

EVALUATION OF BACTERIAL PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN FOR URINARY TRACT INFECTION IN PREGNANCY

Mahadeo Mandal¹, Md. Shahnawaj Mehdi¹, Prakash Kumar Mishra²

¹Tutor, Department of Microbiology, Jan Nayak karpuri Thakur Medical College and Hospital, Madhepura, Bihar, India.

²Assistant Professor, Department of Microbiology, Jan Nayak karpuri Thakur Medical College and Hospital, Madhepura, Bihar, India.

Received : 27/06/2022
Received in revised form : 20/08/2022
Accepted : 29/08/2022

Keywords:
Pregnancy,
Uropathogens,
Urinary tract infections,
E.coli.

Corresponding Author:
Dr. Shahnawaj Mehdi,
Email. drmehdi30@gmail.com
ORCID: 0000-0001-7064-087X

DOI: 10.47009/jamp.2022.4.4.46

Source of Support: Nil.
Conflict of Interest: None declared

Int J Acad Med Pharm
2022; 4 (4); 235-237



Abstract

Background: The kidney produces sterile urine, and the bacteria proliferates in this sterile fluid using it as a culture medium. This micro-pathogen infection if occurred in pregnancy may cause significant morbidity. To evaluate the bacterial profile and antimicrobial susceptibility pattern for urinary tract infection in pregnancy. **Materials and Methods:** This prospective study evaluated 500 samples. The study sample consisted of urine sample of the pregnant females, who reported to our institute for antenatal checkup and volunteered to participate in the study. A clean catch midstream urine sample collected in the sterile container was used for the study. **Result:** The bacterial culture of the sample showed a positive result for significant number of samples (n=180). Of the total bacterial isolates (n=180), 108 were Gram negative bacteria and 72 were Gram positive bacteria. The antibiotic sensitivity pattern showed that, almost 10 percent E. coli were sensitive to ampicillin while almost 74 percent showed sensitivity to nitrofurantoin. **Conclusion:** The rising trend of antibiotic resistance amongst uropathogens, suggest the requirement for geographical location based information about uropathogens and its antibiotic sensitivity patterns.

INTRODUCTION

Urinary tract is a set of organs (kidney, ureter, bladder, urethra and other structures) which accumulate, stock and discharge urine. The kidney produces sterile urine, and the bacteria proliferates in this sterile fluid using it as a culture medium.^[1] These grown micro-pathogens causes, also are the single common bacterial infection of humans.^[2] These micro-pathogens may involve lower urinary tract if occurred in pregnancy.^[3] The urinary tract infection is the commonest cause of obstetrical wards admission, and is reported in almost 20% of the pregnant women.^[4]

Urinary tract infection causes substantial amount of morbidity both in mother and in foetus, if occurred in pregnancy. Acquisition of bacteriuria during pregnancy, may be attributed to the combined physical and physiological alteration of the urinary tract which occurs in pregnancy.^[5] In pregnancy, the urinary stasis also occurs due to - uretero-vesical reflux and is secondary to, 1) ureteric dilatation, 2) decreased ureteric and bladder tone caused by hormone, 3) Increased plasma volume, 4) decrease concentration of urine and 5) augmented bladder volume.^[6] The decreased immunity in pregnancy adds to the growth and proliferation of micro-organisms.^[7,8]

The increased load of micro-pathogens in urine, may remain asymptomatic or may develop severe symptoms during pregnancy.^[9] E. coli, accounts for the vast majority of urinary tract infection pregnancy, these infections are similar to non-pregnant women.^[10,11] Sometimes, this E. coli may come from endogenous colon flora of, using receptor mediated ascending channel.^[12] The increased level of amino acids and lactose in pregnancy also boosts the E. Coli growth.^[13]

The appropriate treatment for such infection requires, an updated knowledge of causative organism and its antibiotic susceptibility. Therefore this study was designed to evaluate the bacterial profile and antimicrobial susceptibility pattern for urinary tract infection in pregnancy.

MATERIALS AND METHODS

Study Design: This was a prospective, cross-sectional study, conducted in the Department of Microbiology, at Jan Nayak karpuri Thakur Medical College and Hospital, Madhepura. The study was approved by the institutional research and ethical committee. The study was conducted over a period of 15 month from June 2020 to September 2021. An informed and written consent was obtained from the participating subjects prior to the commencement of study.

