1.2. Parts of the Urinary system

Urinary system consists of **(Jones, T. C 2013) (Dugdale, D,2011)**:

1-Kidneys : two bean-shaped organs, each about the size of a fist. They are located just below ribcage, one on each side of spine. Every day kidneys filter about 120 to 150 quarts of blood to remove wastes and balance fluids. This process produces about 1 to 2 quarts of urine per day.

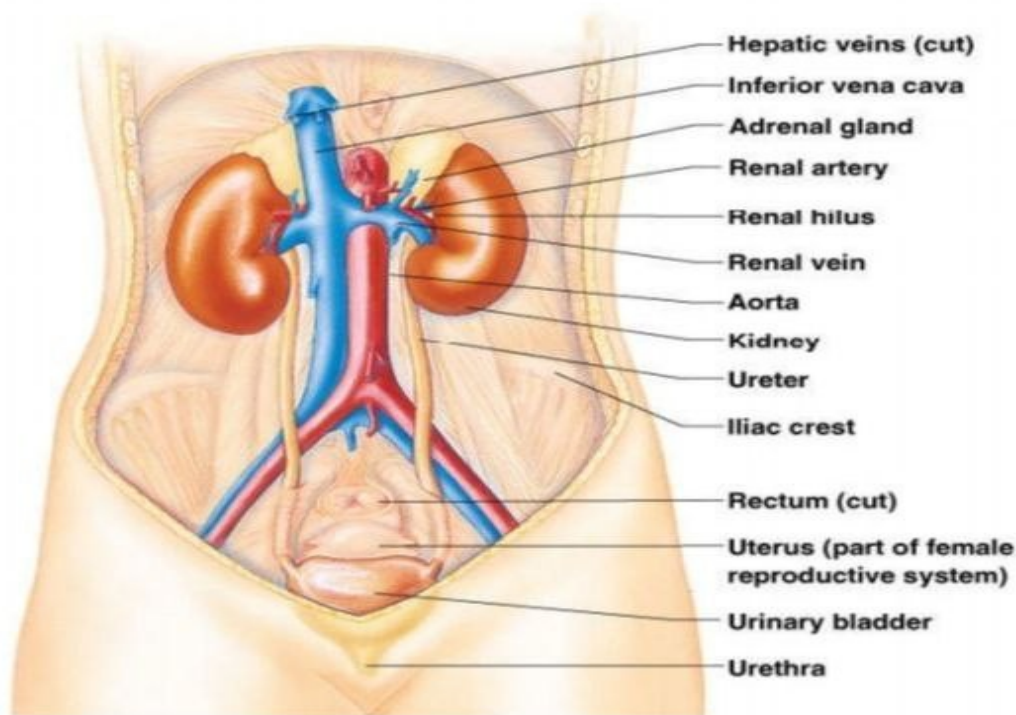
The nephron is the functional unit of the kidney and is composed of the glomerulus and the renal tubule. The products of the kidney include urine, the enzyme hormone renin, and the hormones erythropoietin and calcitriol, which is the active form of vitamin D. The human kidney is located retroperitoneally in the posterior

abdomen and is surrounded by adipose tissue. (Treuting, P. M., & Kowalewska, J. 2012).

2-Ureters : Thin tubes of muscle that connect the kidneys to the bladder and carry urine to the bladder

3-Bladder: A hollow, muscular, balloon-shaped organ that expands as it fills with urine. The bladder sits in the pelvis between the hip bones. A normal bladder acts like a reservoir. It can hold 1.5 to 2 cups of urine .Bladder emptying is known as urination.

4-Urethra: A tube located at the bottom of the bladder That allows urine to exit the body during urination . (Breshears, M. A., & Confer, A. W. 2017).



Fig(2-1):urinary system (Marieb, E. N., & Hoehn, K. 2006).

2.1.3: Some of the Most Common Urologic disease

1-Urinary tract infection: (UTI) is an infection that affects part of the urinary tract. When it affects the lower urinary tract, it is known as a bladder infection (cystitis), and when it affects the upper urinary tract, it is known as a kidney infection (pyelonephritis). About 150 million people develop a urinary tract infection in a given year. They are more common in women than men. **(Lane, D. R. 2011)**

2-Renal failure: Kidney failure, also known as end-stage kidney disease, is a medical condition in which the kidneys can no longer adequately filter waste products from the blood, functioning at less than 15% of normal levels. Kidney failure is classified as either acute kidney failure, which develops rapidly and may resolve; and chronic kidney failure, which develops slowly and can often be irreversible. **(Sever M. S. et al . 2001)**

2.2. Urinary tract infections

Contamination of the periurethral space by specific urological pathogens present in the gut, followed by colonization of the urethra and ascent of disease to the urinary bladder. **(Meštrović, T et al . 2020)** .In woman more than 50% suffer at least one incidence of UTI during their lifetime **(Shaheen, H. M et al 2016)**.

