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ROUTINE URINARY CATHETERIZATION IN PATIENTS UNDERGOING CAESAREAN SECTION : BACTERIOLOGICAL CONSEQUENCES

Gynaecology

Dr Seema Sheokand	MBBS, pursuing MD, Obstetrics and Gynaecology, Government Medical College Hospital, Sector-32, Chandigarh.
Dr Reeti Mehra*	Associate professor, Department of Obstetrics and Gynaecology, Government Medical College Hospital, Sector-32, Chandigarh. *Corresponding Author
Dr Varsha Gupta	Professor, Department of Microbiology, Government Medical College Hospital, Sector-32, Chandigarh.
Dr Poonam Goel	Professor, Department of Obstetrics and Gynaecology, Government Medical College Hospital, Sector-32, Chandigarh.
Dr Arjun Mehra	student of Health Sciences, University of Waterloo

ABSTRACT

Objective – To study the prevalence of bacteriuria pre and post catheterization in caesarean section patients and to ascertain the organisms causing it and their antibiotic sensitivity. We also aimed to see if there was increased emergence of antibiotic resistance patterns.

Methods – A prospective study was carried out from Jan 2017 to June 2018 .The study was conducted in 510 patients undergoing caesarean section. Urine was collected twice per patient, pre-catheterization and 72hrs post catheterization. All urine samples were subjected to bacteriological analysis.

Results – Out of the 510 patients, 20 (3.92%) patients already had bacteriuria, while 114 out of 490 (23.3%) patients developed UTI after catheterization. E.coli was the most isolated bacteria both pre (45%) and post (35.1%) catheterization. ESBL producing organisms were found in 25.4%.

Conclusion – Routine Catheterization in caesarean patients significantly increases UTI and emergence of resistant strains.

KEYWORDS

Catheterization. UTI (urinary tract infection). Caesarean Section.

INTRODUCTION

Caesarean sections are the most common surgical procedure performed all over the world and have reached epidemic proportions. There rates have risen steadily varying from 3% to as high as 41.9% across the world.

The urinary tract undergoes profound physiologic and anatomic changes during pregnancy that facilitate the development of UTI. Catheterization with caesarean section along with all these physiological and anatomical changes further increases risk of UTI significantly to 5-30%. Urinary tract infection is also the most common nosocomial infection, accounting for approximately 35-45% of these cases. 70-80% cases are attributable to the use of indwelling urethral catheter and bacterial colonization has been reported mostly within 48hrs.[1]

Use of indwelling catheter in caesarean section is a routine practice at most places. Periodical surveillance study is needed at national and regional level to address the effectiveness of antibiotics being used and to update the antibiogram of the associated microorganisms. These are also major reservoir of antibiotic resistant pathogens .One such group of organisms now recognized globally as the major cause of nosocomial and antibiotic resistant infections are Extended Spectrum B Lactamases-producing pathogens. These confer resistance to third- and fourth-generation cephalosporins, in addition to the earlier generation cephalosporins.

Through this study we propose to evaluate the impact of catheterisation on UTI and the causative organisms with the antibiotic susceptibility. In addition the prevalence of Extended Spectrum Beta Lactamases producing organisms will also be studied to check for the resistant strains.

AIMS AND OBJECTIVES

1) To Study the prevalence of bacteriuria in patients undergoing caesarean section prior to and after catheterization.
2) To ascertain the pathogenic organisms causing it and to determine the susceptibility of isolated bacteria to antibiotics.
3) To study the prevalence of various antibiotic resistance enzymes in isolates.

MATERIALS AND METHODS

This was prospective study on 510 patients undergoing caesarean section whether elective or emergency admitted. We excluded patients who were already catheterized before caesarean for more than 24 hours, already having established urinary tract infection, nephritic disease or known renal calculus, immunocompromised patients or HIV positive patients, in obstructed labour, with history of unclean vaginal examinations, with prolonged rupture of membranes >24hrs, with febrile morbidity. A detailed history of the enrolled patients was taken and their demographic profile and relevant caesarean records, duration of catheterisation and antibiotic intake were noted.

Catheter sample of urine was collected from patients posted for caesarean section at the time of insertion of catheter before commencement of antibiotics and was subjected to culture sensitivity testing. At 72hrs postoperative, a midstream clean catch sample of urine, or catheter sample was collected if it was still indwelling and the postoperative sample was also subjected to culture sensitivity. The prevalence of various antibiotic resistance enzymes in isolates was also noted. There was proper collection and handling of urine samples.

