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Research Article

Role of Single Prepartum Dose of Amoxicillin in Preventing Catheter Associated Early Postpartum Bacteriuria

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Abstract

Purpose: This study aims to investigate how antibiotic prophylaxis can reduce the prevalence of early postpartum bacteriuria linked to catheter use.

Methods: 500 full-term parturient cases were randomly assigned to two equal groups (250 in each group) for a prospective study. Group (A) received a single intravenous injection of 2000 mg amoxicillin one hour before the delivery, whereas group (B) received nothing as a comparison. The dipstick nitrite test was repeated 24 hours after delivery to check for bacteriuria between January 2025 and July 2025. Urine cultures were performed on all positive patients.

Results: Age, residence, occupation, hypertension, and history of schistosomiasis infestation did not differ statistically significantly between the two groups. The findings indicated that although 23.2% of group B's parturients experienced postpartum bacteriuria, 2.8% of group A's parturient did. The most prevalent infectious agent (67.69%) was *E. coli*.

Conclusion: A single intravenous injection of 2000 mg amoxicillin was found to be an effective antibiotic prophylactic in reducing the prevalence of postpartum bacteriuria linked to catheter use.

Keywords: Catheter, Postpartum bacteriuria, Antibiotic prophylaxis, Urine culture

Introduction

Approximately 40% of hospital-acquired (nosocomial) infections are urinary tract infections, and urinary catheter use is linked to 80% of hospital-acquired urinary tract infections [1-3]. When an indwelling catheter is present, bacteriuria will inevitably develop; the incidence is about 10% each day of catheterization [4,5]. Once the bacteria have first attached and become permanently adhered to the surface of either uroepithelial cells or catheters, the infection is established when host cells invade the bladder and eventually form biofilms [6-8].

There is a lack of thorough research on the natural history of bacteriuria following catheter removal. Not enough research has been done on the possible advantages of antimicrobial therapy in relation to catheter removal [9]. The length of catheterization, female gender, lack of systemic antimicrobial agents, and catheter-care violations are the most significant risk factors linked to an increased risk of developing catheter-associated bacteriuria. The bacteria typically enter the body through the periurethral or intraluminal routes [10,11]. It has been suggested that the Foley catheter be fixed during the cesarean section and left in place till the following morning [12-14]. In this case, the bladder is emptied at the start of the procedure, which is repeated throughout the procedure. In addition, the bladder does not present any issues for the surgeon, and the Foley catheter is fixed to prevent bladder trauma [15,16]. During labor, the bladder should be emptied

every three to four hours, and catheterization should be done if required [17,18]. This study aims to investigate how antibiotic prophylaxis can reduce the prevalence of early postpartum bacteriuria linked to catheter use.

Material and Methods

Study Design and Setting

A total of 500 full-term parturient were involved in our prospective comparative and blind study; 200 of them underwent vaginal delivery, and 300 underwent cesarean delivery. To rule out bacteriuria, the cases underwent nitrite dipstick testing one hour prior to delivery; we only targeted the negative results. Six instances were removed from the research because they tested positive on the dipstick. 250 cases in group (A), which was randomly assigned to two groups, received antibiotic prophylaxis in the form of a single intravenous injection of 2000 mg of amoxicillin one hour prior to labor. 250 members of Group (B) received nothing as a control, while 16F In caesarean deliveries, the Foley catheter was fixed for 6–8 hours, however in vaginal deliveries, the 16 F Nelaton plastic catheter was introduced for the sole purpose of emptying the bladder while taking sterile procedure into consideration during catheter insertion. The nitrite dipstick test was repeated after around twenty-four hours, and those that tested positive were sent for a urine culture.

Patients' Selection Criteria

Female full-term parturients over 19 who are undergoing vaginal or cesarean delivery were included in this study. We did not include, however, cases with bacteriuria as shown by the nitrite test or those that were already receiving antibiotic treatment for any reason.

