
***Escherichia coli* Causing Urinary Tract Infection In Tobruk Medical Centre With Multi Drugs Resistance**

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Abstract: A total of 54 strains of *Escherichia coli* isolated from mid stream urine samples of urinary tract infection patients attending Tobruk medical center . The strains sensitivity to antimicrobial drugs were tested.

High incidence of resistant strains, high degree of association between resistance , most strains were resistance to one or more antibiotics.

And several patterns of antibiotics resistance occurred. *E. coli* showed very resistant to Amoxicillin+Clavulonic acid (68.5%). Sulfamethoxazol+ Trimethoprim (62.96%). And moderately resistant to Chloramphenicol (22.22%). Meropenem (20.37%). Amikacin(18.51%). However it was low resistant to Gentamicin, Ciprofloxacin and Levofloxacin (16.66%) of each one.

1-1.INTRODUCTION:

The susceptibility pattern of different organisms to various antibiotics varies from time to time, institution to institution and there is a need to generate data for every institution that will guide the clinicians to select appropriate antimicrobial drugs .(Archibald *et al.*, 1977). Since antibiotic resistance among uropathogens have gradually been rising, it has been important to have institutional data about the pattern of antimicrobial susceptibility to choose the correct treatment regimen. (Parvin *et al.*,2009) . Antimicrobial resistance a serious public health problem worldwide. Infections caused by resistant bacteria have been shown to be more frequently associated with increased morbidity and mortality than those caused by susceptible pathogens(Helms *et al.*,2002; Travers & Barz 2002). In areas of concentrated use, such as hospitals, this had led to prolonged hospital stays, increased health care costs and in extreme cases, to untreatable infections(Byarugaba,2004). The main cause of nosocomial infections in humans is *Escherichia coli* (*E.coli*) .It is also a common considered an indicator of fecal contamination in food .*E. coli* is one of the organisms most frequently isolated from different clinical cases of diarrhea(Okeke *et al.*, 1995; Tobih *et al.* , 2006). Several factors results in increasing antimicrobial drug resistance rates in poor countries such as irrational antimicrobial drug usage and conditions of poor sanitation(Okeke *et al.*, 1995; Bartoloni *et al.* , 2004). Urinary tract infection varies from urethritis (lower urinary tract infection) To pyelonephritis (upper urinary tract infection).(Zalmanovici Trestioreanu A *et al.*, 2010). The diagnosis of urinary tract infection can not be made without bacteriological examination of urine because many patients with the frequency dysurea syndrome have sterile urine and conversely asymptomatic bacteriurea is a common condition(Green Wood D *et al.* , 2012).Culture of the urine. To be meaningful must performed quantitatively, properly collected urine is cultured in measured amounts on-solid media(Brook G . *et a*

Urine culture are performed primarily when pyelonephritis or cystitis is suspected , a med stream specimen is used for urine cultures(Levinson W .,2012). Gram – negative bacilli ,

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particularly *Escherichia coli* are the commonest urinary pathogens (Taylor .W.,1992). *E. coli* causes cystitis through pili adherence and inflammation from the endotoxin ,strains causing pyelonephritis have additional adhesions like P. Pili that attach to the uroepithelial surfaces (John on A . G , Ziegler R . J , Hawley L ., 2010). UTI can be complicated to bacteremia ,septic shock, sever kidney damage (Wagner G .,1990). Diagnosis of urinary tract infection is usually based in symptoms such as painful urination or a sensation the urinary bladder does not feel empty even after urination(Tortora G J ,Funk E B . R, Case C . L .,2004).

1.2- Reviews of literatures:

The genus belongs in a group of bacteria informally known as "coliforms" Gamma proteo bacteria .(George M . Garrity.,2005).

In May 2011 , one *E. coli* strain, *Escherichia coli* O 104:H4, has been the subject of a bacterial outbreak that began in Germany . Certain strains of *E. coli* are a major cause of food borne illness. The outbreak started when several people in Germany were infected with enter hemorrhagic *E. coli* (EHEC) bacteria, leading to hemolytic – uremic syndrome (HUS), a medical emergency that requires urgent treatment, the outbreak did not only concern Germany , but 11 other countries , including regions in north America.{*Enterohemorrhagic Escherihia Coli (EHEC) outbreak in Germany 2011*} On 30 June 2011 the German *Bundesinstitut fur risikobewertung* (BFR) (*Federal Institute for Risk Assessment*, a federal, fully legal entity under public law of the federal Republic of Germany , an institute within the German Federal Ministry of food, Agriculture and Consumer protection) announced that seeds of fenugreek from Egypt were likely the cause of the EHEC.