Study Sample

The study sample consisted of urine sample of the pregnant females, who reported to our institute for antenatal checkup and volunteered to participate in the study. A clean catch midstream urine sample collected in the sterile container was used for the study. A total of 500 samples were evaluated.

Inclusion Criteria

Pregnant women willing to participate.

Exclusion Criteria

- Not willing to consent
- Other Systemic disease
- On antibiotic premedication

Procedure

All the urine samples were processed in blood agar and mac conkey agar and Microscopy was done. Culture positive was declared only if 10⁵ or more colony forming units/ ml of urine sample, of bacterial colony was grown. Bacterial colony morphology,

Gram staining and standard biochemical tests was used for bacterial identification.^[14] Kirby Bauer disk diffusion technique was followed for antibiotic susceptibility.^[15]

Statistical Analysis

All the data was tabulated in a Microsoft excel spread sheet. Descriptive statistical analysis was done using SPSS Software version 16.0

RESULTS

Total 500 urine samples of pregnant women were received and evaluated for bacteria pathogens along with antibiotic susceptibility. 04 samples were discarded due to technical reason, and 496 samples were evaluated.

The bacterial culture of the sample showed a positive result for significant number of samples (n=180). The detailed bacterial species isolates are shown in [Table 1].

Table 1: Detailed bacterial species isolates of samples. (Bacterial culture positive, n=180)

Bacterial Species	E.coli	Staphylococcus aureus	Coagulase negative Staphylococci (CONS)	Klebsiella	Enterococci	Acinetobacter
Found in number of samples	76	32	28	20	12	120

Table 2: Antibiotic sensitivity pattern of Gram-Negative bacteria bacterial isolates.

	AMP	AMC	CTX	CTR	CIP	GEN	AK	NIT	T	NX	IPM
E. coli (76)	8	32	40	36	44	36	40	56	28	44	57
Kleb (20)	0	4	8	8	1	8	16	8	12	12	20
Acinetobacter (12)	0	4	4	8	8	8	8	4	4	8	9

AMP-Ampicillin, AMC-Amoxiclav, CTX-Cefotaxime, CTR-Ceftriaxone, CIP-Ciprofloxacin, GEN-Gentamicin, AK-Amikacin, NIT-Nitrofurantoin, T-Tetracycline, NX-Norfloracin, IPM-Imipenem.

Table 3: Antibiotic sensitivity pattern of Gram-Positive bacterial isolates.

	AMP	AMC	CTX	CTR	CIP	GEN	C	NX	COT	P	E	T	LZ
S. aureus (8)	8	16	16	20	24	12	16	20	24	8	12	16	32
CONS (7)	4	12	12	14	12	8	20	8	16	4	8	16	28
Enterococci (3)	0	0	0	0	4	4	0	0	8	0	0	0	12

AMP-Ampicillin, AMC-Amoxiclav, CTX-Cefotaxime, CTR-Ceftriaxone, CIP-Ciprofloxacin, GEN-Gentamicin, C- Chloramphenicol, NX-Norfloracin, COT-cotrimoxazole, T-Tetracycline, LZ- linezolid. CONS-Coagulase negative staphylococcus.

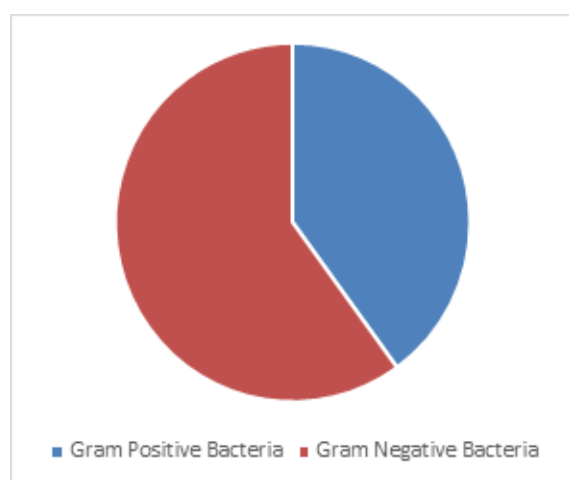


Figure 1: Bacterial isolates

Of the total bacterial isolates (n=180), 108 were Gram negative bacteria and 72 were Gram positive bacteria. [Figure 1]

The antibiotic sensitivity pattern showed that, almost 10 percent E. coli were sensitive to ampicillin while almost 74 percent showed sensitivity to nitrofurantoin. [Table 2 & Table 3].