All Cases were Scheduled for the Following:

Urologic complaints, history of prior bacteriuria attacks during pregnancy, drug history, drug allergy, specifically to penicillin, which will be used in our study as a prophylactic antibiotic, drug intake, specifically to antibiotics for any reason, history of chronic diseases, particularly diabetes mellitus, hypertension, schistosomiasis, and tuberculosis, and obstetric history, as represented by gravidity, parity, and prior abortion attacks, are all areas of special attention when taking a patient's medical history. Her hospital record has complete general and local examinations. We then instructed the cases to go for urination an hour prior to either vaginal delivery (based on clinical obstetric signs such as the degree of cervical dilatation and other signs based on our obstetric fellows' experience) or caesarean delivery. After passing the first few milliliters of urine, a midstream sample was brought to us in a clean plastic bag after the vulval area was cleaned unidirectionally from anterior to posterior using saline emersed goaze. This sample was put through the Griess test, which uses a dipstick nitrite to identify bacteria in urine.

Technique of Nitrite Test

To stop the reagents from dissolving into the urine, the dipstick's reagent regions were fully submerged in a brand-new, uncentrifuged urine sample before being removed right away. To eliminate extra pee, the dipstick's edge is pulled along the container's rim as it is taken out of the urine specimen container. When reading, the dipstick should be held horizontally until the right moment, at which point it should be compared to the color chart. If there is too much urine on the dipstick or if the dipstick is held vertically, chemicals from nearby reagent pads may mix and cause an incorrect diagnosis. Any color shift in the nitrite test-specific area will be interpreted as a positive result. If the test came back negative, this was our goal; if it came back positive, the case was removed from the research.

Every instance that tested negative on the dispatch was split equally into two groups. Group A received an intravenous injection of 2000 mg amoxicillin as antibiotic prophylaxis right after the test, whereas Group B received nothing as a control. Catheters were used in all cases during labor, for 6–8 hours during caesarian deliveries, and only to empty the bladder during vaginal deliveries, particularly during the placental expulsion stage. In order to prevent iatrogenic bacterial introduction into the bladder, we have taken care to use the best catheterization method when performing these procedures.

Technique of Catheterization in Females

The urethral meatus was identified, the collection bag was inserted into the catheter, the vulval area was dripped as in surgical procedures, the catheter tip was lubricated with a lubricant gel, the labia were spread aside, the sterile gloves were used, and the 16F Foley catheter was carefully introduced to the bladder. In most cases, we only used the Nelaton plastic catheter for a few minutes to empty the bladder. The previously mentioned approach was usually used for caesarian deliveries. It was also used for vaginal deliveries. We performed the dipstick test again after around twenty-four hours. If the test came back negative, this was recorded, and if it came back positive, a urine culture was performed to record the type of bacteria and the sensitivity results. In cases where the results were positive, the obstetric unit received the results for follow-up. If any symptoms or indicators of a frank UTI emerged, the patient received treatment based on the culture results, and diabetic women received treatment even if they showed no symptoms; this was recommended to be done during the postpartum visit.

Sample Size Estimation

Following signed informed consent from each parturient enrolled in the study, a sample cluster of our patients was estimated based on the total number of full-term parturients who were treated at Damanhur National Medical Institute, Damanhur, Al-Behera governorate, Egypt, during the study period from January 2025 to July 2025.

Ethics Approval and Consent to Participate

Following a thorough explanation of the study's objectives, the subject signed an informed consent form. The permission form was prepared in accordance with the Helsinki Declaration and the Egyptian Ministry of Health's Quality and Improvement System specifications. The study proposal was approved by the Damanhur National Medical Institute's local ethical scientific council in Damanhur, Al-Behera governorate, Egypt (IRB: HD000245-10/9/2025).

Statistical Analysis Methods

Statistical analysis was performed using IBM SPSS Statistics 25 (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY; IBM Corp.). Clinical data are presented using descriptive statistics. Depending on how the continuous variables were distributed, either the Wilcoxon test or paired t-tests were used. A Q-Q plot, a Histogram chart with a normal distribution curve, and the Shapiro-Wilk test were used to evaluate the normal distribution. Mean, median, and standard deviation (SD) were among the descriptive statistics; the Chi-square test (X2), Fisher exact test (FE), independent t test (t), Mann-Whitney U test (U), and odds ratio (OR) were among the analytical statistics. Statistical significance was defined as a P value of less than 0.05.