The culture medias used were-MacConkey agar, CLED agar, Mueller Hinton agar, ESBL screening agar plate, ChromID ESBL screening agar plate and MIC-strip ESBL. The antibiotic discs used were with following concentrations:- Amoxycillin-clavulanic acid(20/10 µg), Cotrimoxazole (1.25/23.75µg), Trimethoprim(5µg), Sulphamethoxazole (250 µg), Nitrofurantoin(300µg), Ciprofloxacin (5µg), cefazolin(30 µg), Cefotaxime (30µg), Ceftazidime(10µg), Cefepime (30µg),Gentamicin (10µg), Mecillinam(10µg), Fosfomycin (200µg) and Imipenem(10µg). Quality control strainE.coli ATCC 25922 was used to validate the results of the antimicrobial discs.

Extended spectrum beta lactamase production was confirmed by phenotypic confirmatory disc diffusion test (PCDDT) and the double disc synergy test (DSST). ESBL production was detected by Clinical Laboratory Standard Institute (CLSI) method (using CAZ and CAZ-CA combination discs) and by double disc synergy (DDS) method using ceftazidime (CAZ), cefopodoxime, ceftriaxone and cefepime discs along with CAZ-CA combination disc (method already used by the authors and work published).[2]

RESULTS

Total of 510 patients were enrolled in the study, of which 20 patients tested positive for bacteriuria at the first sample prior to catheterization and 114 out of remaining 490 developed UTI after catheterization, post

caesarean accounting for total percentage of 3.92% and 23.26% respectively in the two groups.

Following factors were studied in the subjects-

Age - All patients enrolled were randomly assigned into three age groups of-

- less than 20 years, n = 18
- 20- 30 years, n = 402 and
- more than 30 years, n = 70

Majority of patients studied belonged to age group of 20 to 30 years (n=402) and UTI was seen in 100 out of 402 (24.9%) women between 20-30yrs of age, 22.2% (n=4/18) in <20 years and 14.3% (n=10/70) in >30yrs. So association between age and UTI was not found to be statistically significant (p value=0.153).

Parity - The subjects were divided into two groups' primigravida and multigravida. Out of total 490 patients, there were 201 primigravida and 289 multigravida. There was no statistical difference in prevalence of UTI in two groups, as p value=0.357.

Place of residence - This factor was subdivided into those residing in urban area and rural area. Out of 490, there were 306 from urban areas and 184 belonged to rural background. Relation between residence and UTI was not found to be statistically significant p value=0.535.

Type of LSCS - Out of total participants of 490, 440 (89.8%) underwent emergency caesarean section and 50 (10.2%) underwent elective caesarean. Both group had almost equal incidence of UTI, the p value found to be 0.823 that is statistically not significant.

Duration of Catheterization - Of all the 490 patients, 456 were with catheterization of less than 48hrs and 34 subjects had indwelling catheterization of more than 48hrs. Out of 456 with catheterization of <48hrs, 106 developed UTI (23.2%) and of 34 patients with prolonged catheterization 8 subjects developed UTI (23.5%), p value was 0.970 i.e not significant .

Anemia - A total of 490 patients allocated, 217 (44.3%) subjects had anemia and 273 (55.7%) had normal hemoglobin (Hb>11gm%). 217 anemic subjects divided into three categories according to the WHO classification of anemia- mild (no. of patients = 169), moderate (no. of patients = 43) and severe (no. of patients = 5).

63 out of 273 (23.1%) patients with normal hemoglobin developed UTI, 41 out of 169 (24.3%) with mild anemia developed UTI, 9 out of 43 (20.9%) with moderate anemia and 1 out of 5 (20.0%) subjects with severe anemia developed UTI. Association between severity of anaemia and UTI was not found to be statistically significant p value >0.967.

Type of prophylactic antibiotics used - Routinely to all patients undergoing caesarean section, triple i/v antibiotics are given at our institute for 24hrs in one of the two combinations-

- ampicillin + metronidazole + gentamycin
  or
- ceftriaxone + metronidazole + gentamycin

Those who received ampicillin prophylaxis post caesarean section, UTI developed in 75 out of 268 (28%) and 222 received ceftriaxone prophylaxis of which only 39 (17.6%) subjects developed UTI. Those who received ceftriaxone prophylaxis were found to have lesser development of UTI compared to those who received ampicillin combination. This was found to be statistically significant as p value=0.007.

