



Original Research Article

Microbial Profile in Females with Puerperal Sepsis: A Major Threat to Women's Health: Study at a Tertiary Health Care Centre

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ABSTRACT

Puerperal sepsis is an infection of the genital tract occurring within 2 to 6 weeks after childbirth or abortion and it is the third leading cause of maternal death in developing countries. The organisms involved may be either endogenous, exogenous or nosocomially acquired. The study evaluated a total of 85 women going through puerperal phase, over a period of 15 months, presenting with fever, chills, foul smelling lochial discharge or pelvic pain and malaise. Vaginal swab, fluid from pouch of douglas and peritoneal fluid were aspirated and sent for the cytologic examination and culture sensitivity to the department of Pathology and Microbiology respectively, of Jawaharlal Nehru Medical College. Out of total of 85 women investigated, almost all showed predominantly neutrophilic infiltrates on cytology. Isolated microbes on culture comprised of group B *Streptococci* in 37/85 (44%), *Escherichia coli* in 15/85 (18%), *Staphylococcus aureus* in 11/85 (13%), *Corynebacterium vaginale* (*Gardenella vaginalis*) in 8/85 (9%) cases, *Klebsiella* in 4/85 (5%) cases, 10/85 (11%) culture plates showed mixed growth, while 10/85 (11%) plates did not show any growth or was insignificant. Amikacin and Gentamycin were the most effective antibiotics in both gram positive and gram negative bacterias.

Keywords

Puerperium, sepsis, Obstetrics, Neonatal sepsis, Neutrophil, Genital infections

Introduction

Sepsis-associated maternal morbidity and mortality continues to be a pertinacious problem worldwide, posing a major threat to the parturients (Fernández-Pérez *et al.*, 2005). A WHO technical working group on The prevention and management of puerperal infections, in 1992 put forward

the following definition of puerperal sepsis (Geneva, 1992): Infection of the genital tract occurring at any time between the rupture of membranes or labour, and the 42nd day postpartum in which 2 or more of the following are present:

- Pelvic pain
- Fever i.e. oral temperature 38.5°C or higher on any occasion
- Abnormal vaginal discharge, e.g. presence of pus
- Abnormal smell/foul odour of discharge
- Delay in the rate of reduction of the size of the uterus (<2cm/day during the first 8 days).

Puerperal sepsis has been a common pregnancy-related condition, which could eventually lead to obstetric shock or even death. WHO report estimated 358,000 maternal deaths yearly occurring due to complications following child birth. Out of these up to 15% are found to be associated with puerperal sepsis (WHO, 2010). Following childbirth the woman's genital tract provides a large bare surface, which is prone to infection. Disease is commonly polymicrobial and source of infection can range from nosocomial, exogenous and endogenous (Dushyant *et al.*, 2007). Puerperal sepsis remains a major preventable cause of maternal morbidity and mortality. There is an indispensable need to introduce interventions, to promote better maternal care by the community health education and by the health institutional development. Reducing maternal mortality is a key goal towards achieving a developed nation. The purpose of this study was to identify and isolate the causative microbes in patients presenting in a tertiary care hospital, with the clinical symptoms suggestive of puerperal sepsis. The study aimed to aid the obstetricians in preventing such infection and to manage patients at an initial stage of infection thus avoiding further complications. Though advocacy and campaign on attitudinal change can modify

some of the risk factors responsible for puerperal sepsis, the health care professionals must also be cognizant of the epidemiology and changing antibiotic sensitivity is necessary for initiating its prompt and meticulous treatment.

Materials and Methods

This study was conducted prospectively at Jawaharlal Nehru medical college, Aligarh, India over a period of 15 months from 12 April 2013 to 11th May 2014. All women admitted to obstetrics and gynaecology department, within 42 days of termination of pregnancy with genital tract sepsis, fulfilling the criteria proposed by the World Health Organization (WHO) for definition of puerperal sepsis were included in the study. The study evaluated a total of 85 women presenting with fever, chills, foul smelling lochial discharge or pelvic pain and malaise. Patient's general and obstetric profile were recorded on a proforma that included following parameters as: age, parity, socioeconomic status, level of education, general health status, antenatal visits, duration of labour, mode of delivery, duration of rupture of membranes, clinical symptoms and related morbidity was noted (Table 1). Numbers of maternal death due to sepsis were also noted. Hematological profile was done. Ultrasonography was done to know retained products of conception if any or development of endometritis, endomyometritis and peritonitis and to access the need for blood transfusion or surgical intervention procedures. This study was design to identify the common pathogens causing puerperal sepsis and their susceptibility to current antibiotics. Vaginal and cervical swab, fluid from pouch of douglas and peritoneal fluid were aspirated and sent for the cytologic examination and culture and sensitivity of microbes, to the department of Pathology and Microbiology

respectively, of Jawaharlal Nehru Medical College. The pus from cervical swab and the colpopuncture fluid were collected by sterile technique and were inoculated on various culture media as Blood Agar, Mac Conkey agar, Chocolate agar and BHI (brain heart infusion) broth. Culture showing growth was further identified as per standard biochemical tests (Baron *et al.*, 1990). Antimicrobial sensitivity testing was performed by disc diffusion method by the Kirby Bauer technique according to CLSI guidelines on Mueller Hinton agar (CLSI, 2008).