Results

Ten of the 510 full-term parturient women who were enrolled in the study were eliminated (6 of them did not match the inclusion requirements, and 4 of them chose not to participate), according to a flowchart. Thus, out of the 500 women who took part in the study and had their data statistically examined, 200 gave birth vaginally and 300 via caesarean section. (Figure 1) The women in the study were between the ages of 18 and 38; their mean ages were 31.54±3.11 years for NVD parturient and 36.75±1.80 years for CD parturient; there was no discernible difference in their ages (p=0.706). (Table 1). After receiving antibiotics, seven out of 250 individuals experienced bacteriuria (2.8%), but 58 out of 250 cases without antibiotics experienced postpartum bacteriuria (23.2%). (Table 2).

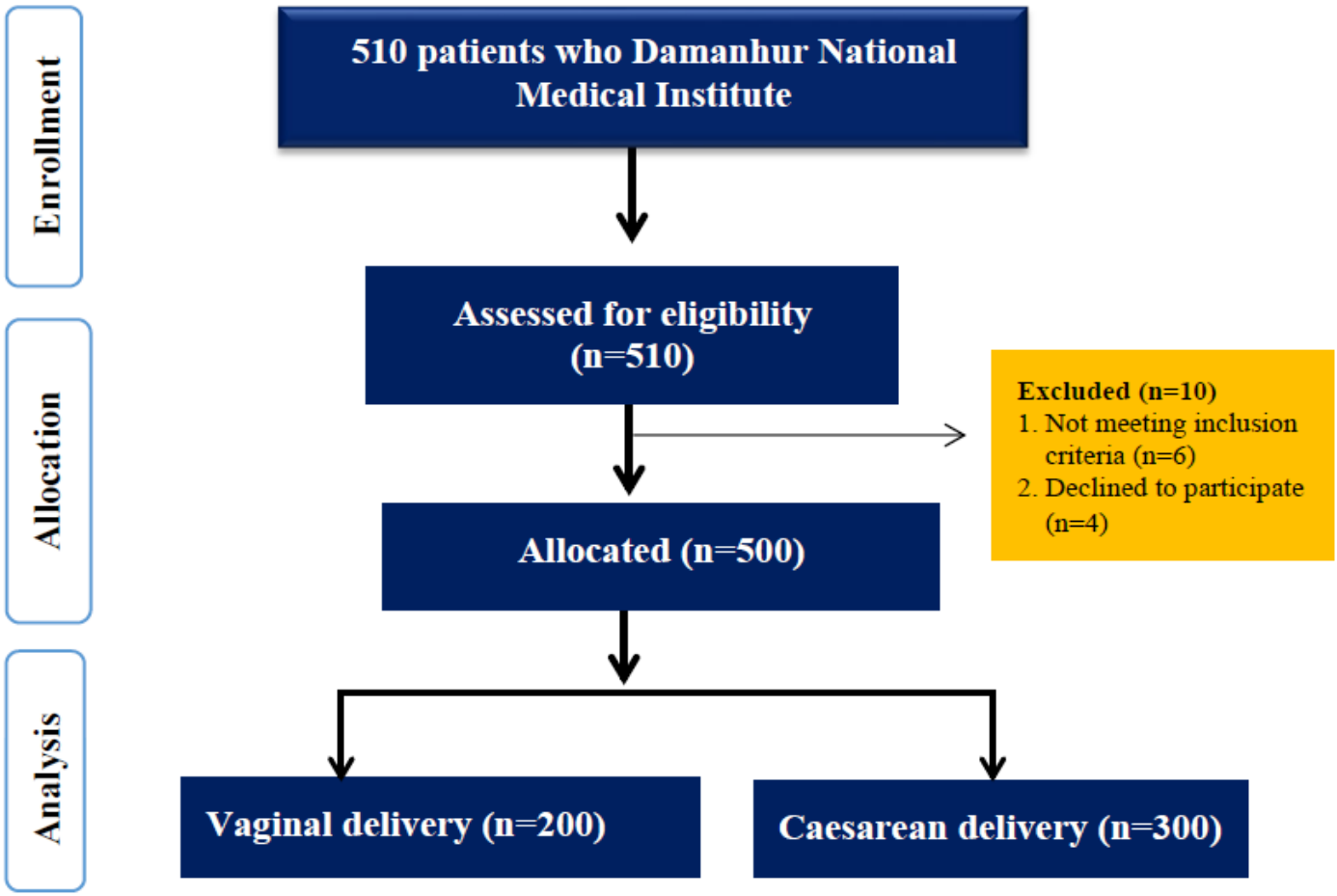

Figure1:

	NVD (N=200)	CD (N=300)	t	*P value*
Age/year Mean ± SD Range	18-38 31.54 ± 3.11	18-38 36.75 ± 1.80	0.492	0.706

Table 1: Comparison between different studied groups regarding their age.