The pathogenesis of urinary tract infections (UTI) represents a balance between infectious agents causing urologic disease and host

resistance. Urinary tract infections are treated with antimicrobial agents; However, the establishment of host defences mechanisms is important in the development of UTIs and in successful treatment and prevention. Treatment for a bacterial UTI depends on the host's defences is temporary or persistent. Bacterial UTIs can be classified as simple/uncomplicated or complicated . A bacterial urinary tract infection with no underlying structural, neurological, or functional abnormality is considered a simple infection. It is usually successfully treated with a 10-14 day course of appropriate antimicrobials although a response can be seen in as few as 3 days. Bacterial urinary tract infections associated with structural, neurological, or functional abnormalities are considered (Sathiananthamoorthy, et al .2019)

Urinary tract infections (UTI) during pregnancy. 2.3

Urinary tract infections (UTIs) during pregnancy may be classified as asymptomatic bacteriuria (ASB), infections of the lower urinary tract (cystitis), or infections of the upper urinary tract (pyelonephritis). Lower tract bacteriuria (ASB or cystitis) is associated with a 20% to 30% increased risk of developing pyelonephritis in pregnancy, likely due to the physiologic changes of the urinary tract during pregnancy. Both lower and upper urinary tract bacteriuria are associated with adverse maternal and fetal outcomes, including preterm birth (Glaser & Schaeffer, 2015; Shaheen et al,2016)

UTI Are the most common bacterial infection in pregnancy, increasing the risk of maternal and neonatal morbidity and mortality.

Urinary tract infections may present as asymptomatic bacteriuria, acute cystitis or pyelonephritis. Escherichia coli is the most common pathogen associated with both symptomatic and asymptomatic bacteriuria. If asymptomatic bacteriuria is untreated, up to 30% of mothers develop acute pyelonephritis, with an increased risk of multiple maternal and neonatal complications, such as preeclampsia, preterm birth, intrauterine growth restriction and low birth weight. Urinary tract infection is a common, but preventable cause of pregnancy complications, thus urinary tests, such as urine culture or new technologies such as high-throughput DNA sequence-based analyses, should be used in order to improve antenatal screening of pregnant women .**(kalinderi et al , 2018; Shaheen et al,2016)**

UTI in pregnancy has been considered as a risk factor for adverse maternal and perinatal outcomes. There are several studies the relationship between UTI and preterm labor, low birth weight, perinatal mortality, neonatal heart abnormalities, mental retardation, delayed infant development, maternal hypertension, preeclampsia, maternal anemia, infection amniotic fluid and endometritis have been reported. **(Taghavi et al , 2020)**

In the women who acquire urinary tract infections during pregnancy are at increased risk of delivering low-birth weight, premature, and preterm low-birth weight infants and also found to be associated with increased maternal morbidity (hypertension, anemia, and amnionitis. **(Schieve et al 1994)**

2.4. The pathogens of urinary tract infection:

2.4.1. Bacterial urinary tract infections

Urinary tract infections (UTIs) are one of the major causes of morbidity and comorbidities in patients with underlying conditions, and it accounts for the majority of the reasons for hospital visit globally. Sound knowledge of factors associated with UTI may allow timely intervention that can easily bring the disease under control.

(FADEL EDDINE,2019)

Urinary tract infections (UTIs) are a severe public health problem and are caused by a range of pathogens, but most commonly by *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Enterococcus faecalis* and *Staphylococcus saprophyticus*. High recurrence rates and increasing antimicrobial resistance among uropathogens threaten to greatly increase the economic burden of these infections. **(Flores-Mireles et al 2015; Mohammed et al 2022)**

1-*Escherichia coli*

There are several bacteria that can cause a urinary tract infection (UTI), which normally live in the intestines or infect the tract when the urethra is exposed to feces. In some cases, other types of bacteria are the cause. More than 90% of bladder infections are caused by *Escherichia coli* **(FADEL EDDINE,2019)** There are many different bacteria that can cause a urinary tract infection (UTI), but the most common type is *E. Coli*, which normally live in the intestines and can infect the urinary tract when the urethra is exposed to feces.

