Original Article

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Severe Puerperal Sepsis-A Simmering Menace

Obstetrics and Gynaecology Section

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ABSTRACT

Introduction: Even decades after the development of effective low-cost antibiotics, sepsis persists as the foremost cause of preventable maternal death worldwide. In developing countries like India, where the paramount impediment to intervention is poverty, maternal mortality due to sepsis is a continuing representation of maternal health inequality.

Aim: To determine the incidence, risk factors and mortality in women presenting with puerperal sepsis in a tertiary care health facility in India.

Materials and Methods: This retrospective study was carried out in VMMC and Safdarjung Hospital, New Delhi, India, from January 2016 to June 2016 in Department of Obstetrics and Gynaecology. Case records of all eligible patients of puerperal sepsis were reviewed and data were extracted regarding demographic profile, clinical profile on admission, course in hospital, management, complications and cause of mortality (in case of death). Inclusion criteria were any patient presenting either immediately after delivery or miscarriage or within 42 days of these events with fever and any of the following: pain abdomen, malodorous lochia, abdominal distention, uterine tenderness, pelvic abscess, peritonitis, mechanical or foreign body injury, any system/organ failure or shock. Exclusion criteria consisted of patients presenting with fever during pregnancy or more than 42 days after delivery or miscarriage, or patients presenting with fever due to medical conditions, wound infection, mastitis, UTI or thrombophlebitis. Data were entered in predesigned proformas and analysed. A p-value of less than 0.05 was considered significant.

Results: During the study period, a total of 33 cases met the inclusion criteria. Of these, 90% were referred cases. Anaemia, prolonged labour, delivery by an untrained person and unsafe abortion were the main identifiable risk factors. Surgical management was required in 75% cases, while 70% women succumbed to their illness, mostly due to multiorgan failure.

Conclusion: Maternal mortality due to maternal sepsis is very high; Lack of safe and hygienic practices for conducting delivery and abortion are important contributory factors.

Keywords: Maternal morbidity, Maternal mortality, Puerperium, Postabortal period

INTRODUCTION

Sepsis remains one of the foremost cause of preventable maternal death worldwide even decades after the advent of effective low cost novel antimicrobials [1]. It is one vital member of the deadly triad, along with haemorrhage and hypertensive disorders, that contributes greatly to maternal morbidity and mortality [2]. Chiefly in settings like India, where the paramount impediment to intervention is poverty, maternal mortality due to sepsis is a continuing representation of maternal health inequality. According to reports of WHO, puerperal sepsis has been stated to be the second leading cause of maternal mortality in developing countries [3].

Puerperal sepsis is the septicaemia contracted by women during or soon after child birth or miscarriage [4]. It is constituted by a conglomeration of symptoms of fever and supplementary symptoms of pelvic pain, foul smelling vaginal discharge and subinvolution of uterus during the period. Sepsis is described as infection coupled with its systemic manifestations. Severe sepsis is summarized as a possibly perilous malady typified by systemic inflammatory response syndrome along with infection, organ dysfunction, hypoperfusion or hypotension [5,6].

Most conjectures of maternal sepsis, especially from low income countries, come from small cohorts which have focused on either postabortal sepsis (or its sequelae) or on postdelivery sepsis [7-14]; amongst them, very few have amalgamated the causes through a holistic approach. Keeping in view this backdrop, the present study was proposed to analyse the patients presenting with puerperal sepsis (postabortal and postdelivery) in a tertiary level hospital, to determine the magnitude of the problem. This would help to formulate institutional protocols, which would be, in turn, instrumental in planning preventive strategies at higher levels. This would go a long way in fostering maternal health.

MATERIALS AND METHODS

This retrospective study was carried out in VMMC and Safdarjung Hospital, New Delhi from January 2016 to June 2016 in Obstetrics and Gynaecology department. During this period, 366 women with puerperal sepsis admitted in the hospital were enrolled into the study. Ethical approval was taken by Institutional Ethical Commitee.

Inclusion criteria were any patient presenting: a) either immediately after or within 42 days of vaginal delivery, caesarean section (LSCS) or miscarriage; b) associated with pain abdomen, malodorous lochia, abdominal distention, uterine tenderness, pelvic abscess, peritonitis, mechanical or foreign body injury, any system/organ failure and shock.

Exclusion criteria consisted of: a) fever during pregnancy or more than 42 days after delivery, LSCS or miscarriage; b) fever due to medical causes; c) wound/surgical site infection; d) mastitis; e) UTI; and f) thrombophlebitis.

A total of 33 women with severe maternal sepsis were finally enrolled for the study and their case records were reviewed.

The primary outcome was frequency of severe puerperal sepsis, while secondary outcomes included demographic variables, booking status, predisposing risk factors, antecedent pregnancy event and the interval between it and presentation, clinical presentation at admission, complications, need for ICU admission and/or surgical management, duration and course of hospital stay and mortality with cause of death.

STATISTICAL ANALYSIS

Data analysis was performed using SPSS version 21.0 for windows and applying chi-square test, keeping null hypothesis value of 10% for risk factors, clinical profile and possible modifiable factors. In all cases, p-value < 0.05 was considered significant.

