Original Article

Study of cases of puerperal sepsis, its socio-demographic factors, bacterial isolates, and antibiotic sensitivity pattern

Preeti Singh[1], Sarita Tirkey[1], Kiran Trivedi[1], Rani Hansda[1], Jay Prakash[2]

Departments of [1]Obstetrics and Gynecology and [2]Critical Care Medicine, Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand, India

Abstract

Objective: Due to the lack of resources for culture and antibiotic susceptibility testing in most underdeveloped countries, puerperal sepsis is treated empirically with a wide range of antibiotics. Empirical treatment, on the other hand, does not ensure treatment effectiveness and may even contribute to antibiotic resistance. So, we studied cases of puerperal sepsis, its socio-demographic factors, bacterial isolates, and antibiotic sensitivity in a tertiary health center. **Material and Methods:** This was a cross-sectional study conducted at the obstetrics and gynecology department of a tertiary health center in India from April 2019 to September 2020. During this time, all patients with sepsis who met the criteria for inclusion were included. After granting an informed written consent, the subjects were registered on a pre-designed proforma. **Results:** There were 2,049 obstetrical admissions throughout this period, with 106 (5.1%) of these having puerperal sepsis. The majority of these women (58.7%) were between the ages of 21 and 30, were multiparous (96.5%), and unbooked. Fever 104 (98.1%) was the most prevalent clinical characteristic, whereas wound gape was the most common consequence (47.1%). *Klebsiella aerogens* was the most common organism found in various cultures. Many organisms were shown to be multidrug-resistant and sensitive to gentamycin and amikacin. **Conclusion:** *Klebsiella aerogens* wasthe most common cause of puerperal sepsis in this investigation. Because the causal agents of puerperal sepsis and their antibiotic sensitivity patterns change over time, positive blood culture and antibiotic susceptibility of the isolates are the best guides for selecting the optimum antimicrobial therapy for treating sepsis.

Keywords: Antibiotic susceptibility, bacterial resistance, multidrug-resistant, puerperal sepsis

Introduction

Childbirth is a joyful experience for many, but it can also be a challenging time filled with new difficulties that emerge during the vital hours of childbirth and continue to emerge in the days afterward. Childbirth-related illnesses and deaths account for a considerable share of the world's poor health and death. Puerperal sepsis is one of the issues.[1]

Address for correspondence: Dr. Kiran Trivedi, Rama Nursing Home Main Road, Ranchi, Jharkhand, India.
E-mail: trivedikiran2011@gmail.com

Received: 15-12-2021 **Revised:** 29-01-2022
Accepted: 31-01-2022 **Published:** 14-10-2022

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/jfmpc.jfmpc_2419_21

The infection of the genital tract that occurs during labor or within 42 days after delivery is known as puerperal sepsis. It is constituted by a conglomeration of symptoms like fever (oral temperature 38°C/100.4 ° F), pelvic pain, abnormal vaginal discharge, foul odor of discharge, delay in the reduction of the size of the uterus (sub-involution), pus in the pelvis, salpingitis, parametritis, and pelvic thrombophlebitis.[2] Puerperal sepsis is graded as Grade I: confined to the uterus (endometritis), Grade II: confined to the pelvis (cellulitis, abscess, or thrombophlebitis), and Grade III: peritonitis or endotoxic shock.

The world health organization reported about 3,58,000 maternal deaths occurring during labor and childbirth, and 15% were

How to cite this article: Singh P, Tirkey S, Trivedi K, Hansda R, Prakash J. Study of cases of puerperal sepsis, its socio-demographic factors, bacterial isolates, and antibiotic sensitivity pattern. J Family Med Prim Care 2022;11:5155-60.

related to puerperal sepsis. In both poor and developed countries, puerperal sepsis is one of the disorders that can be avoided. It mainly occurs after discharge in the first 24 h of parturition.[3]