The most popular type is: *Escherichia coli* or *coli bacillus* is one of the most important types of bacteria that live in the intestines of mammals. Discovered by Theodore Echirch. It is also known as the germ of the large intestine. *Escherichia coli* is a gram-negative bacterium that inhabits the large intestine in humans, and composes about 80% of its structure as an aerobic bacterium

Escherichia coli is the causative agent for the largest number of spontaneous urinary diseases, Diseases are divided into low that affects the bladder, and high that affects the kidneys. The incidence of the disease in these infections is higher in women than in men due to the easy transmission of germs from the feces to the urinary tract, penetrating the short urethra of women. Pregnancy, which causes urinary stagnation, also helps, facilitates the takeover of germs is the presence of adhesive substances on them, and the spread of their receptors along the cells of the urinary system up to the kidneys. Therefore, the *coli* forms that possess these characteristics reach the upper part of the urinary system and seize it, causing pyelonephritis. (FADEL EDDINE,2019)

2-Klebsiella pneumoniae

Klebsiella pneumoniae is a pathogenic bacterium commonly responsible for urinary tract infections (UTIs). *Klebsiella* species cause a wide range of diseases including pneumonia, urinary tract infections (UTIs), bloodstream infections and sepsis. These infections are particularly a problem among neonates, elderly and immunocompromised individuals. It is also responsible for a

.....

significant number of community-acquired infections., It isolated from catheterized urine of a woman with a recurrent UTI. (**Bhimalli, P ,et al ,2020 ; Bengoechea, J. A., & Sa Pessoa, J. 2019**).

Klebsiella pneumoniae is an opportunistic pathogen that can colonize mucosal surfaces and can be community or hospital acquired (**Podschun R, and Ullmann U. 1998**). This species is known to be problematic in a clinical setting, as it is resistant to a wide array of antibiotics and capable of evading host immune responses (**Navon-Venezia S, et al , 2017**)

2.4.2. Fungal urinary tract infections

When the terms funguria or fungal urinary tract infection are used, most physicians are referring to candiduria and urinary tract infections due to *Candida* species. Other fungi, including yeasts, such as *Cryptococcus neoformans* and *Trichosporon asahii*, and molds, such as *Aspergillus* species and members of the Mucorales, can involve the kidney during the course of disseminated infection, but rarely cause symptoms referable to the urinary tract. Among the major dimorphic fungi, *Blastomyces dermatitidis* not uncommonly causes symptomatic(**Kauffman,2014**)

Among funguria cases, *Candida* sp make up the majority of pathogens, representing greater than 95% of positive result of urine cultures. Candiduria is rare in healthy individuals (< 2% of urine cultures) but common among hospitalized individuals and in those with significant comorbidities (up to 40%). In addition, candiduria is

increasing in prevalence, representing 22% of nosocomial urinary tract infections (UTIs) in 1986 to 1989. (**Thomas, 2015**).

The number of fungal infections of the urinary tract has increased in recent decades, and has become a growing public health problem. *Candida albicans* is the yeast most commonly involved in urinary tract infections, although other species in the genus are gaining importance due to antifungal drug resistance associated with some species. (**Ortiz, Bryan, et al, 2018**).

The incidence of candiduria and fungal urinary tract infections (UTI) has increased in recent years. Risk factors comprise the extensive use of broad-spectrum antimicrobial agents, corticosteroids, immunosuppressive agents, cytotoxic chemotherapy complicated by mucositis and neutropenia, elderly age, diabetes mellitus, structural or functional abnormalities of urinary tract with indwelling urinary catheter or nephrostomy. Increased incidence is also observed in chronic renal failure and hemodialysis patients. Renal transplant patients are at high risk for developing funguria and pyelonephritis due to immunosuppressive therapy. (**Kauffman, 2014**).

Chapter three

Materials and Methods

3. Materials and Methods

3.1. The materials and apparatuses

Table (3-1) apparatuses ,instrument and chemical material are used in the study .

Apparatus /instruments	Company name	Origin
Incubator	Memmert	Germany
Autoclave	Gallenkaap	England
Compound light microscope	Olympus	Japan
Slide	Superstar	India
Cover slide	Superstar	India
Sensitive electronic balance	Gallenkaap	England
Disposable Petri dish	Saibran	China
Beaker	Jlassco	India
Chemical material	Company name	Origin
Sabouraud dextrose agar	Himedia	India
Nutrient media	Himedia	India
MacConkey	Himedia	India
Gram stain	Hoechst	Germany

3.2. Methods

3.2.1. Patients and Specimens

In this study, samples and data were collected from pregnant patients with urinary tract infection diagnosed by the doctor and the laboratory at the woman`s and Children`s Teaching Hospital in the city of Diwaniyah between October 2022 and February 2023. We recorded cases of urinary tract infection among pregnant women during that period. Data were collected (the age of the

patient, the month of pregnancy ,the presence of symptoms or not, and whether they suffered from urinary tract infections before pregnancy or not) and 20 of the cases were cultured in the laboratory of the Research Unit in the College of Science to identification the pathogens.