RESULTS

During the study period, there were 14,550 admissions in Obstetrics and Gynaecology Department, out of which, 366 were due to puerperal sepsis, giving an incidence of 2.5%. Of these, 33 (9%) women fulfilling the inclusion and exclusion criteria for severe puerperal sepsis were finally enrolled into the study.

Young women aged less than 20 years constituted 9% of these patients and 12% of the patients were primiparas. Preponderance of women was seen between 20-30 years (p-value=0.001). Maximum women were multigravidas (p-value=0.002). Majority (94%) of the patients were unbooked (p-value=0.001), having delivered at home (p-value=0.007) or in other peripheral hospitals [Table/Fig-1].

Antecedent pregnancy event was term delivery in 24 women and miscarriage in nine (two in first trimester and seven in second trimester) females. The most frequent mode of delivery in patients reaching term was LSCS (67%), making it statistically significant (p-value=0.001). Also, higher incidence was seen in second trimester unsafe abortions (p-value=0.009) [Table/Fig-2,3].

Women were uniformly distributed with respect to puerperal day of presentation, with most of the patients presenting within first 72 hours/more than six days postpartum (p-value=0.845), with frequent complaints of fever (100%), pain abdomen (70%, p-value<0.001), malodorous discharge (p-value<0.001) and abdominal distension (64%, p-value<0.001) [Table/Fig-4].

Baseline characteristics	Cases n=33(%)	p-value
Age (years)		
<20	3 (9%)	<0.001
20-25	19 (57.58%)	
25-30	09 (27%)	
>30	2 (6%)	
Parity		
Primigravida	4 (12%)	0.002
G2-G4	20 (61%)	
>G5	9 (27%)	
Religion		
Hindu	18 (55%)	0.006
Muslim	12 (36%)	
Sikh	3 (9%)	
Christian	0	
Others	0	
SE status (Modified Kuppuswami)		
Upper	0	0.078
Upper middle	0	
Lower middle	5 (15%)	
Upper Lower	13 (39%)	
Lower	15 (46%)	
Residence		
Urban	5 (15%)	<0.001
Rural	28 (85%)	
Booking Status		
Referred	31 (94%)	<0.001
Booked	2 (6%)	

[Table/Fig-1]: Demographic variables and baseline maternal characteristics.

Amongst the associated risk factors, malnourishment (67%, p-value <0.001 and pre-existing anaemia (42%, p-value<0.001) were the most common and significant, followed by prolonged rupture of

Antecedant pregnancy event	Cases n =33 (100%)	p-value[a]	p-value[b]
Miscarriage 9 (27%) • Spontaneous • Induced	0 9 (27%)	-	<0.001
Delivery 2 (6%) • Vaginal • Instrumental	2 (6%) 0	-	
Caesarean 22 (67%) • Elective • Emergency	1 (3%) 21 (64%)	<0.001	

[Table/Fig-2]: Antecedent pregnancy event in cases.
p-value [a]-gives the association of women with caesarean section as antecedent pregnancy event when compared to miscarriage and delivery
p-value [b]-gives the comparison of emergency caesarean with elective cesearean indicating that maximum women had undergone emergency cesearean prior to developing sepsis, and this was significant with p <0.001.

Risk Factors	Cases	p-value
Body mass index <18.9	28 (85%)	<0.001
Comorbidities • Anaemia • Diabetes Mellitus • Tuberculosis	 14 (42%) 2 (6%) 2 (6%)	 <0.001 0.4437 0.4437
Obesity	1 (3%)	0.1801
Smoking	0	-
Poor hygiene	7 (21%)	0.0352
Frequent vaginal examinations (>5)	10 (30%)	<0.001
Delivery/abortion by untrained persons	11 (33%)	<0.001
Prolonged labour	12 (36%)	<0.001
Prolonged rupture of membrane	14 (42%)	<0.001
Delivery / abortion place (n=11) • Home • Institutional	 10 (30%) 1 (3%)	<0.001
Postpartum haemorrhage	10 (30%)	<0.001
Period of gestation of induced abortion (n=9) • First trimester • second trimester	3 (9%) 6 (18%)	0.009
Methods for induced abortion (n=9) • Curettage • Instillation of abortifacient • Hysterotomy • Others/history not revealed by patient	 5 (15%) 2 (6%) 0 2 (6%)	0.009

[Table/Fig-3]: Risk factors for puerperal sepsis.

Clinical profile	Cases n (%)	p-value
Puerperal day of presentation • 1-3 • 3-6 • 6-9 • ≥10	 9 (27%) 6 (18%) 9 (27%) 9 (27%)	0.845
Persistent fever >100.4 without chills	33 (100%)	-
Malodorous discharge	9 (27%)	<0.001
Pain abdomen/pelvic pain	23 (70%)	<0.001
Uterine tenderness	18 (55%)	<0.001
Abdominal distension	21 (64%)	<0.001
Peritonitis	18 (55%)	<0.001
Shock	12 (36%)	<0.001
Systemic /end-organ failure	11 (33%)	<0.001
Coma	2 (6%)	0.444
Multi Organ Dysfunction Syndrome (MODS)	5 (15%)	0.338
Haemo-peritoneum	9 (27%)	<0.001

[Table/Fig-4]: Clinical profile of the patients.