Result and Discussion

Of the 85 women in the study group (Table 1), 45 (53%) delivered at hospital while 40 (47 %) gave a history of delivery at home. Only 11 women (13%), underwent Cesarean section. Delivery to admission interval, which in the present study was ranging from 0 to 32 days, maximum admissions 45/85 (53%) were from 3rd to 10th day. Prolong rupture of membranes from 48–72 hours, was seen in 48/85 (56%) of women, 59/85 had fever, 58/85 complained of pain in abdomen as presenting symptom, 25/85 presented with distension of abdomen, 19/85 had loose motions. Foul smelling discharge was chief complaint of 17/85 women. Most of the patients had more than one symptom. 42/85 women were primis, 20/85 were second para, 14/85 were third and 9/85 were of 4th or above parity. Out of 59 women who had pyrexia, defined as temperature more than 38°C, 33/85 also had tachycardia, defined as pulse rate more than or equal to 120 per minute. As revealed by USG, 34/85 women (40 %) had pelvic infection limited to uterine cavity i.e. endometritis. While 30/85 women (35%) had endomyometritis and 21/85 (25 %) had frank signs of peritonitis. Perineal tear was found in 17/85 women, of which 9/85 had first degree, 5/85

had second degree and 3 had third degree tear. 65/85 (76%) cases of puerperal sepsis were seen in women who gave birth to live child either, at term or preterm irrespective of instrumentation, while 15/85 (18%) cases followed abortion and 5/85 (6%) cases were associated with still birth. Maternal mortality was reported to be 9/85 (11%) however morbidity was observed in 100% Case. All 85 women were anemic and 67 had leucocytosis predominantly neutrophilic. Predominant neutrophilic infiltrates was observed on colpopuncture fluid cytology. Smears from collected pus revealed bacterial colonies (figure 1), neutrophilic infiltrates and candidal spores and hyphae (Figure 2) in few samples. Isolated microbes on culture (Table 2) comprised of group B *Streptococci* in 37/85 (44%), *E. coli* in 15/85 (18%), *Staphylococcus aureus* in 11 /85 (13%), *Corynebacterium vaginale* (*Gardenella vaginalis*) in 8/85 (9%) cases, *Klebsiella* in 4/85 (5%) cases, 10/85 (11%) culture plates showed mixed growth out of which 7 contained *Staphylococcus aureus*, *E. coli* and *Candida*, while 4 plates contained *Corynebacterium vaginale* and *Streptococci*. 10/85 (11%) plates did not show any growth or the growth was insignificant (Table 2). Amikacin and Gentamycin were the most effective antibiotics in both gram positive and gram negative bacterias. Fluroquinolones showed poor sensitivity among gram negative bacteria, being effective in only 4/26 (15%) isolates. ESBL (Extended Spectrum Beta – Lactamases) production was detected in 2/26 (8%) while 7/26 (27%) were Amp C beta lactamase producers. Among *Staphylococcus* specie, 4/11 (36%) were MRSA (Methicillin-resistant *Staph. aureus*). Among Gram positive bacteria vancomycin was most effective with 100% sensitivity. While in Amp C beta lactamases producers, Imipenem was found to be most effective

with 100% sensitivity. Incidence of puerperal sepsis around the world is estimated with difficulty, because the etiology and epidemiology of sepsis is extremely variable due to local conditions prevailing in particular community, with regards to hygiene during performing delivery and rate of reproductive tract infections including those transmitted sexually.