Growth of organisms - Uropathogens prevalent in pre-catheterization and post-catheterization subjects–

Pre-catheterization- Out of total 20 patients with UTI, E.coli was found to be the most common microorganism in 9 out of 20 subjects (45%). Other microorganisms found to be prevalent- Klebsiella pneumoniae n=3 out of 20 (15%), Staphylococcus aureus n=3 out of 20 (15%), Acinetobacter n=3 out of 20 (15%) and other less common species detected are shown in graph below –

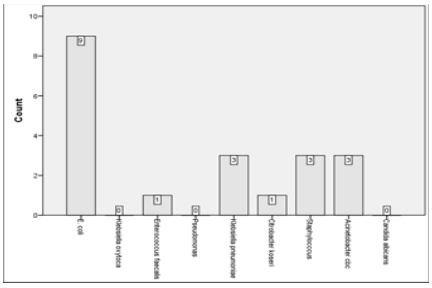

Figure 1- Growth of various organisms pre catheterization.

Post catheterization - Out of total 114 patients with UTI- E. coli was seen in n = 40 out of 114 (35.1%) and was the most common organism found. Other organisms found to be prevalent were- Acinetobacter caloaceticus-baumannii complex (cbc) 27.2%, Klebsiella pneumoniae 14.9%, Klebsiella oxytoca 11.4% and the less common varieties are shown in graph below-

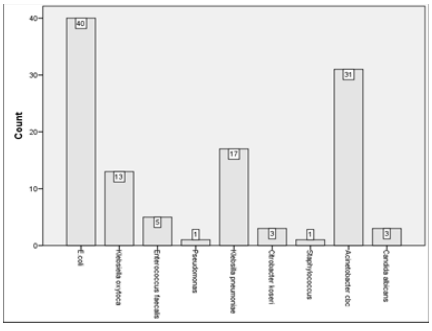

Figure 2- Growth of various organisms causing UTI post catheterization.

Antibiotic sensitivity - The organisms found to be prevalent pre-catheterization were more sensitive to following antibiotics- Nitrofurantoin (most sensitive- 55% of cases), Amikacin (45% of cases), Gentamycin (40% of cases), Ceftriaxone (25% of cases) and Ciprofloxacin (25% of cases)

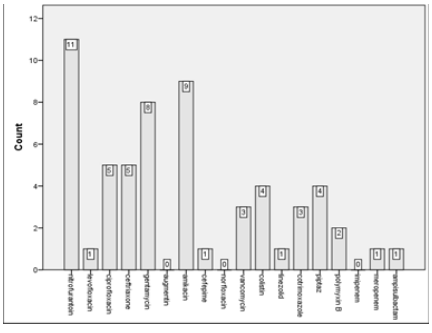

Figure 3- Overall antibiotic sensitivity of organisms prior to catheterization.

The overall antibiotic sensitivity of organisms detected commonly post-catheterization are shown in and were -nitrofurantoin (43.8%), amikacin (39.4%), piptaz (31.6%), polymyxin (28.9%), colistin (31.6%), ciprofloxacin (16.7%), gentamycin (4.4%) and ceftriaxone (2.6%).

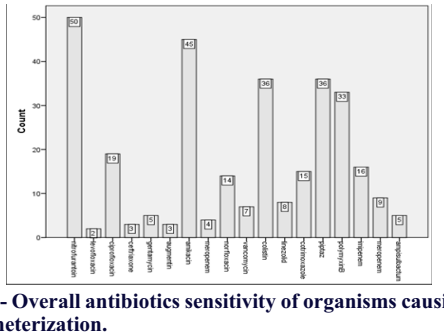

Figure 4- Overall antibiotics sensitivity of organisms causing UTI post catheterization.

Correlation of common organism isolated both pre and post catheterization versus effectiveness of antibiotics in our study shown in table below -

Table 1- Showing percentage sensitivity of antibiotics against common organism.

