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A DESCRIPTIVE RESEARCH ON RESISTANCE RATE OF ANTIBIOTICS IN URINE SPECIMENS REGARDING PATHOGEN YIELD AND SENSITIVITY PATTERN

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Abstract:
Objective: *Objective of this particular research was the determination of common pathogens yield isolated from specimen of urine and its pattern of sensitivity in adolescents.*
Methods: *Our research was descriptive retrospective, which was carried out at Mayo Hospital, Lahore (Pathology and Pediatric Nephrology Department) in the timeframe of January, 2016 to August, 2017. Sensitivity and culturing of every urine sample was carried out. We inoculated the urine samples with CLED (Cystine Lactose Electrolyte Deficient). Incubation of the tubes and plates was carried out at a temperature of 37ºC for twenty-four hours with significant consideration of (> 105 CFU) as growth rate. Identification of the colonies was made through morphology, Gram stain, lactose fermentation and biochemical assessments.*
Results: *We processed a total of 4107 urine samples with positive yield observed in 1442 cases (35%) with females as (66%) and males as (34%). Repeated pathogen was E. Coli (55%), Pseudomonas (13.6%), Candida albicans (11%) and Klebsiella (13.5%). Numerous pathogens were (80% – 100%) sensitive to piperacillin tazobactam. A total of 65 – 90 percent cases were sensitive to aminoglycosides and 65 – 85 percent to quinolones. Number of pathogens had third generation resistance to cephalosporins (75%) excluding Citrobacter.*
Conclusion: *We report a higher common pathogen yield in the collected samples of urine with higher resistance rate to antibiotics.*
Keywords: *Bacteria, Urine specimen, Children and Bacterial Sensitivity Tests.*

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INTRODUCTION:

The definition of UTI (Urinary Tract Infection) can be made as single pathogen growth with colony that forms the units (CFU > 105 per ml) clean midstream urine [1, 2]. Children face UTI as repeated infection after respiratory infection which is dominant in females than males [2]. There is five percent reported UTI rate in the children with age bracket of 2 months to 24 months [3]. Girls are commonly observed with asymptomatic bacteriuria. In UTI, tissue inflammation and invasion caused because of proliferating bacteria which results in the shape of renal parenchymal infection also called pyelonephritis. An untreated infection may cause hypertension, renal scarring and chronic kidney diseases [3, 4].

UTI can also be attributed to drug recurrence, resistance, delayed surgical intervention and hospitalization. It is a marker of functional and structural urinary tract deformities in 30% – 40% children [4]. UTI can be classified on the basis of severity and predominant symptoms associated to upper urinary tract (pyelonephritis) or lower urinary tract (cystitis). Variation may be observed from child to child due to structural urinary deformities which is age dependent. Its symptoms include abdominal pain, fever, frequency, vomiting, burning micturition, dysuria and occasional either frank pyuria or urine retention. Children may present complicated signs such as uremia, anemia, acidosis, hypotension, hypertension and convulsions. Hospitalization is recommended for such cases for onward treatment which includes radio imaging, biochemical assessment, hematological assessment, urinalysis, urine culture, blood culture with an intensive care such as dialysis or catheterization. Numerous congenital deformities such as urinary tract and kidneys cause mortality and morbidity [1, 4]. Major responsible causes include posterior urethral valves, neurogenic bladder and vesicoureteral reflux which are complicated and recurrent as well [2 – 4]. Recurrent UTI can also be attributed to Urolithiasis, urosepsis, (12%) acute kidney injury and (> 20%) chronic kidney disease [5]. It is mandatory to have appropriate diagnosis to reduce or eliminate damage to liver or kidneys.

UTI definite diagnosis and causative agent's sensitivity pattern are necessary for treatment with prolonged follow-up [4, 6, 7]. UTI management is difficult in obstructive conditions, neurogenic bladder, refluxing kidneys or in immunocompromised adolescents such as post-transplant cases [4].

Gold standard consideration is given to urine sensitivity and urine culture for the definite UTI diagnosis. In general, clinical assessment suggests for the antibiotic intervention; whereas, urinalysis is based on the bacterial sensitivity and culturing [4, 8, 9].