Antibiotics were discovered at a pivotal point in human history, revolutionizing medicine and saving many lives. Unfortunately, these "magic bullets" have been accompanied by microorganisms that have developed resistance to them. Antimicrobial resistance (AMR) is a severe global danger to human, animal, and environmental health that is gaining traction. The growth, spread, and persistence of multidrug-resistant (MDR) bacteria, also known as "superbugs," are to blame. As a result, early detection of the infection's source, adequate culture and sensitivity tests, and cautious antibiotic usage should all be prioritized. We need to pay greater attention to these infections as a whole, approach our patients with more precise, full information, and try to eliminate the societal variables that predispose patients to sepsis and its complications.[4-7]

Thus, there is a requirement for an in-depth analysis of such causes concerning the cases, etiopathogenesis, varied clinical presentations, and their principles of management to prevent the progression of infection to puerperal sepsis, its complications, and bacterial resistance. This study aims to determine the causes of puerperal sepsis, its risk factors, predominant organisms causing sepsis, and antibiotic sensitivity pattern in a tertiary care health facility in India.

Materials and Methods

The current study is a cross-sectional study that was conducted in an Indian tertiary health center's department of obstetrics and gynecology between April 2019 and September 2020 after the International Ethical Review Committee approved the study.

The study included patients with two or more symptoms and signs of puerperal sepsis, such as fever, pelvic pain, foul odor of discharge, or uterine sub-involution (on clinical examination or laboratory investigations) within 42 days of vaginal delivery or cesarean section, as well as patients who gave birth after the 28th week of pregnancy. Patients who had a fever for reasons other than puerperal sepsis, such as medical causes, or who presented after 42 days of puerperium were excluded from the study.

Patients were chosen via consecutive sampling based on inclusion and exclusion criteria for the study. A systematic data collection tool was utilized to collect information on the patient's socio-demographic profile, clinical characteristics, obstetric history, physical examination, and laboratory findings. The microorganisms isolated, their antibiotic susceptibility, associated risk factors in labor events, clinical characteristics, complications, and mortality were all used to evaluate the results.

Specimen collection and transportation

a. High vaginal swabs were taken from the posterior fornix before pelvic examination after separating the labia with the left hand.
b. Swabs for bacterial culture were ten from the pus of cesarean incision, infected episiotomy wound; pus was aspirated with a syringe in cases of pyoperitoneum where laparotomy was carried out.
c. Blood (10 mL) was collected aseptically for blood culture from a peripheral vein and transferred equally in two Becton Dickinson, Towson, Md (BACTEC) bottles with aerobic and anaerobic media and was sent to the microbiology department.
d. Midstream urine samples were collected and sent for culture.

Antimicrobial susceptibility testing

The susceptibility of different commonly used antibiotics was tested using the Kirby Bauer disc diffusion method. Mac Conkey's agar and blood agar were inoculated with bacterial culture swabs and urine for overnight incubation. Robertson Cooked Meat (RCM) broth was employed as the anaerobic culture medium.

Results

During the study period from April 2019 to September 2020, 2049 individuals were hospitalized to obstetrics emergency, of whom 106 patients with puerperal sepsis were included in the study based on inclusion criteria.

The most prevalent age of onset of puerperal sepsis was 21–30 years, accounting for 54.7 percent of cases. The majority of the women were married with at least two children, uneducated, and resided in rural regions, and they gave birth via vaginal delivery as indicated in Table 1.

The majority of the patients delivered vaginally, with the most common labor problem being prolonged labor with absent membranes and delivery by unskilled people. In 65 cases, the hospital stay was 7–10 days, and the majority of them had grade I sepsis (approximately 81 cases) as shown in Table 2.

In the vaginal swab, most organisms were sensitive to gentamycin, piperacillin + tazobactam, and resistant to ampicillin, as shown in Table 3.