Definition of puerperal sepsis differs from one study to another, discerning their comparability difficult. Corroborating the data based on a literature review of hospital and community studies, the speculated global incidence of sepsis is 4.4% of live births, giving a cumulative number of puerperal sepsis cases of nearly 6 million and almost 77,000 maternal deaths (Abouzahr, 2003). The consequential long-term complication is infertility that results from tubal occlusion, imprecisely affecting 450,000 women each year (Abouzahr, 2003). Moreover, hospital-based studies are not a reliable source of data around the world. It is fraught with difficulty, especially in the developing countries, where many women do not have access to health facilities, due to various reasons as geographical distance, financial constraints and cultural beliefs that limits the possibility of estimating exact incidence. Another problem may be that most postpartum infections take place after hospital discharge, which is usually 24 hours after delivery. Therefore, due to lack of postnatal follow-up, encountered in many developing countries, tenuous and limited number of cases of puerperal infection is being diagnosed and reported (Abouzahr *et al.*, 1998). Approximately 5.2 million new cases of maternal sepsis are speculated to occur annually and an estimated 62,000 maternal deaths anticipated from this condition (WHO, 1998). Puerperal sepsis is

responsible for a small proportion of maternal deaths in high-income countries, but is leads to approximately 10% of maternal deaths in Africa and Asia (Khan *et al.*, 2006). Implicated risk factors in the occurrence of maternal sepsis include delivery at home in an unhygienic conditions, low socioeconomic status, poor nutrition, primiparity, anaemia, prolonged rupture of membranes, perineal tear, prolonged labour, multiple vaginal examinations in labour (>5), caesarean section, multiple pregnancy, artificial reproductive techniques, overweight and obstetrical manoeuvres (Kramer *et al.*, 2009; Maharaj *et al.*, 2007). All these risk factors were seen prevailing in our study group also. Perineal tear which can be easily avoided by the practicing episiotomy in all cases of vaginal delivery, was observed in 17/85 (20%) cases, higher than seen in other study 8/56 (14%) (Bhanap and Sakhre, 2013). In low-income countries, the root causes of puerperal sepsis are mostly related to health system failures and noncompliance with long-established infection prevention and management procedures (Tsu and Coffey, 2003). Other community factors might also influence the risk for puerperal infections, such as cultural factors, delivery by untrained birth attendants, limited access to adequate healthcare and delays in rendering health facilities (Dolea and Stein, 2003)

Patient presents with fever and other clinical symptoms like pelvic pain, foul smelling vaginal discharge and delayed reduction of the uterine size (Dillen *et al.*, 2010). Infection is either limited to the uterine cavity and wall of uterus, or may spread beyond the uterine wall to cause peritonitis, septicaemia, and even death, because of decreased resistance due to prolong labour or severe bleeding. Nosocomial infections are acquired in hospitals from the hospital environment or from other patients.

Exogenous infections come from external contamination, especially when deliveries take place under unhygienic conditions. Endogenous organisms consist of mixed flora colonizing the woman's own genital tract.

The majority of women with puerperal sepsis have a mix of organisms. Studies in developing countries report causative organisms such as bacteroides, enterobacteriaceae, *E. coli*, *Klebsiella*, *Neisseria gonorrhoea*, *Pseudomonas*, *Proteus*, *Staphylococcus aureus*, *Streptococci*, *Trichomonas vaginalis* and various anaerobes (Lagro *et al.*, 2003). The most frequently cultured organism as reported (Bako *et al.*, 2012) was

Staphylococcus aureus in 43/139 (30.9%) of cultures followed by *Eschericia coli* which was isolated in 22/139 (15.8%) and *Streptococcus* Species in 8/139 (5.8%) which varied from our study as *Streptococci* 37/85 (44%) was most frequently isolated organism followed by *E. coli* 15/85 (18%) and *Staph. aureus* 11/85 (13%). Also we got mixed flora in 10/85 (11%) culture plates comparable to that studied by (Bako *et al.*, 2012) who found it to be in 13 specimens (10.8%). Microbial profile in our study was similar to those reported by studies in developed nations (Dushyant *et al.*, 2007; Dillen *et al.*, 2010) and by some health personals in Enugu, Nigeria (Momoh *et al.*2010).

Table.1 Clinical and obstetric profile of the patient

S.No.	Variables	Number / 85	Percentage	
1	Presenting symptoms	Fever	59	69
		Abdominal distension	25	29
		Abdominal pain	58	68
		Foul smelling discharge	17	20
		Loose motion	19	22
2	Place of delivery	Tertiary care centre	45	53
		Home	40	47
3	Mode of delivery	Vaginal delivery	74	87
		Cessarean section	11	13
4	Prolong rupture of membrane (48–72 hours)	48	56	
5	Perineal tear	1° perineal tear	9	11
		2° perineal tear	5	6
		3° perineal tear	3	4
6	Parity	Primi para	42	49
		Multipara	20	24
		Grand multipara	23	27
7	Delivery to admission interval,	0-12 th day	45	53
		12-24 th day	30	35
		24-42 th day	10	12
8	USG findings	Endometritis	34	40
		Endomyometritis	30	35
		Peritonitis	21	25
9	Mortality	Maternal	9	11
		Fetal	5	6