DISCUSSION

One of the commonest findings in pregnancy is bacteriuria. The infection may remain symptomatic or asymptomatic. Both the mother and foetus are at risk, if the bacteriuria is not addressed, and it may cause wide array of problems ranging from nil to life threat.^[16]

Our study, found the prevalence of urinary tract infection in 180 samples. The percentage bacterial infection in our study was higher than Akinloye et

al,^[17] similar to Onuh et al,^[18] and lesser than Ajayi et al.^[19] Overall, the observation of our study was in range within the range of previous study reports. Yet, a few studies reported very low prevalence.^[20,21,22] The study reports are spread over a wide range, may be due to inclusion of both symptomatic / asymptomatic subjects.

In the present study, the E. Coli remained the predominant isolate, the other pathogens included, S. aureus, coagulase-negative staphylococci, Klebsiella spp and Enterococci and Acinetobacter respectively in the decreasing order. This observation was similar to the previous study report of similar study.^[23,24] Urine stasis during pregnancy creates a conducive environment for E.coli strain colonization. Poor genital hygiene are amongst the other possible reason for highest isolation of these strains.^[25,26]

In the present study, all Gram negative and Gram-positive bacteria were found sensitive to Imipenem and Linezolid respectively. Since these two drugs are not considered safe in pregnancy, therefore not recommended. About 3/4th of E. Coli and 2/5th of Klebsiella has shown sensitive towards nitrofurantoin. Nitrofurantoin is considered safe in pregnancy. Also E.coli showed poor sensitivity to Ampicillin. Gram positive bacteria also showed high resistance towards ampicillin. A high percentage of Staph aureus showed sensitivity to Ciprofloxacin and cotrimoxazole. Antibiotic abuse may be considered as a prime reason for high resistance.^[27]

CONCLUSION

The rising trend of antibiotic resistance amongst uropathogens, suggest the requirement for geographical location-based information about uropathogens and its antibiotic sensitivity patterns. Early diagnosis and timely treatment becomes utmost important, to reduce UTI associated pregnancy complications.

REFERENCES

- Omonigho SE, Obasi EE, Akukalia RN. In vitro Resistance of Urinary Isolates of Escherichia coli and Klebsiella species to Nalidixic Acid. *Niger J Microbiol.* 2001;15(1):25-29.
- Theodor M. Prevalence and antibiogram of urinary tract infections among prison inmates in Nigeria. *Internet J Microbiol.* 2007;3(2):12 - 23
- Oladeinde BH, Omoregie R, Olley M, Anunibe JA. Urinary tract infection in a rural community of Nigeria. *N Am J Med Sci.* 2011;3(2):75-7. doi: 10.4297/najms.2011.375.
- Bacak SJ, Callaghan WM, Dietz PM, Crouse C. Pregnancy-associated hospitalizations in the United States, 1999-2000. *Am J Obstet Gynecol.* 2005;192(2):592-7. doi: 10.1016/j.ajog.2004.10.638.
- TaherAseel M, Mohamed Al-Meer F, Ghaith Al-Kuwari M, Ismail MF. Prevalence and Predictors of Asymptomatic Bacteriuria among Pregnant Women Attending Primary Health Care in Qatar. *Middle East J Fam Med.* 2009;7:10-13.
- Delzell JE Jr, Lefevre ML. Urinary tract infections during pregnancy. *Am Fam Physician.* 2000;61(3):713-21.
- Macejko AM, Schaeffer AJ. Asymptomatic bacteriuria and symptomatic urinary tract infections during pregnancy. *Urol Clin North Am.* 2007;34(1):35-42. doi: 10.1016/j.ucl.2006.10.010.