Single organisms were identified in 54 vaginal swabs, 20 pus culture samples, 37 urine samples, and 18 blood samples, whereas 39 vaginal swabs, 20 pus culture samples, 55 urine samples, and 21 blood samples were sterile. *Klebsiella aerogens* was the most prevalent organism isolated in this investigation, followed by *Escherichia coli*. *Staphylococcus albus* was the least common organism. The majority of the organisms in blood culture were susceptible to gentamycin and ampicillin but resistant to metronidazole. The organisms in pus culture were responsive to gentamycin but resistant to amikacin. Whereas bacteria in urine cultures were responsive to ciprofloxacin but resistant to amikacin.

Figure 1 depicts the risk factors for puerperal sepsis, which include caesarean wound infection and gape in 47.1%, puerperal endometritis in 24.5%, episiotomy or vaginal tear infection in 9.4%, retained products of conception in 8.4%, retained placenta

Table 1: Socio-demographic data

	Total no. of patients (*n*=106)	*P*
Age		
<21 years	27 (25.4%)	0.774
21-30 years	58 (54.7%)	
>30 years	21 (19.8%)	
Marital status		
Married	102 (96.2%)	0.696
Unmarried	4 (3.7%)	
Parity		
Para 1	11 (10.3%)	0.679
Para 2	49 (46.2%)	
> Para 2	46 (43.3%)	
Educational status		
Illiterate	73 (68.8%)	0.705
Primary school	21 (19.8%)	
High school	8 (7.5%)	
College	4 (3.7%)	
Residence		
Rural	78 (73.5%)	0.809
Urban	28 (26.4%)	
Place of delivery		
Study hospital	18 (16.9%)	0.946
Local clinic	38 (35.8%)	
Home	50 (47.1%)	

Table 2: Labour events & grade of sepsis

	Total no. of patients	*P*
Mode of delivery		
Vaginal delivery	56 (52.8%)	0.556
Cesarean	50 (47.1%)	
Duration of labour		
<24 HRS	11 (10.3%)	0.696
>24 HRS	40 (37.7%)	
Duration not known	55 (51.8%)	
Rupture of membrane		
<12 HRS	14 (13.2%)	0.174
>24 HRS	8 (7.5%)	
Duration not known	84 (79.2%)	
Delivery conducted by		
Family member/DAI	41 (38.6%)	0.524
Lady health worker/nurse	12 (11.3%)	
Doctor	53 (50%)	
Hospital stay		
<7 DAYS	12 (11.3%)	0.13
7-10 DAYS	65 (61.3%)	
>10 DAYS	29 (27.3%)	
Grade of sepsis		
Grade 1	81 (76.4%)	<0.01
Grade 2	17 (16.03%)	
Grade 3	8 (7.5%)	

in 5.6%, burst abdomen in 4.7%, peritoneum in 2.8%, and pelvic abscess in 0.9%.

Figure 2 shows the most common symptom was fever in 98.1 followed by pain in the abdomen and pelvic pain in 86.7%, wound gap in 47.1%, foul-smelling discharge in 23.5%, subinvolution in 19.8%, bleeding per vaginal (p/v) in 18.8%, signs of dehydration in 13.2%, abdominal distension with absent bowel sounds in 8.4%, septic shock in 3.7%, renal failure in 1.8%, jaundice and disseminated intravascular coagulation (DIC) in 1.8%, and pelvic abscess in 0.9%.

Life-threatening complications seen in the patients were two cases with renal failure, four with septic shock and cardiac arrest, two with DIC, and two cases needing dialysis as depicted in Figure 3.

Surgical intervention was needed in most patients (68.8%). Secondary suturing was done in 50 patients (47.1%). Laparotomy was done in four patients, where hysterectomy and abdominal lavage were done. A total of 16 (15.09%) patients were shifted to the intensive care unit (ICU), where ventilator support was required in 10. Inotropes were given to 13 cases.

There was an uneventful recovery in 75 patients (70.7%), 22 (20.7%) near-miss patients recovered but prolonged hospital stay was required, 5 women (4.7%) died despite all efforts, and 4 patients were lost to follow up.