Table.2 Pathogens found on the culture of cervical swab (CS) and colpopuncture fluid (CF)

S. No	Pathogen	Sample type	Number / 85	Percent (%)
1.	Group B <i>Streptococci</i>	CF & CS	37	44
2.	<i>E. coli</i>	CS	15	18
3.	<i>Staph. aureus</i>	CF	11	13
4.	<i>Gardnerella vaginalis</i>	CS	8	9
5.	<i>Klebsiella</i>	CS & CF	4	5
6.	<i>Candida</i> (as mixed flora)	CS	7	8
7.	Mixed flora	CS & CF	10	11
	TOTAL		85	100

NOTE: *Candida* found as mixed flora with *Staph. aureus* and *E. coli*, therefore not added separately in total.

Figure.1 Smear from cervical discharge showing multiple bacterial colonies and a dense neutrophilic infiltrates (Papanicolaou x 100)

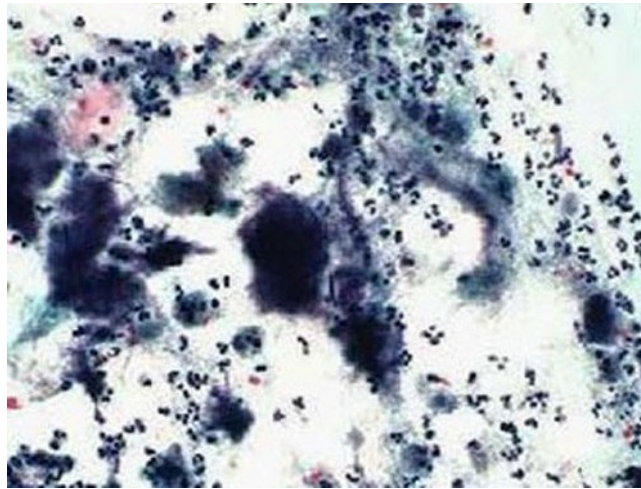
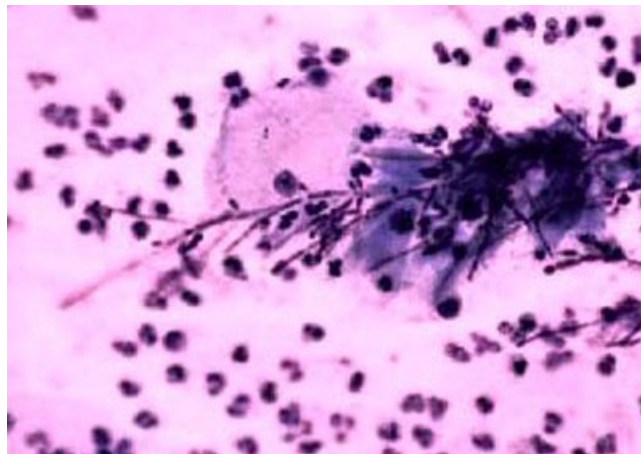


Figure.2 Smear from cervical discharge showing Candidal spores and hyphae adhering to the squamous epithelial cells, dense surrounding neutrophilic infiltrates also seen (Papanicolaou x 100)



Corynebacterium vaginale (*Gardenella vaginalis*) is an opportunistic minor pathogen that apparently gains access to the blood stream via an exposed vascular bed rather than as the result of immunosuppression (Venkataramani and Rathbun, 1976) or it affects predominantly women after obstetric trauma (Adeniyi *et al.*, 1980) which is in accordance with our study in which it was isolated from 8/85 case having 2nd and 3rd degree perineal tear. Maternal mortality was reported to be 11% (9/85) in our study which was a figure slightly less than those reported by other studies as 14.2% (Shamshad *et al.*, 2010), 15% (Jafary *et al.*, 2002) and 19.2% (Begum *et al.*, 2003).

Of all the components of maternal healthcare delivery, postnatal and early newborn care is the fields demanding heightened vigilance. Postpartum care is infrequently encountered in India as only 1 in every 6 women gets this privilege. Clean and hygienic environment of postpartum ward with avoidance of too many visitors, judicious use of sterile sanitary pads and frequent change of pads, use of antiseptic solutions to cleanse perineal wound after every act of defecation and urination are the basic recommendations that must be advocated in order to prevent puerperal sepsis. Prevention demands a multipronged healthcare service dispensed by cognizant primary health workers, skilled birth attendants, doctors, nurses, family members of the new mother and local health authorities. Continuous investment in healthcare will bring excellent segue in improvement of women's health.

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