Developing countries also report antimicrobial resistance against numerous antibiotics because of the illogical use of primary treatment of infections. Recently, developing countries have presented eighty percent resistance in the children E. coli UTI on the use of antibiotics [7]. A local author reports most common pathogen as E. coli (63%) with sensitivity as (82%) [10].

Ultimate benefit can be obtained through identification of weak areas; therefore, we planned this particular research for the determination of common pathogens yield isolated from specimen of urine and its pattern of sensitivity in adolescents.

MATERIAL AND METHODS:

Our research was descriptive retrospective, which was carried out at Mayo Hospital, Lahore (Pathology and Pediatric Nephrology Department) in the timeframe of January, 2016 to August, 2017. Sensitivity and culturing of every urine sample was carried out. We inoculated the urine samples with CLED (Cystine Lactose Electrolyte Deficient). Incubation of the tubes and plates was carried out at a temperature of 37ºC for twenty-four hours with significant consideration of (> 105 CFU) as growth rate. Identification of the colonies was made through morphology, Gram stain, lactose fermentation and biochemical assessments. We collected the samples in the age bracket of one to thirteen years in a sterile container (Number = 4107). Urine sample was centrifuged with a consideration of (8 – 10 pus cells / HPF) as pyuria. Inoculation of the samples with pyuria was carried out with CLED (Cystine Lactose Electrolyte Deficient) biochemical tubes and agar plates. Gram negative and positive was categorized on the basis of significant colonies gram stain. Bacterial pathogen was identified through biochemical tests panel. In the light of clinical guidelines, we tested the antibiotic sensitivity through the method of "Kirby-Bauer" [11]. We monitored and examined pattern of sensitivity at 37ºC after 24 hours.

Main variables were bacterial pathogen type and antimicrobial pattern of sensitivity. Hospital records were collected through a proforma and these records were reanalyzed and coded.

RESULTS:

We processed a total of 4107 urine samples with positive yield observed in 1442 cases (35%) with

females as (66%) and males as (34%). Repeated pathogen was E. Coli (55%), Pseudomonas (13.6%), Candida albicans (11%) and Klebsiella (13.5%). Numerous pathogens were (80% – 100%) sensitive to piperacillin tazobactam. A total of 65 – 90 percent cases were sensitive to aminoglycosides and 65 – 85 percent to quinolones. Number of pathogens had third generation resistance to cephalosporins (75%) excluding Citrobacter. Detailed outcomes have been shown in frequency and percentage in Table I and II with correspondent figures.

Table – I: Various Pathogen Frequency

Various Pathogen	Frequency	Percentage
Total Positive Urine Samples	144	35.1
Most Common Pathogen	794	55
Klebsiella	194	13.74
Pseudomonas	187	13.6
Proteus	24	1.6
Candida albicans	160	11.1