In a study done in july 1995 sey chelle`s victoria Hospital, *E. coli* isolates from urine samples of Uti patient`s shawed a 78.6% resistance against Ampicillin and Amoxicillin and a 54.8% resistance against cotrimoxazole . The same *E. coli* isolates shawed a 75% susceptibility to Gentamicin Nalidixic acid and Nitrofurantion (Hajarnis S .,1996).

In a similar study in Nepal , *E. coli* was the most prevelant organism isolated (49%) and it shawed a 100% susceptibility to Nitrofurantion and considerable resistance to amoxicillin and ciprofloxacin(Jhan Bapat SK .A .,2005)

The pathogens causing UTI are almost always predictable with *E.coli*

Being the leading etiology agent among both the outpatients and inpatients. As antimicrobial susceptibility test report is usually found after 48 hours, the clinicians have to start an antimicrobial drug before getting the report. In these cases , the choice of antibiotic is influenced by recent available data about the susceptibility pattern of the causative agent(Semra *et al* ., 2005)

A urinary tract infection is a bacterial infection that affects any part of the urinary tract. Symptoms include frequency feeling and or need to urinate , pain during urination , and cloudy urine(ManaalZahera *et al*., 2011).

Escherichia coli is the predominant cause of both community and nosocomial urinary tract infection . In the UK, trimethoprim or nitrofurantion are usually recommended for empirical treatment of episodes of uncomplicated cystitis in the community(Baerheim.,2011).

Parenteral cephalosporins and aminoglycosides are reserved for complicated infections or pyelonephritis. In North America a cutoff point of 20% has been suggested as the level of resistance at which an agent should no longer be used empirically(Gupta *et al*., 2001).

Study of three collections of *E. coli* strains obtained from patients in east London in 1991, 1999 and 2004 showed rates of trimethoprim resistance of over 30%(Bean *et al*., 2005).

The emergence of strains producing extended spectrum B-lactamases (ESBLs) and others exhibiting quinolone resistance now threatens the empirical use of both cephalosporins and ciprofloxacin (Potz *et al.*, 2006)

In study done about lower effective in treatment of urinary tract infection

Found out in their respective studies that a trimethoprim and sulphamethoxazole combination was not effective for the treatment of urinary tract infections as all the uropathogens from inpatients and outpatients showed high degrees of resistance to cotrimoxazole (Gupta V., *et al.*) And (Praise D., *et al.*)

An other study carried out in 2003 by Dr. Joseph Ehimmadu of the faculty of pharmaceutical sciences, ABU Zaria showed large isolates of the faculty of pharmaceutical sciences. He Isolates of *E. coli* (40%) in the urine samples. Ciprofloxacin was shown to be the most effective antibiotic and Amoxicillin the least effective in the study (Ehimmadu Jo., 2003)

A study done a total of one hundred and eighty one (181) urine samples were collected from prison inmates attending university of Nigeria teaching hospital bacteriological centre. Of the total No. screened, one one hundred and forty one (77.9%) gave significant bacteriuria. A forty 40 (22.1%) showed no growth. Standard bacteriological methods and microscopy were used for the study. *Escherichia coli* was mostly isolated with the frequency of 47 (33.3%) followed by *Klebsiella pneumoniae* 28 (19.9%), *Staphylococcus aureus* 21 (14.9%), *Proteus mirabilis* 21 (14.9%), *Citrobacter freundii* 10 (7.1%), *Staphylococcus epidermidis* 7 (5.0%), *Streptococcus faecalis* 5 (3.5%), and *Pseudomonas aeruginosa* 2 (1.4%). In vitro antibiotic susceptibility test showed that gram-negative isolates were sensitive to ciprofloxacin, nalidixic acid and gentamicin, where erythromycin and chloramphenicol were active against the gram-positive isolates, all the gram-negative isolates were sensitive to the quinolone drugs. These may therefore be drugs of choice in the treatment of acute urinary tract infections (Theodore M., 2007).