3.2.2. Identification of pathogen (Garcia, L. S. 2010)

To identification the pathogen of urinary tract infection in this study, it was diagnosed in the laboratory by culture the urine of the patients on two mediums, one of which is sabroaud dextrose agar for the growth of fungi and Nutrient Agar medium for the growth of bacteria as a primary isolate.

Bacterial identification was based on macroscopic examination (shape and color of colony on the Petri dish) and microscopic examination under the microscope.

3.2.2.1. Culture of specimens

1.Culture of specimens on nutrient agar

This medium was prepared according to the manufacturer's instructions and sterilized with autoclave at 121 °C and at 1 atmosphere pressure for 20 minutes, then cooled to 45 °C Then it was poured into Petri dishes. (Washington, J. A. 2012)

2.Culture of bacteria isolates on selective medium

Culture of bacteria on selective media, which is MacConkey Agar medium MacConkey agar is used for the isolation of gram-negative enteric bacteria and the differentiation of lactose fermenting from lactose non fermenting gram-negative bacteria (**Allen, M. E. 2005; Stapp, J. R., et al ,2000 ; Barcella, L, et al 2016**)

3. Examination under a microscope

Bacterial growth was examined under a microscope by preparing slides and staining them with gram stain (**Beveridge, T. J. 2001**).

3.3.Statistical analysis

The results of the current study were statistically analysis by the Statistical Package for Social Sciences version 30. Chi-square test (X^2) was used for the assessment of association between the variables studied. An estimate was considered statistically significant if its calculated P value less than 5%. (Field,2005).

chapter four

Results

and Discussion

4.Results and Discussion

4.1.Results

In this study, cases of urinary tract infection associated with pregnant women were studied. Data were collected on 70 cases of pregnant women with urinary tract infection. Distributed in tables according to age (table 4-1), according to the severity of infection (table 4-2), the month of pregnancy (table 4-3), the presence of infection before pregnancy(table4-4), and severity of infection and age interval (table4-5).

Table (4-1) Distribution patients according to the age

%	.No	Age interval
52.85	37	17-25
40	28	26-34
7.14	5	35-44
100	70	Total
35.01		X ²
*0.001>		P value

* Significant difference at P<0.05

Table (4-2) Distribution of pregnant patients according to the severity of infection

%	.No	Severity of infection
40	28	+
30	21	++
20	14	+++
10	7	++++
100	70	Total
18.66		X ²
*0.001>		P value

* Significant difference at P<0.05

Table (4-3) Distribution of pregnant patients according to the month of pregnancy

%	.No	The month of pregnancy
8.57	6	First month
10	7	Second month
7.14	5	Third month
15.71	11	Forth month
18.57	13	Fifth month
10	7	Sixth month
10	7	Seventh month
11.42	8	Eighth month
8.57	6	ninth month
100	70	Total
8.49		X ²
*0.387		P value

* No Significant difference at P<0.05

Table (4-4) Distribution of pregnant patients according to present of UT infection prior to the pregnancy

%	.No	Present of UT infection prior to pregnancy
31.42	22	Yes
68.57	48	No
100	70	Total
19.31		X ²
*0.001>		P value

* Significant difference at P<0.05

4.1.1. Relationship between severity of infection and age interval

Table (4-5) Relationship between severity of infection and age interval

Severity of infection				.No	Age interval
++++	+++	++	+		
(8.1)3	(13.51)5	(29.72)11	(48.64)18	37	17-25
(7.14)2	(25)7	(32.14)9	(35.71)10	28	26-34
(40)2	(40)2	(20)1	(0)0	5	35-44
7	14	21	28	70	Total
10.02					X ²
*0.124					P value

* No Significant difference at P<0.05

4.1.2. Relationship between severity of infection and present of infection before pregnancy

Table (4-6) Relationship between severity of infection and present of infection before pregnancy

Severity of infection				.No	present of infection before pregnancy
++++	+++	++	+		
(9.09)2	(22.72)5	(31.81)7	(36.36)8	22	Yes
(10.41)5	(18.75)9	(29.16)14	(41.66)20	48	No
7	14	21	28	70	Total
0.287					X ²
*0.962					P value

*No Significant difference at P<0.05

4.1.3. Relationship between severity of infection and present of symptoms

Table (4-7) Relationship between severity of infection and present of symptoms

Severity of infection				.No	Present of symptoms
++++	+++	++	+		
(15.38)4	(19.23)5	(34.61)9	(30.76)8	26	Yes
(6.81)3	(20.45)9	(27.27)12	(45.45)20	44	No
7	14	21	28	70	Total
2.38					X ²
*0.496					P value