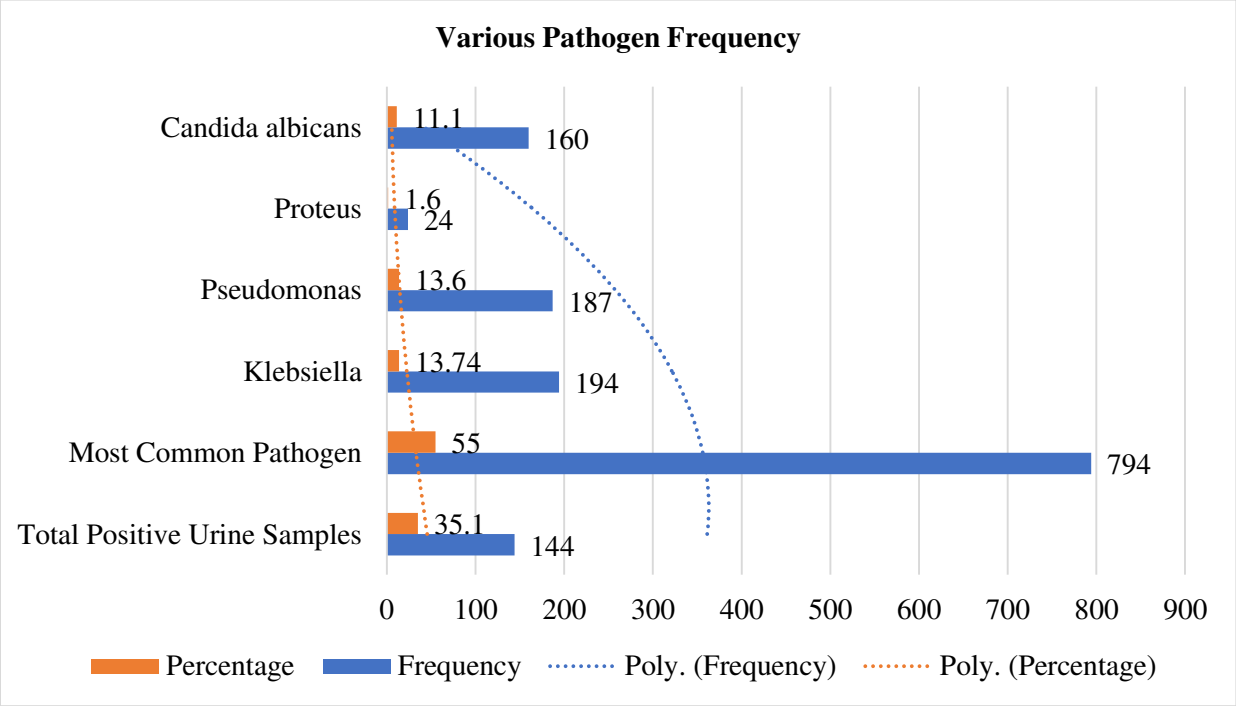
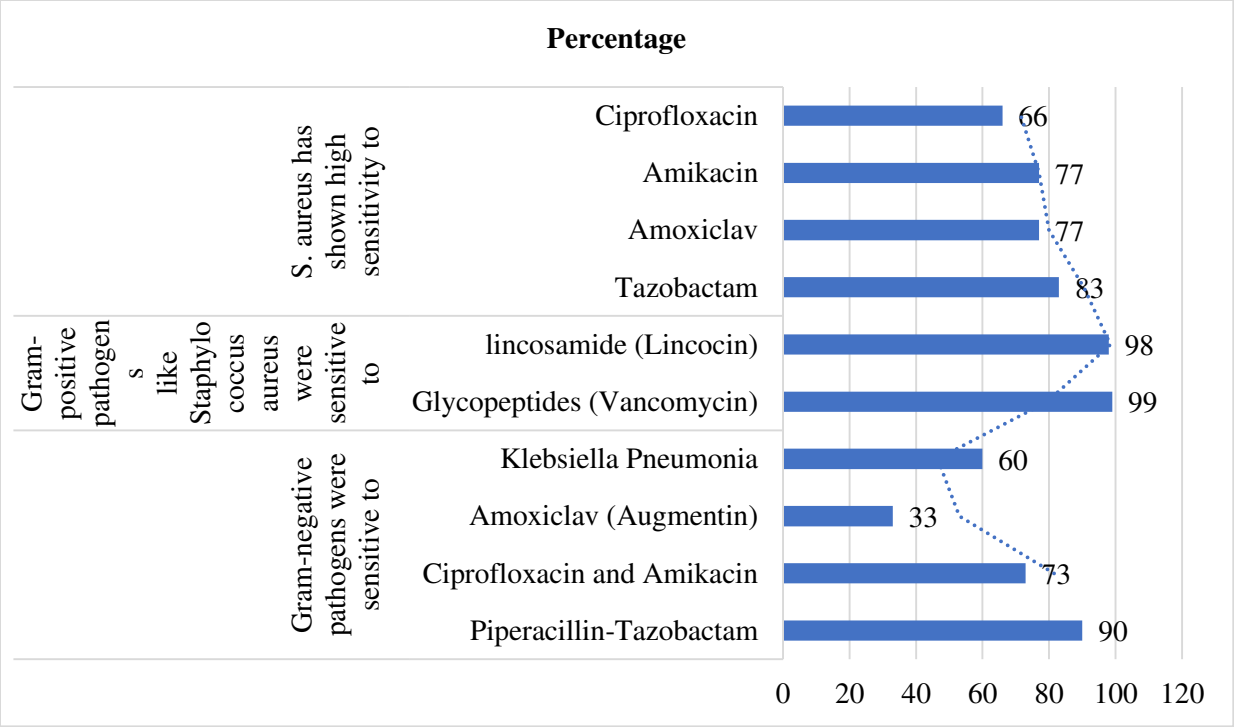