Discussion

Puerperal sepsis was highly reported in women between 21 and 30 years age group in this study that was around 54.7%. We believe that women of this age were most likely primigravids with pelvises who sought medical help when their labor got obstructed and infected. In a study on puerperal sepsis, Shamshad *et al.*[8] (2010) found that roughly 67 percent of the participants were between the ages of 15 and 25. Rural dwellers were more likely to develop puerperal sepsis in our study that were around 73.5%. Similarly, Demisse *et al.*[9] (2019) showed sepsis was more common in rural women around 70%.

A significant association was observed between para 2 patients and puerperal sepsis in our study that was around 46.2% which was similar to Ngonzi *et al.*[10] (2016) study who reported that puerperal sepsis was most common in multipara.

The current study found that 52.8% of the mothers who delivered vaginally were more sensitive to sepsis than those who had a cesarean section, which is consistent with Shamshad *et al*'s[8] (2010) study, which found that 76 percent of cases with puerperal sepsis delivered vaginally. It iss worth noting that puerperal sepsis was more common in patients who gave birth at home (47.1%), likely Shamshad *et al.*[8] (2010) found that puerperal sepsis was more common in patients who had home delivery (74%). The risk of sepsis is increased when medical professionals are not trained, and asepsis is ignored. Furthermore, because the majority of the people analyzed were home births, the source of infection could be exogenous, such as pathogens from adjacent skin flora, contact with contaminated nonsterilized devices, or frequent vaginal examination with unwashed hands.

Wound infection and gape (47.1%) were shown to be the most common associated risk factors in patients, which is consistent

Table 3: Sensitivity pattern of isolated organisms in vaginal swab

Isolate antibiotics	Klebsiela *aerogens* Total no-18	*Staphylococcus aureus* Total no-8	*Pseudomonas* Total no-6	*Proteus* Total no-3	*Escherichia coli* Total no-9	*Streptococcus pyogens* Total no-4	*Staphylococcus albus* Total no-1	*Bacteriodes* Total no-7	Beta–haemolytic streptococcus Total no-3	Clostridium Total no-3
AMP										
S	7	6	3	1	4	1	1	6	1	1
R	1	-	-	2	1	1	1	-	-	-
GEN.										
S	14	3	4	1	5	1	1	3	3	2
R	-	1	2	-	1	-	-	-	-	-
AMO., CLA										
S	5	5	2	1	4	1	1	2	1	1
R	-	1	-	-	1	-	2	1	-	-
CIPRO										
S	9	2	5	2	7	4	-	3	2	1
R	1	-	-	-	-	-	-	2	-	1
CEF.										
S	6	5	2	1	4	-	1	2	1	1
R	3	-	-	1	-	-	-	-	-	-
PIP, TAZO.										
S	8	1	2	1	6	1	1	5	3	1
R	-	1	1	-	-	1	-	2	-	-
AMI.										
S	8	2	2	1	3	3	1	5	1	2
R	1	2	-	1	-	-	-	-	2	-
MET.										
S	1	1	1	-	5	3	-	5	-	1
R	2	-	-	-	-	-	1	1	-	-
ERY.										
S	2	1	0	1	-	2	0	1	1	-
R	-	-	-	-	-	2	-	-	-	-
MER.										
S	5	1	2	1	4	2	-	3	2	-
R	-	1	1	-	-	-	-	-	-	-
COLI.										
S	-	-	1	1	-	-	-	-	-	-
R	-	-	1	-	-	-	-	-	-	-
LINEZ										
S	-	2	1	1	-	2	-	-	1	1
R	2	-	1	-	-	-	-	1	-	-
COTRI										
S	8	3	2	2	4	2	1	3	2	2
R	1	-	1	-	3	-	-	-	-	-

S-SENSITIVITY, R-RESISTANCE, AMP. - AMPICILLIN, GEN- GENTAMYCIN, AMOXY. - AMOXYCILLIN; CLAV-CLAVUNATE; PIPERACILL-PIPERACILLIN; TAZO-TAZOBACTUM, AMI- AMIKACIN, MET. -METRONIDAZOLE, ERY- ERYTHROMYCIN, MER.-MEROPENAM, COLI-COLISTIN, LIN.-LINEZOLID, CIPRO-CIPROFLOXACIN, COTRI-COTRIMAXAZOLE, CEF- CEFTRIAXONE

with research by Filho *et al.*[11] (2010) that linked puerperal sepsis to postcesarean wound infection.