Organisms	Nitrofurantoin	Amikacin	Piptaz	Colistin	Polymyxin B	Ciprofloxacin	Gentamycin
E.coli n=49	81.3%	66.7%	47.9%	14.6%	8.3%	20.8%	6.3%
Acinetobacter cbc n=34	2.9%	5.9%	0%	52.9%	55.9%	2.9%	2.9%
Klebsiella pneumonia n=20	45%	50%	40%	35%	40%	20%	5%
Klebsiella oxytoca n=13	46.2%	69.2%	53.8%	15.4%	15.4%	30.8%	7.7%

ESBL producing organism - Among 114 patients with UTI post catheterization, 29 were ESBL producing making it to be 25.4% prevalent in our hospital set up and 1 out of 20 patients (5%) was found to be ESBL producing prior to catheterization. The antibiotic sensitivity of ESBL producing organisms- nitrofurantoin-72.4%, amikacin-72%, piptaz-55.2%, ciprofloxacin-31.4%, norfloxacin- 31% , imipenem-13.8% and ceftriaxone, gentamycin, augmentin and vancomycin showed 0% sensitivity at our institute.

DISCUSSION

UTI was seen in 23.26% of caesarean section patients post catheterization , out of those 25.4% were ESBL producing organisms, inspite of the fact that all catheterizations are done in our university teaching hospital by resident doctors pursuing their doctorate under aseptic technique , and all patients were given prophylactic antibiotics . Our study result was comparable to study results of Dougnon TV et al in 2015[3] who also showed 23.3% prevalence.

It was observed in earlier studies that increasing age or greater parity is associated with a higher frequency of significant bacteriuria[4]. In our study there was no correlation found between age and UTI as well as between parity and UTI accounting to almost equal incidence in all three age groups and also was not influenced by number of previous childbirth.

Also in our study prolonged catheterization of more than 48hrs did not show any significant rise in UTI as compared to group who were catheterized for less than 48 hours. This finding could be explained that maybe 48hrs difference is too short a period to make a significant impact on bacteriuria.

In a study done at Nepal Medical College they demonstrated more prevalence of urinary tract infection in patients undergoing emergency caesarean section along with other factors studied like length of hospital stay, febrile morbidity and wound infection. All these factors also had increasing association with emergency caesarean section cases.[5] In the present study type of caesarean section whether emergency and elective had no influence on UTI and was found to be statistically insignificant, possibly due to antibiotic cover given routinely.

Anteby et al studied 278 women undergoing caesarean section and were evaluated retrospectively to determine the value of prophylactic antibiotic treatment on post-operative urinary tract infection morbidity. 118 women who received no prophylactic treatment and 98 were treated prophylactically with ampicillin and colistin. Significant difference in the rate of infection after the introduction of prophylactic treatment was found. Morbidity rate was reduced to 6.1% in patients treated with ampicillin and colistin compared to 16.1% in the control group (p less than 0.001).[6] So routinely prophylactic antibiotics should be given and in our study antibiotics were given to all females who underwent caesarean section and ceftriaxone effectiveness was found to be more than ampicillin in preventing UTI.

In our study also the E.coli was found to be the most common organism both pre-catheterization and post-catheterization, which is in concordance with other studies.[7]

In the present study nitrofuratoin was found to be most effective and sensitive antibiotic in treatment of UTI comparable to other study[8]. Also in our study, post catheterization amikacin emerged as a better antibiotic compared to gentamycin, 39.4% sensitivity of amikacin vs. only 4.4% of gentamycin. It was also more effective against ESBL producing organisms showing 72% sensitivity.

Thus we conclude that the antibiotic sensitivity patterns should be studied from time to time for determining effective therapy as inappropriate therapy has been responsible for emergence of resistant strains, recurrences of bacteriuria with development of acute pyelonephritis later. Also catheter use should only be done for appropriate indication as it is responsible for significantly increasing the incidence of UTI and for causing infection with ESBL producing resistant strains.

CONCLUSIONS

Catheterization increases the incidence of UTI significantly and post catheterization prevalence of UTI was found to be 23.3% and 25.4% were tested positive for ESBL producing organisms.

Ceftriaxone is a more effective prophylactic antibiotic as compared to ampicillin in preventing UTI when given routinely in caesarean patients. E.coli was most common pathogen isolated in both pre and post catheterization patients and the prevalence of ESBL was found to be 25.4% in post catheterized. The single most effective antibiotic for UTI was nitrofurantoin for both pre-catheterization and post catheterization UTI as well as ESBL producing organism. Also amikacin showed clear superiority to gentamicin, in post caesarean bacteriuria and for ESBL producing organisms.

Patients should be catheterized only if necessary and its use should be reduced as much as possible to reduce risk of UTI and postpartum morbidity.

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