The vast majority of urinary tract infections are caused by bacterial agents, the most important of which are the Enterobacteriaceae. A family of gram-negative bacilli. *E. coli* accounts for more than 80% of acute urinary tract infections in children (Amin., *et al.* 2009).

The study done seven hundred and fifty-nine pediatric patients admitted to Benghazi children Hospital during period of three months October, November, December 2010, (389) females, (370) males their ages ranged between one day to 12 years old. Identified systematically and antimicrobial susceptibility by specific technique phoenix TM 100 Automated system. Prevalence of UTIs was calculated to be 10.5%, 49 (61.25%) female, 31 (38.75%) male of all urinary isolates, there were (80%) gram-negative. *Escherichia coli* were the most common isolated organism 46 (57.5%) (Alketrani., 2010)

In total one hundred ninety five pathogenic isolates (isolation rate 24.52%) were obtained with the maximum isolates rate in between 21-40 year age group of patients. The rate of culture positive females was 63.6% (124/195), where in male it was 36.4% (71/195) among isolates *E. coli* was the predominant isolates (72.3%). The sensitivity tested against various antimicrobials showed maximum sensitivity against Imipenem (94.3%). And resistant to third generation cephalosporin, Ceftazidime was also noticed (Banerjee S., 2011).

In study eighty two cultures were positive for UTI. *Staphylococcus spp.* (46%) and *Escherichia coli* (39%) were the most common pathogens, there was high resistance to cotrimoxazole (73.2%), nalidixic acid (52.4%) and Amoxicillin (51.2%), the favorable antibiograms were obtained with Gentamycin, Amoxicillin-clavunlonate and levofloxacin where (85.4%, 72%, 67.1%) of isolates respectively, were either sensitive or intermediate,

only (51%) of isolates were sensitive to Ciprofloxacin (**Odongo C . O , Anwar D A . Luryamamolk , Odango Op ., 2013**).

2-Material and Methods:

2.1-Study population .

A total of 54 urine samples collected from patients clinically suspected as having urinary tract infection (UTI) were investigated in the laboratory for urine culture test during the period of January to June 2020 .and were obtained consecutively from urine specimens in both outpatient and inpatient from Department of Microbiology of Tobruk medical centre.

2.2-Isolation of pathogens.

The urine specimen was inoculated on two types of media plates MacConkey agar and Blood agar by standard culture techniques, a calibrated loop(4mm diameter) delivering 0.01 ml of urine was used to inoculate the sample . The plates are incubated at 37C for 24 hrs .

2.3-Identification of Isolates .

Identification of the isolated organisms was done on the basis of cultural characteristic and Gram staining was performed to confirm the Gram negative bacilli belong to Enterobacteriaceae to confirm the organisms that ferment lactose.

2.4-Disc diffusion testing .

A total of Twenty antibiotics were used in the study . The disc used were purchased Oxoid, UK (table-1).Susceptibility tests were done on fresh pure cultures of the isolated organisms on Muller Hinton agar Plates as described by the Clinical Laboratory Standards Institute (CLSI) standards.

The diameter of the zone of complete inhibition was measured to the nearest whole millimeter (mm) by a ruler. The zone of inhibition of bacterial growth around the disc is measured in mm which represents susceptibility of the organism to that particular drug.

3-Result and Discussion.

The 54 *E.coli* strains isolated from urine samples were identified according to their cultural characteristic on Blood agar and MacConkey agar.

These isolates were collectively tested for sensitivity and resistance against 8 antibiotics. The antibiotics susceptibility of the isolates showed that *E . coli* strains were sensitive to Ciprofloxacin (81.48%). Levofloxacin (79.62%). Meropenem (74.07%) . Table (5) , the result of this study for Ciprofloxacin was in agreement with the result of **Ehimmidu Jo ., 2003**

Who reported that Ciprofloxacin was shown to be the most effective Antibiotic, also agreement with the result of **Theodore M., 2007** which reported that gram –negative isolates were sensitive to Ciprofloxacin and Gentamicin, Where Chloramphenicol were active against the gram positive isolates , While in our study sensitive in (64.81%).Table (5) The result of Levofloxacin susceptibility in our study was (79.62%). Table (5) Also agreement with the result of **Odongo C . O et al 2013**. The susceptibility of Gentamicin was (68.51%) Table (5) it represent lower than study of **Hajarnis S .,1996** which reported *E . coli* isolates showed a 75% susceptible to gentamicin Table (5) it is different than **Odongo C . O et al.**, which reported it was 85.4% sensitive to gentamicin