* Significant difference at P<0.0

4.1.4. Relationship between severity of infection and month of pregnancy

Table (4-8) Relationship between severity of infection and month of pregnancy

Severity of infection				.No	Month
++++	+++	++	+		
(0)0	(0)0	(50)3	(50)3	6	First month
(14.28)1	(14.28)1	(42.85)3	(28.57)2	7	Second month
(20)1	(20)1	(40)2	(20)1	5	Third month
(0)0	(36.36)4	(18.18)2	(45.45)5	11	Forth month
(7.69)1	(15.38)2	(38.46)5	(38.46)5	13	Fifth month
(0)0	(0)0	(28.57)2	(71.42)5	7	Sixth month
(0)0	(28.57)2	(14.28)1	(57.14)4	7	Seventh month
(25)2	(25)2	(37.5)3	(12.5)1	8	Eighth month
(33.33)2	(33.33)2	(0)0	(33.33)2	6	ninth month
7	14	21	28	70	Total
23.57					X ²
*0.486					P value

* No Significant difference at P<0.05

4.1.5. The type of pathogen in this study

In this study, 20 specimens were cultured of 70 cases registered in the Women's and Children's Hospital in Diwaniyah city , and the results were:15 cases appeared, including *E. coli* bacteria(75%), and 5 cases including *Klebsiella* bacteria (25%), As shown in Figure (4-1) and Figure (4-2). Where *E.coli* appeared in the form of colonies with a pink color on MacConkey Agar, and under the microscope, gram-negative bacilli, i.e. red in color, appeared. As for *Klebsiella* bacteria, it appeared as mucous pink colonies on MacConkey agar (Jawetz et al. 2016; Wang et al2017)



Fig (4-1)

Escherichia coli



Fig (4-2)

Klebsiella sp.

4.2. Discussion

UTIs are the most common bacterial infections during pregnancy. They are characterized by the presence of significant bacteria anywhere along the urinary tract. Enterobacteriaceae account for 90% of UTIs(Le, J., et al 2004).

The results of this study, after recording cases from the Women's and Children's Hospital, collected 70 cases of urinary tract infection in pregnant women, as shown in Table No. (4-1). 52 percent of the cases were among women between the ages of 17-25, while only 5 cases were recorded among women between the ages of 35-44. This is supported by (Scholes, D et al 2000;Hooton, T. M et al 1996), as he indicated that the cases of women between the ages of 18-30 are recorded, and the reason for this was attributed to the sexual activity of this group more than others. It is also possible that this is due to the fact that there are more pregnant women at these ages than in other groups.

As for Table No.(4-2), it shows the distribution of the severity of infection in relation to the studied cases, which were divided into four severity (mild+, moderate++, sever +++, and very sever +++) The most cases admitted to the hospital were from the severity (+), and the least was(++++) .Table (4-3)shows the number of cases according to the month of pregnancy. The most recorded months among the studied cases were the fourth and fifth months. This does not match

.....

with (**Parveen, K., et al 2011**)those Who noticed that the infection of the urinary tract increases as the months of pregnancy progress.Maybe the result of our research is due to the fact that the number of women hospitalized during this periodwas more numerousin the fourth and fifth months of pregnancy.

As for the table (4-4) , It is the distribution of whether women suffer from urinary tract infection before pregnancy or not,The result was that 48 (68.57 %)of the studied cases did not suffer from urinary tract infections before pregnancy, and 22 of them had UT infections before pregnancy.This supports what **Johnson, C. Y , et al in 2021**also studied general urinary tract infection between 3 months before pregnancy and the birth of the child. Mothers were asked whether urinary tract infection occurred (before pregnancy or during pregnancy in the first, second, or third trimester),The results were there Urinary tract infection during pregnancy, but cases of Candida infection were recorded before pregnancy.And **Shaheen, H. M.et al in 2016**found that 58.3% of pregnant women with a UTI had a previous history of a UTI.and 41.7% do not.

.....

Kumar in 2019 mentioned in his book the presence of a urinary tract infection before pregnancy may increase the severity of the disease and an increased risk of complicated urinary tract infection .