Cases	NVD (N=200)				CD (N=300)			
	Received antibiotic N=100		Not received antibiotic N=100		Received antibiotic N=150		Not received antibiotic N=150	
	No.	%	No.	%	No.	%	No.	%
Positive	0	0.0	25	25.0	7	4.67	33	22.2
Negative	100	100.0	75	75.0	43	95.33	117	77.8
Total	**100**		**100**		**150**		**150**	
X^2 p	12.65 0.013*							

Table 2: Comparison between different studied groups regarding positive bacterial culture.

Furthermore, the most prevalent infecting organism in our study was E. coli, which was detected in 44 patients, 17 of whom had NVD and 27 of whom had CD. Pseudomonas was detected in 11 patients (8 NVD, 3 CD), and Proteus was detected in 10 patients, all of whom had CD. There was a highly significant difference between NVD and CD patients (p=0.001) (Table 3).

Infectious agent	NVD (N=200)				CD (N=300)			
	Received antibiotic N=100		Not received antibiotic N=100		Received antibiotic N=150		Not received antibiotic N=150	
	No.	%	No.	%	No.	%	No.	%
E. coli	0	0.0	17	68.0	4	57.1	23	69.7
Pseudomonas	0	0.0	8	32.0	0	0.0	3	9.1
Proteus	0	0.0	0	0.0	3	42.9	7	21.2
Total	**0**		**25**		**7**		**33**	
X^2 P value	9.89 0.0125*							

Normal Vaginal delivery (NVD), Caesarean delivery (CD), *Significant

Table 3: Distribution of positive cases regarding bacterial species.

Twenty diabetic patients (60.6%) had bacteriuria, which was shown to be more common in diabetic populations than in nondiabetic individuals (n=45, 9.64%). The difference was significant, with p=0.001. (Table 4). Primigravidae had a higher prevalence of postpartum bacteriuria than multipara (45 out of 65 bacteriuric cases were primigravidae (69.23%) compared to 20 were multipara (30.77%)), with a significant difference (p=0.001). (Table 5). Females who experienced bacteriuria during pregnancy (n.45, 69.23%) were more likely to have postpartum bacteriuria than those who had no prior infection (n=20, 30,67%). (Table 6).

Cases	Diabetic patients		Nondiabetic patients	
	No.	%	No.	%
Positive cases	20	60.6	45	9.64
Negative cases	13	39.4	422	90.36

Total	33	467
X^2 P value	12.98 0.001*	

Table 4: Relation between positive infection and diabetic patients.

Cases	Primigravidae		Multipara	
	No.	%	No.	%
Positive cases	45	24.32	20	6.3
Negative cases	140	75.68	295	93.7
Total	**185**		**315**	
X^2 P value	7.93 0.004*			

Table 5: Relation between positive infection and gravidity.

Cases	Previous infection			
	Positive		Negative	
	No.	%	No.	%
Positive cases	20	29.9	45	10.39
Negative cases	47	70.1	393	89.61
Total	**67**		**433**	
X^2 P value	7.08 0.007*			

Table 6: Relation between bacteriuria distribution and previous infection.

Discussion

The most significant risk factor for the development of catheter-associated bacteriuria is elevated serum creatinine during the catheterization period. Other risk factors include not receiving systemic antimicrobial therapy, female sex, positive urethral meatal culture results, microbial colonization of the drainage bag, catheter insertion outside of the operating room, catheter care violations, rapidly fatal underling illness, older age, and diabetes mellitus [19]. Parturients with sterile urine cultures may be at risk for postpartum bacteriuria due to iatrogenic interventions, and labor is a bacteriuric event [20]. According to a study done at the Damanhur National Medical Institute in Damanhur, Al-Behera governorate, Egypt, vaginal delivery may increase the risk of postpartum bacteriuria, particularly if the bladder has already been catheterized. Nine out of 112 women (8%) in this study experienced postpartum bacteriuria for the first time following labor; of these, four experienced early membrane rupture, two experienced extended labor, and two experienced cervical and vaginal tears [21].