In the current study, 80 percent of the patients were classified as grade I sepsis, 5% as grade II sepsis, and 15% as grade III sepsis. J Vanukuru *et al.*[12] (2016) conducted a study on puerperal sepsis in which grade I was found in 47 percent of cases, grade III in 49 percent, and grade II was found in 5% of the cases.

Gram-negative bacilli species were the most common organisms found. The most prevalent isolate was *Klebsiella aerogens*, followed by *Escherichia coli*. This is in line with previous research, such as Kiponza *et al.*[13] (2019), who discovered that *Klebsiella* species were the most common. In a similar study, Chetana Gopachade (2018) found that *Klebsiella* was the most prevalent isolate in blood cultures, followed by *Staphylococcus epidermidis*.[12]

The data revealed that the majority of the organisms were susceptible to gentamycin, ciprofloxacin, and amikacin, and that many of them were multidrug-resistant. Similarly, Kiponza *et al.*[13] (2019) published research in which the majority of the bacteria were responsive to meropenem, gentamycin, and ciprofloxacin, which is consistent with our findings.

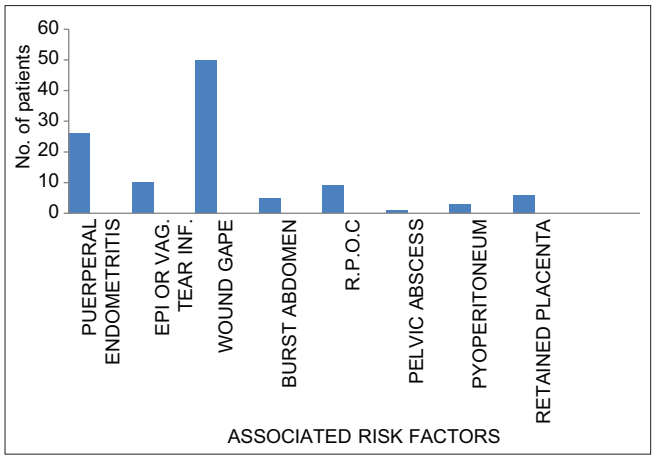

Figure 1: Associated risk factors

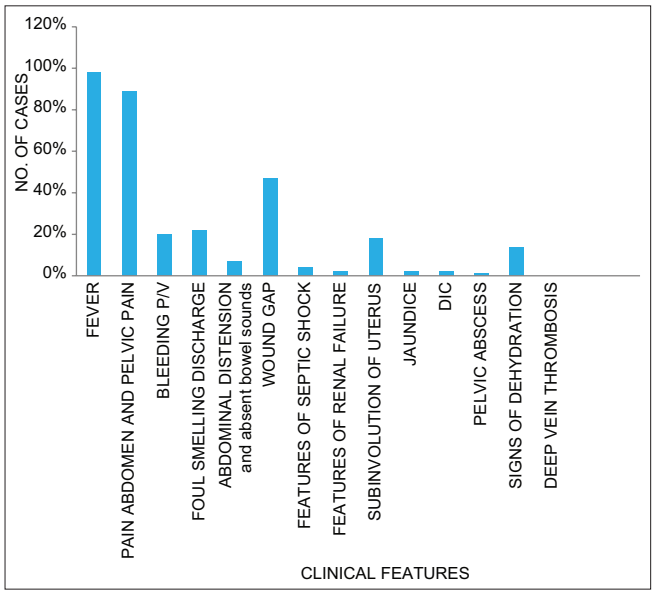

Figure 2: Clinical features

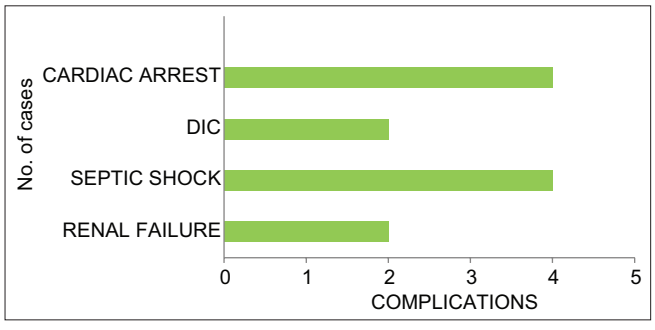

Figure 3: Complications

Conclusion

Most patients with puerperal sepsis are residents of rural areas, with a high number of illiterates and ignorant populations. Irrational use and over-prescription of antibiotics should be avoided to prevent drug resistance. The spread and sharing of antimicrobial resistance can be contained by the rational use of antibiotics, infection control, awareness, and immunization.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their consent for their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Murray CJ, Lopez AD. Quantifying the health risks of sex and reproduction: Implications of alternative definitions. In: Murray CJL Lopez AD, editors. Health Dimensions of Sex and Reproduction: The Global Burden of Sexually Transmitted Disease, HIV, Maternal Conditions, Perinatal Disorders, and Congenital Anomalies. Cambridge, MA: Harvard School of Public Health on Behalf of the World Health Organization and World Bank, (global burden of disease and injury Series, No. III); 1998. p. 1-17.
2. Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe SJ, Hoffman BL, *et al.* William's Obstetrics: Hypertensive Disorders. 24th ed. New Delhi: McGraw Hill; 2014. p. 728-79.
3. Pradhan B, Duwal S, Singh A, Bhandary S, RC L, Shrestha R. Puerperal Sepsis and its Cause in Patan Hospital. Nepal J Obstet Gynecol 2015;10:33-5.
4. Nathan C, Cars O. Antibiotic resistance-problems, progress, and prospects. N Engl J Med 2014;371:1761-3.
5. Nathan C. Antibiotics at the crossroads. Nature 2004;431:899-902.
6. Davies J, Davies D. Origins and evolution of antibiotic resistance. Microbiol Mol Biol Rev 2010;74:417-33.
7. Van Boeckel TP, Brower C, Gilbert M, Grenfell BT, Levin SA, Robinson TP, *et al.* Global trends in antimicrobial use in food animals. Proc Natl Acad Sci U S A 2015;112:5649-54.
8. Shamshad, Shamsher S, Rauf B. Puerperal sepsis--still a major threat for parturient. J Ayub Med Coll Abbottabad. 2010;22:18-21.
9. Demisse GA, Sifer SD, Kedir B, Fekene DB, Bulto GA. Determinants of puerperal sepsis among post partum women at public hospitals in west SHOA zone Oromia regional STATE, Ethiopia (institution BASEDCASE control study). BMC Pregnancy Childbirth. 2019;19:95.
10. Ngonzi J, Tornes YF, Mukasa PK, Salongo W, Kabakyenga J, Sezalio M, *et al.* Puerperal sepsis, the leading cause of maternal deaths at a Tertiary University Teaching Hospital in Uganda. BMC Pregnancy Childbirth. 2016;16:207.
11. Martins Filho ED, Santos AC, Rodrigues Junior RST, Adeodato L, Coutinho I, Katz L. Epidemiological and clinical profile of patients admitted at an obstetrical ICU with diagnosis of puerperal pelvic sepsis in Northeastern Brazil.

Rev Bras Saude Matern Infant 2010;10:469–75.

12. Vanukuru J, Bagga R, Muthyala T, Gautam V, Sethi S, Jain V, *et al.* A clinical and microbiological study of puerperal sepsis in a tertiary care hospital in India. J Matern Fetal Neonatal Med. 2019;32:1931-7.
13. Kiponza R, Balandya B, Majigo MV, Matee M. Laboratory confirmed puerperal sepsis in a national referral hospital in Tanzania: etiological agents and their susceptibility to commonly prescribed antibiotics. BMC Infect Dis. 2019;19:690.