We also examined the relationship between severity of infection and age interval in table (4-5) There were no significant differences at $P < 0.05$ Women whose ages ranged between 17-25 were the largest number compared to the rest of the cases, so the percentage of recording the severity of urinary tract infection (52.85), As for the least recorded cases they were for ages between 35-44, and on the other hand, it was the severity of urinary tract infection less .In Table (4-6) we studied the relationship between severity of infection and present of infection before pregnancy Also, there is no significant, as there are 48 cases of infection of the urinary tract that occurred during pregnancy. On the other hand, the severity of the infection of the urinary tract increased in them as said (**Johnson, C. Y , et al in 2021**)

As for when studying the relationship between severity of infection and present of symptoms table (4-7) There were significant differences at a $P < 0.05$ There are 44 cases that did not suffer from symptoms, and about 20 cases of them suffer from urinary tract infection from the

.....

severity mild (+), while only 3 cases of them suffer from urinary tract infection from the severity (+++) ,in 2008 **Schnarr J et al** mentioned that urinary tract infections have different presentations ranging from symptomatic to asymptomatic. As for the relationship between the severity of the infection and the month of pregnancy, we have studied it in Table (4-8) No Significant difference at $P < 0.05$ this may be due to small of samples collected from infected pregnant women in the advanced months of pregnancy, **Dezell JE and Lefevre M Lin 2000; Parveen, K ,et al in 2011** also explained that the risk of urinary tract infection in pregnancy increases around the sixth week due to the physiological changes of pregnancy and is at its peak between the 22nd and 26th week, i.e. between the fifth and sixth months of pregnancy, This is consistent with the results of our study.

As for the diagnosis of pathogens, **Ibrahim and Hamza Khalifa** identified in 2017 the types of bacteria that cause urinary tract infections in women, and they were E.Coli, Klebsiella, and Staph albus, and this corresponds almost to what we found in our study, which are the two types of bacteria E.Coli and Klebsiella. Also, **Barcella, L., Barbaro & Rogolino**, diagnosed in 2016 that 73% of the causes of urinary tract infection are E. coli from hospitalized

.....

patients and 27% from outpatients. **Brown and Foxman, 2000; Badran et al in 2015** stated that the mechanical action of sexual intercourse may facilitate entry of *E. coli* strains into the urethra and bladder, because sexual intercourse alters the normal lactobacillus-dominant vaginal flora and facilitate *E. coli* colonization of the vagina.

Pathogenic strains of *Escherichia coli* express distinct bacterial characteristics as virulence factors because they help the organism overcome host defenses and colonize or invade the urinary tract. Virulence factors of recognized importance in the pathogenesis of urinary tract infection (UTI) include P fimbriae, some other mannose-resistant aerobics and the aerobactin system, hemolysin, K-capsule, and serum killing resistance. The higher the virulence factors expressed by the strain, the more severe the infection it can cause. (**Johnson, J. R. 1991; Salvadori, M. R et al 2003; Mainil, J. 2013**).

Klebsiella bacteria, the presence of cell wall receptors enables to bind to the host cell, thus changing the bacterial surface so that phagocytosis is impeded by leukocytes and polymorphic macrophages and invasion of the non-phagocytic host cell is

.....

facilitated. The large polysaccharide capsule surrounding the bacterial cell facilitates host cell invasion and protects Bacteria from phagocytosing as *K. pneumoniae* produce an endotoxin. **(Lawlor et al 2007; Candan & Aksöz 2015; Zhu, J. et al 2021)**

Chapter five

Conclusions

and Recommendations

6.1: Conclusions

The study concluded that:

- 1-Urinary tract infection cases in Pregnant women whose ages ranged between 17-25 are the most frequently recorded cases, and the least were among women whose ages ranged between the of 35-44 years.
- 2-Most of the cases were recorded from pregnant women suffering from urinary tract infection without symptoms
- 3-The most pathogenic cause of urinary tract infection in pregnant women is *E. coli*, with a rate of 75 %, followed by bacteria *Klebsiella* by 25 %.

6.2: Recommendations

- 1- Even if they don't have any symptoms or pains, pregnant women should still be checked for a urinary tract infection.
- 2- In order to treat all patients suffering urinary tract infections, the type of pathogen must be determined.
- 3- An antibiotic sensitivity test should also be conducted for each pathogen of urinary tract infection before treatment is administered to pregnant women.

Chapter Six

References

.....

Allen, M. E. (2005). MacConkey agar plates protocols. *American Society for Microbiology*, 1-4.

Badran, Y. A., El-Kashef, T. A., Abdelaziz, A. S., & Ali, M. M. (2015). Impact of genital hygiene and sexual activity on urinary tract infection during pregnancy. *Urology annals*, 7(4), 478.

Barcella, L., Barbaro, A. P., & Rogolino, S. B. (2016). Colonial morphology of *Escherichia coli*: Impact of detection in clinical specimens. *Microbiologia Medica*, 31(2).

Bengoechea, J. A., & Sa Pessoa, J. (2019). *Klebsiella pneumoniae* infection biology: living to counteract host defences. *FEMS microbiology reviews*, 43(2), 123-144.

Beveridge, T. J. (2001). Use of the Gram stain in microbiology. *Biotechnic & Histochemistry*, 76(3), 111-118.