Table – II: Antimicrobial sensitivity pattern of isolated pathogens

Sensitive To		Percentage
Gram-negative pathogens were sensitive to	Piperacillin-Tazobactam	90
	Ciprofloxacin and Amikacin	73
	Amoxiclav (Augmentin)	33
	Klebsiella Pneumonia	60
Gram-positive pathogens like Staphylococcus aureus were sensitive to	Glyco-peptides (Vancomycin)	99
	Lincosamide (Lincocin)	98
S. aureus has shown high sensitivity to	Tazobactam	83
	Amoxiclav	77
	Amikacin	77
	Ciprofloxacin	66



DISCUSSION:

Appropriate antibiotic can be selected through UTI diagnosis to get an optimal response with related specific measures. Optimal management requires understanding of the pattern of sensitivity and culturing in UTI affected children.

Thirty five percent of the urine samples showed bacterial growth isolation frequency. Which represents 65.5% of the hospitalized cases in nephrology ward having numerous nephro-urological complications because of surgical procedures or catheterization as a result of antibiotic intervention. Repeated and prolonged antibiotic treatment is also caused Candida albicans growth as (11%).

Most repeated pathogen was E. coli which was observed in 55% specimen as a causative pathogen as reported in numerous research studies about 80% of UTI affected children [2, 3, 6]. There has been a decline in the E. Coli isolation all over the world in the cases of pediatric urinary tract infections. We can attribute high variation rate to research design, method of sample collection, study duration and research site. There is a consistency in the E. Coli growth as observed in other studies with our research (55%). We observed Klebsiella, Pseudomonas and Proteus respectively as 13.74%, 13.6% & 1.6% which is also observed in other research studies [11 – 15]. Pseudomonas growth reflects a high complication rate in UTI affected children with numerous urological ailments. Gram positive was developed in (2.4%) cases which are UTI rare causative agents. These may also suggest renal, UTI or perirenal abscess complications having a possibility of hematogenous route [9, 15 – 17].

An alarming situation have been observed about the antibiotics resistant pattern. Non-effective of the frontline treatment interventions have been observed as 70% to 80% pathogens were resistant to cefotaxime, cefixime, amoxiclav and nalidixic acid. There is a global high resistant of urinary pathogens in under developed countries like Pakistan and India [17 – 21].

Variation in the outcomes can be explained in terms of variation in the population, antibiotic pattern and bacterial sensitivity prevalence. Numerous children had already received antibiotics before the clinical assessment of the urine samples. Over the counter availability of the drugs may be considered as the cause of illogical drug intake in under developed countries [7]. High resistance as observed in our research is also because of this mal-practice which is also reported in countries like Nigeria and Ghana [7].

Last six-month antibiotic use was observed as high resistance in under five years age children. Repeated and prolonged antibiotic use is also a reason of the urological disorders and febrile illnesses. Other research studies held in under developed countries also report E. Coli resistance in the UTI affected

children about antibiotics including ampicillin, co-trimoxazole and co-amoxiclav respectively as (73.0% – 87.7%), (59.8% – 89.8%) and (40.9% – 79%) [7]. However, relatively better sensitivity was observed in ciprofloxacin, piperacillin-tazobactam and amikacin against gram-negative (69% – 89%) pathogens. E. coli resistance to ciprofloxacin was reported in various studies as 28.6% [7, 11, 22 – 24]. Complicated UTI cases have also been recommended piperacillin tazobactam, aminoglycosides and cefoperazone-sulbactum in recent research studies [16]. Our outcomes also suggested that in UTI affected children related complications included urine retention, urosepsis, uraemia, lincosamide and glycopeptides which were effective about sensitivity against 98% to 99% gram-positive organisms which can be compared with other research studies [16].

CONCLUSION:

We documented high common bacterial pathogens yield in the UTI affected children urine specimens. We also observed higher bacterial resistance to common antimicrobial agents; however, ciprofloxacin, tazobactam and amikacin showed relatively better pattern of sensitivity.

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