58 out of 250 individuals in our study that did not receive antibiotics developed postpartum bacteriuria (23.2%), whereas seven out of 250 cases that received antibiotics developed bacteriuria (2.8%). All of the individuals in our study had catheterization during labor, which is frequently the reason why postpartum bacteriuria is more common than in other studies. Another study at the University of Oslo's Akar Hospital's Department of Gynecology and Obstetrics (1990) revealed that 8.1% of women had postpartum bacteriuria, as demonstrated by midstream urine culture. This subsequent investigation discovered that a higher frequency of postpartum bacteriuria was linked to a history of urinary tract infections, bacteriuria during pregnancy, and surgical delivery. In this trial, amoxicillin worked well to cure this bacteriuria [22]. We found that the overall incidence of postpartum bacteriuria was 65 cases out of 500 parturients (approximately 25.83%). We also confirmed that pregnancy-related bacteriuria is a risk factor for its recurrence in the postpartum period because 45 of the 65 cases (approximately 69.23%) were pregnant-related bacteriuria and received proper treatment. In our study, 40 out of 300 caesarian deliveries (13.33%) had bacteriuria, whereas 25 out of 200 vaginal deliveries (12.5%) developed bacteriuria, indicating that surgical operation (cesarean) was a risk factor for postpartum bacteriuria. The overall frequency of postpartum bacteriuria in term vaginal labor was

34.5%, according to a 1998 study done in Trinidad, and primigravidae were more likely than multiparas to have bacteriuria. Primigravidae were more likely than multipara to have postpartum bacteriuria in our study; 45 out of 65 bacteriuric cases were primigravidae (69.23%), while 20 were multipara (30.77%). The overall incidence of postpartum bacteriuria in term vaginal delivery in the (no prophylaxis) group was 25 out of 100 cases (25%) in this group. The incidence of postpartum bacteriuria in catheterized parturient was 6.1% in a Texas study, and it was higher in the primigravida group [23]. Of the 33 diabetic individuals in our study, 20 (60.6%) developed bacteriuria. Twenty (30.76%) of the 65 bacteriuric patients had diabetes. According to a study done in the USA, sulfamethoxypyridazine was successful in preventing catheter-associated postpartum bacteriuria (2 cases out of 217 cases contracted bacteriuria versus 17 out of 198 in the contra test group), suggesting that prophylactic antibiotic drug therapy may be appropriate for people who need relatively short-term catheterization and are at high risk for complications from urinary tract infections [24]. Another study conducted in the Netherlands in 2005 demonstrated that prophylactic antibiotics, when microbiologically indicated, reduced the incidence of post-operative bacteriuria, pyuria, and gram-negative isolates in females who had abdominal surgery and were catheterized for 24 hours after the procedure [25].

The incidence of postpartum bacteriuria in term vaginal deliveries was found to be reduced by a single two-hour intravenous injection of amoxicillin one hour before delivery (out of 100 cases, none became bacteriuric in the prophylaxis group, 0%), compared to 25 out of 100 cases in the control group, 25%). In the prophylactic group, 7 out of 250 cesarean deliveries (4.67%) developed bacteriuria, while in the control group, 33 out of 250 cases (22.2%) did so. Compared to 58 instances out of 250 cases in the control group (23.2%), 7 cases out of 250 patients that had received a prophylactic antibiotic developed bacteriuria (2.8%).

Conclusion

We have concluded that the incidence of early postpartum bacteriuria was effectively reduced by antibiotic prophylaxis in the form of a single 2000 mg intravenous injection of amoxicillin, a low-cost, safe antibiotic during pregnancy and breastfeeding. Additionally, we have validated the findings of research indicating a higher prevalence of postpartum bacteriuria in women with diabetes, primigravida, cesarean birth, and those who experienced bacteriuria during pregnancy.

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