Bhimalli, P., Miller-Ensminger, T., Voukadinova, A., Wolfe, A. J., & Putonti, C. (2020). Draft genome sequence of *Klebsiella pneumoniae* UMB7779, isolated from the female urinary tract. *Microbiol Resour Announc* 9: e00396-20.

Breshears, M. A., & Confer, A. W. (2017). The urinary system. *Pathologic basis of veterinary disease*.

Brown PD, Foxman B (2000). Pathogenesis of urinary tract infection: The role of sexual behavior and sexual transmission. *Curr Infect Dis Rep.* ;2:513

Candan, E. D., & Aksöz, N. (2015). *Klebsiella pneumoniae*: characteristics of carbapenem resistance and virulence factors. *Acta Biochimica Polonica*, 62(4).

.....
Delzell JE, Lefevre ML, 2000 UTI during pregnancy american family physician

Dugdale, D. (2011). Vital signs. Medline Plus Medical Encyclopedia.

FADEL EDDINE, A., DJEBBARI, F., & MEZARGUIA, B. E. (2019). Prévalence des infections urinaires dans les services de Pédiatrie et de Maternité de l'hôpital Khaldi Abdel Aziz-Tébessa (Doctoral dissertation, Université laarbi tebessi tebessa

Field, A. (2005). Discovering Statistics using SPSS for Windows – Second Edition, Sage Publications Ltd.

Flores-Mireles, A. L., Walker, J. N., Caparon, M., & Hultgren, S. J. (2015). Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nature reviews microbiology*, 13(5), 269-284.

Garcia, L. S. (Ed.). (2010). *Clinical microbiology procedures handbook* (Vol. 1). American Society for Microbiology Press.

Glaser, A. P., & Schaeffer, A. J. (2015). Urinary tract infection and bacteriuria in pregnancy. *Urologic Clinics*, 42(4), 547-560. *infectious diseases*, 182(4), 1177-1182.

Ibrahim, Hamza Khalifa. 2017 "ANTIBIOTICS EFFECTS (C-PROFLOXACIN-AUGMENTIN-GENTAMICIN-NORFLOXACIN-

Jawetz, E.; Melnick, J. A. and Adelberg, E. A. (2016). Review of Medical Microbiology 27th ed. McGraw-Hill education, Inc : 851pp

Johnson, C. Y., Rocheleau, C. M., Howley, M. M., Chiu, S. K., Arnold, K. E., Ailes, E. C., & National Birth Defects Prevention Study. (2021). Characteristics of women with urinary

.....
Johnson, J. R. (1991). Virulence factors in *Escherichia coli* urinary tract infection. *Clinical microbiology reviews*, 4(1), 80-128.

Jones, T. C., Hard, G. C., & Mohr, U. (Eds.). (2013). *Urinary system*. Springer Science & Business Media

Kalinderi, K., Delkos, D., Kalinderis, M., Athanasiadis, A., & Kalogiannidis, I. (2018). Urinary tract infection during pregnancy: current concepts on a common multifaceted problem. *Journal of Obstetrics and Gynaecology*, 38(4), 448-453

Kumar, A. (2019). Urinary tract infection. *Infections in Pregnancy: An Evidence-Based Approach*, 129.

Lane, D. R., & Takhar, S. S. (2011). Diagnosis and management of urinary tract infection and pyelonephritis. *Emergency medicine clinics*, 29(3), 539-552.

Lawlor, M. S., O'connor, C., & Miller, V. L. (2007). Yersiniabactin is a virulence factor for *Klebsiella pneumoniae* during pulmonary infection. *Infection and immunity*, 75(3), 1463-1472.

Le, J., Briggs, G. G., McKeown, A., & Bustillo, G. (2004). Urinary tract infections during pregnancy. *Annals of Pharmacotherapy*, 38(10), 1692-1701.

Mainil, J. (2013). *Escherichia coli* virulence factors. *Veterinary immunology and immunopathology*, 152(1-2), 2-12.

Marieb, E. N., & Hoehn, K. (2006). Urinary system. *Essentials of Human Anatomy and Physiology*, 501-526.

Meštrović, T., Matijašić, M., Perić, M., Čipčić Paljetak, H., Barešić, A., & Verbanac, D. (2020). The role of gut, vaginal, and urinary microbiome in urinary tract infections: from bench to bedside. *Diagnostics*, 11(1), 7.

Mohammed, A. A., Samad, A., & Omar, O. A. (2022). *Escherichia*

.....
coli spp, Staph albus and Klebseilla spp were affected by some Antibiotics for Urinary Tract Infections in Bani Waleed City. *Brilliance: Research of Artificial Intelligence*, 2(2), 66-70.

Kauffman, C. A. (2014). Diagnosis and management of fungal urinary tract infection. *Infectious Disease Clinics*, 28(1), 61-74.