- Patterson TF, Andriole VT. Bacteriuria in pregnancy. *Infect Dis Clin North Am.* 1987;1:807-822.
- Matuszkiewicz-Rowińska J, Małyszko J, Wieliczko M. Urinary tract infections in pregnancy: old and new unresolved diagnostic and therapeutic problems. *Arch Med Sci.* 2015;11(1):67-77. doi: 10.5114/aoms.2013.39202.
- Hart A, Pham T, Nowicki S, Whorton EB Jr, Martens MG, Anderson GD, et al. Gestational pyelonephritis--associated Escherichia coli isolates represent a nonrandom, closely related population. *Am J Obstet Gynecol.* 1996;174(3):983-9. doi: 10.1016/s0002-9378(96)70337-x.
- Bergeron MG. Treatment of pyelonephritis in adults. *Med Clin North Am.* 1995;79(3):619-49. doi: 10.1016/s0025-7125(16)30060-8.
- Barber AE, Norton JP, Wiles TJ, Mulvey MA. Strengths and Limitations of Model Systems for the Study of Urinary Tract Infections and Related Pathologies. *Microbiol Mol Biol Rev.* 2016;80(2):351-67. doi: 10.1128/MMBR.00067-15.
- Shepherd AK, Pottinger PS. Management of urinary tract infections in the era of increasing antimicrobial resistance. *Med Clin North Am.* 2013;97(4):737-57. xii. doi: 10.1016/j.mcna.2013.03.006.
- Meltzer AS. Medical Laboratory Manual for Tropical Countries. Vol. II. CMAJ. 1986;134(12):1378.
- Humphries R, Bobenchik AM, Hindler JA, Schuetz AN. Overview of Changes to the Clinical and Laboratory Standards Institute Performance Standards for Antimicrobial Susceptibility Testing, M100, 31st Edition. *J Clin Microbiol.* 2021;59(12):e0021321. doi: 10.1128/JCM.00213-21.
- KASS EH. Pyelonephritis and bacteriuria. A major problem in preventive medicine. *Ann Intern Med.* 1962;56:46-53. doi: 10.7326/0003-4819-56-1-46.
- Akinloye O, Ogbolu DO, Akinloye OM, Terry Alli OA. Asymptomatic bacteriuria of pregnancy in Ibadan, Nigeria: a re-assessment. *Br J Biomed Sci.* 2006;63(3):109-12. doi: 10.1080/09674845.2006.11732734.
- Onoh R, Umeora O, Egwuatu V, Ezeonu P, Onoh T. Antibiotic sensitivity pattern of uropathogens from pregnant women with urinary tract infection in Abakaliki, Nigeria. *Infect Drug Resist.* 2013;6:225-33. doi: 10.2147/IDR.S46002.
- Ajayi AB, Nwabuisi C, Aboyeji AP, Ajayi NS, Fowotade A, Fakeye OO. Asymptomatic bacteriuria in antenatal patients in Ilorin, Nigeria. *Oman Med J.* 2012;27(1):31-5. doi: 10.5001/omj.2012.06.
- Obiora CC, Dim CC, Ozumba BC. Assessment of Significant Bacteriuria, Bacterial Profile and Pyuria among Pregnant Women with Urinary Tract Symptoms in Enugu, South-Eastern Nigeria: A Cross-Sectional Study. *West Afr J Med.* 2021;38(5):428-433.
- Flores-Mireles AL, Walker JN, Caparon M, Hultgren SJ. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nat Rev Microbiol.* 2015;13(5):269-84. doi: 10.1038/nrmicro3432.
- Ronald A. The etiology of urinary tract infection: traditional and emerging pathogens. *Am J Med.* 2002;113 Suppl 1A:14S-19S. doi: 10.1016/s0002-9343(02)01055-0.
- Onifade AK, Omoya FO, Adegunloye DV. Incidence and control of urinary tract infections among pregnant women attending antenatal clinics in government hospitals in Ondo State, Nigeria. *J Food Agric Environ.* 2005;3(1):37-38.
- Okonofua EEA, Okonofua BN. Incidence and Pattern of Asymptomatic Bacteriuria of Pregnancy in Nigerian Women. *Nig Med Pract.* 1989;17:354-358
- Imade PE, Izeke PE, Eghafona NO, Enabulele OI, Ophori E. Asymptomatic bacteriuria among pregnant women. *N Am J Med Sci.* 2010;2(6):263-6. doi: 10.4297/najms.2010.2263.
- Demilie T, Beyene G, Melaku S, Tsegaye W. Urinary bacterial profile and antibiotic susceptibility pattern among pregnant women in north west ethiopia. *Ethiop J Health Sci.* 2012;22(2):121-8.
- Albrich WC, Monnet DL, Harbarth S. Antibiotic selection pressure and resistance in Streptococcus pneumoniae and Streptococcus pyogenes. *Emerg Infect Dis.* 2004;10(3):514-7. doi: 10.3201/eid1003.030252.