The result of our study was high resistance to Amoxicillin-clavulonate (68.51%) Table (3) that different with the **Odongo C . O et al** which reported *E . coli* (72%) sensitive to

Amoxicillin-clavulonate , also high resistance to Sulfamethoxazol+ Trimethoprim(62.96%)
Table (3) . Similar finding with the result of **Hajarnis S ., 1996** .

Table (1) Antibiotics used for *E.coli* isolated from urine.

Name of antibiotic	Symbol
Amoxicillin+Clavulanate	AMC
Gentamicin	CN
Chloramphenicol	F
Sulfamethoxazol + Trimethoprim	SXT
Ciprofloxacin	CIP
Levofloxacin	LEV
Meropenem	MEM
Amikacin	Ak

Table (2) frequency of *E. coli* resistant to three antibiotics and more.

Antibiotic (R)	Frequency	%
Three	10	18.51
Four	6	11.11
Five	0	0
sixe	0	0
Seven	2	7.40
Eight	2	7.40

Table (3) No. and percentage of (R) *E. coli* isolates against different Antibiotics.

Antibiotics	No. of <i>E. coli</i> (R)	%
-Amoxicillin +Clavulanate	37	68.51
-Gentamicin		
-Chloramphenicol	9	16.66
-Sulfamethoxazol	12	22.22
+Trimethoprim	34	62.96
-Amikacin		
-Ciprofloxacin	10	18.51
-Levofloxacin	9	16.66
Meropenem	9	16.66
	11	20.37

Table (4) No. and Percentage of (I) *E. coli* isolates against different Antibiotics.

Antibiotics	No. of <i>E.coli</i> (I)	%
-Amoxicillin+ Clavulanate	16	29.62
-Gentamicin		
-Chloramfenicol	8	14.81
-Sulfsmethoxazol+ Trimethprim	6	11.11
-Amikacine		
-Ciprofloxacin	4	7.40
-Levofloxacin	8	14.81
-Meropenem	1	1.85
	3	5.55
	3	5.55

Table (5) No. and Percentage of (s) *E. coli* isolates against different Antibiotics.

Antibiotics	No. of <i>E.coli</i> (s)	%
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Amoxicillin+ Clavulanate	1	1.85
Gentamicin	37	68.51
Chloramfenicol	35	64.81
Sulfamethoxazol+Trimethoprim	14	25.92
Amikacin	36	66.66
Ciprofloxacin	44	81.48
Levofloxacin	43	79.62
Meropenem-	40	74.07

4-CONCLUSION:

E. coli isolates were found resistant to different antibiotics . High incidence of resistant strains and high degree of association between resistance were observed . several and complex resistance patterns to more than three antibiotics were obtained . The frequency of resistance to three antibiotics occurred 10 times , Also resistance to 7 antibiotics occurred two times and resistance to 8 antibiotics also two times.

المستخلص: تم عزل عدد 54 صنف من بكتيريا السيريشيا القولونية من عينات البول بطريقة وسط عملية التبول لمرضى يعانون من التهاب المسالك البولية بمركز طبرق الطبي . حساسية البكتيريا التي تم عزلها للمضادات الحيوية التي تم اختبارها كانت مقاومتها عالية . والمقاومة لعدة أصناف من المضادات الحيوية كانت هي الأغلب فمعظم المقاومة كانت لنوع أو أكثر من المضادات الحيوية فالاستشريشة القولونية شوهدت مقاومة بشكل مرتفع للاموكسيسيللين مع الكلافولونات (68%) و السلفاميثوكسازول مع التريميثوبريم (62%). وكانت متوسطة المقاومة للكلورامفينيكول (22.22%) . والميروينيم (20.37%) . والاميكاسين (18.51%). وشوهد أنها كانت اقل مقاومة لكل من المضاد الحيوي جيتتاميسين , سيبروفلوكساسين , والليفوفلوكساسين (16.66%) لكل منهم.

5- References.

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