Thomas, L., & Tracy, C. R. (2015). Treatment of fungal urinary tract infection. *Urologic Clinics*, 42(4), 473-483.

McCormick, T., Ashe, R. G., & Kearney, P. M. (2008). Urinary tract infection in pregnancy. *The Obstetrician & Gynaecologist*, 10(3), 156-162.

Ortiz, B., Pérez-Alemán, E., Galo, C., & Fontecha, G. (2018). Molecular identification of Candida species from urinary infections in Honduras. *Revista Iberoamericana de Micologia*, 35(2), 73-77.

Navon-Venezia S, Kondratyeva K, Carattoli A. 2017. Klebsiella pneumoniae: a major worldwide source and shuttle for antibiotic resistance. *FEMS Microbiol Rev* 41:252–275.

Parveen, K., Momen, A., Begum, A. A., & Begum, M. (2011). Prevalence of urinary tract infection during pregnancy. *Journal of Dhaka National Medical College & Hospital*, 17(2), 8-12.

Parveen, K., Momen, A., Begum, A. A., & Begum, M. (2011). Prevalence of urinary tract infection during pregnancy. *Journal of Dhaka National Medical College & Hospital*, 17(2), 8-12.

Podschun R, Ullmann U. 1998. Klebsiella spp. as nosocomial pathogens: epidemiology, taxonomy, typing methods, and pathogenicity factors. *Clin Microbiol Rev* 11:589–603.

.....
Salvadori, M. R., Valadares, G. F., Leite, D. D. S., Blanco, J., & Yano, T. (2003). Virulence factors of *Escherichia coli* isolated from calves with diarrhea in Brazil. *Brazilian Journal of Microbiology*, 34, 230-235.

Sathiananthamoorthy, S., Malone-Lee, J., Gill, K., Tymon, A., Nguyen, T. K., Gurung, S., ... & Rohn, J. L. (2019). Reassessment of routine midstream culture in diagnosis of urinary tract infection. *Journal of clinical microbiology*, 57(3), e01452-18.

Schieve, L. A., Handler, A., Hershov, R., Persky, V., & Davis, F. (1994). Urinary tract infection during pregnancy: its association with maternal morbidity and perinatal outcome. *American journal of public health*, 84(3), 405-410.

Schnarr J, Smaill F (2008). Asymptomatic bacteriuria and symptomatic urinary tract infections in pregnancy. *Eur J Clin Investig* ; 38(Suppl 2): 50–57

Scholes, D., Hooton, T. M., Roberts, P. L., Stapleton, A. E., Gupta, K., & Stamm, W. E. (2000). Risk factors for recurrent urinary tract infection in young women.

Sever, M. Ş., Erek, E., Vanholder, R., Akoğlu, E., Yavuz, M., Ergin, H., ... & Marmara Earthquake Study Group. (2001). The Marmara earthquake: epidemiological analysis of the victims with nephrological problems. *Kidney international*, 60(3), 1114-1123.

Shaheen, H. M., Farahat, T. M., & Hammad, N. A. E. H. (2016). Prevalence of urinary tract infection among pregnant women and possible risk factors. *Menoufia Medical Journal*, 29(4), 1055.

Stapp, J. R., Jelacic, S., Yea, Y. L., Klein, E. J., Fischer, M., Clausen, C. R., ... & Tarr, P. I. (2000). Comparison of *Escherichia coli* O157: H7 antigen detection in stool and broth cultures to that in sorbitol-MacConkey agar stool cultures. *Journal of clinical microbiology*, 38(9), 3404-3406

.....
Taghavi Zahedkalaei, A., Kazemi, M., Zolfaghari, P., Rashidan, M., & Sohrabi, M. B. (2020). Association between urinary tract infection in the first trimester and risk of preeclampsia: A case–control study. *International Journal of Women's Health*, 521-526.

tract infection in pregnancy. *Journal of Women's Health*, 30(11), 1556-1564.

Treuting, P. M., & Kowalewska, J. (2012). Urinary system. In *Comparative Anatomy and Histology* (pp. 229-251). Academic Press.

Wanger, A.; Chavez, V.; Huang, R. S. P.; Wahed, A.; Actor, J. K. and Dasgupta, A. (2017). *Microbiology and Molecular Diagnosis in Pathology*. Elsevier Inc. All Rights Reserved. 300pp.

Washington, J. A. (Ed.). (2012). *Laboratory procedures in clinical microbiology*. Springer Science & Business Media.

Zhu, J., Wang, T., Chen, L., & Du, H. (2021). Virulence factors in hypervirulent *Klebsiella pneumoniae*. *Frontiers in microbiology*, 12, 642484.