Management protocol	Cases n=33 (100%)	p-value	p-value for surgical correction* (1,2, 3)	p-value for a, b and c within 1 and 2
Conservative (non-surgical)	9 (27%)			
Surgical (n=24)*	24 (73%)			
Exploratory laparotomy followed by				
• Uterine rent repair along with#	8 (24%)			
a. closure	5 (15%)			
b. bladder repair	2 (6%)	0 .009	0.392	0.197
c. gut resection and anastomosis	1 (3%)			
• Subtotal hysterectomy along with#	5 (15%)			
a. closure	3 (9%)			
b. gut resection and anastomosis	2 (6%)			
• Peritoneal lavage only	8 (24%)			
• Colpotomy	3 (9%)			0.655

[Table/Fig-5]: Management protocol instituted.

Course in the hospital	Cases n = 33 (100%)	p-value
ICU admission		
• Yes	• 24 (73%)	0.009
• No	• 9 (27%)	
~Not needed	~3 (9%)	
~Needed but no availability*	~6 (18%)	
Duration of hospital stay		
• <48 Hours	• 18 (55%)	<0.001
• 48-96 hours	• 11 (33%)	
• 96-168 hours	• 2 (6%)	
• >168 hours	• 2 (6%)	
FATE IN HOSPITAL		
• Recovered	• 3 (9%)	<0.001
• Died	• 28 (85%)	
• LAMA	• 0	
• Re-laparotomy	• 2 (6%)	
Cause of death		
• Pulmonary edema	• 12 (36%)	0.098
• DIC	• 4 (12%)	
• Cardiac arrest	• 4 (12%)	
• MODS	• 8 (24%)	

[Table/Fig-6]: Course in the hospital.
*=these patients though required ICU care, could not be sent to ICU due to non-availability of beds in ICU, owing to high patient load in this tertiary care government hospital.
MODS- Multiorgan dysfunction syndrome, DIS- Disseminated intravascular coagulation, LAMA-Leaving against medical advice

Modifiable Factors	Cases (n=33	p-value
1. Personal/Family		
• Delay in obtaining legal abortion	• 9 (27%)	0.001
• Delay in seeking timely help of doctor	• 6 (18%)	0.126
• Lack of awareness of available services	• 3 (9%)	0.848
• Lack of resources	• 14 (42%)	<0.001
• Past adverse experience	• 3 (9%)	0.848
• Refusal of treatment/admission	• 1 (3%)	0.180
2. Logistics		
• Lack of transport from home to health care facility	• 9 (27%)	0.001
• Lack of transport between health facilities	• 3 (9%)	0.848
• Lack of communication network	• 5 (15%)	0.338
3. Other Lacunae at first referral units		
• Infrastructural issues	7 (21%)	0.035
• Inappropriate choice of antibiotics	7 (21%)	0.035
• Lack of safe instruments, equipments/consumables	6 (18%)	0.126
• Surgical complications	9 (27%)	0.001
• Lack of recognition of seriousness of condition by caregiver	13 (39%)	<0.001
• Delay in referral of patient to tertiary care hospital	12 (36%)	<0.001
• Lack of support services (anaesthesia, OT staff, blood bank services)	4 (12%)	0.702
4. Present Facility/facilities		
• Infrastructural issues like non availability of ICU beds due to patient load	6 (18%)	
• Lack of medications, instruments, equipments/ consumables	0	0.126
• Non utilization of available medications, instruments, equipments/ consumables	0	

[Table/Fig-7]: Possible modifiable factors.

membranes (30%, p-value<0.001) and frequent pelvic examinations (30%, p-value<0.001) [Table/Fig-3].

A total of 73% women required surgical exploration and further procedure for management which was statistically significant (p-value=0.009). A breakup of surgical procedures showed uniform distribution amongst all of these women (p-value=0.09) [Table/Fig-5].

Majority (73%) of patients were admitted in the ICU of the hospital; another 18% did not get ICU care even though required due to non availability of ICU beds.

Despite best efforts, 85% of women succumbed to their illness, most common cause of death being pulmonary oedema (36%) or multiorgan dysfunction syndrome (24%), though it was insignificant [Table/Fig-6].

Amongst the preventable modifiable factors, considerable delay in diagnosis of by index physician (39%) was the chief amendable issues unveiled during the study that were significantly associated with severe sepsis [Table/Fig-7].

DISCUSSION

Severe puerperal sepsis is a known source of severe maternal morbidity and mortality in developing nations like India [11]. In the course of the study period, 2.5% of the total admissions in Obstetrics and Gynaecology Department were due to puerperal sepsis. Amongst these, 9% were anguished with severe puerperal sepsis.

[Table/Fig-8] displays a comparative evaluation of studies done by past pollsters on obstetric sepsis across the world, with the findings of the present study.

In contrast with previous research studies, a relatively younger women in the present study reflects an early age at marriage and conception in India [1,3,4,7-12,14]. On further analysis, most of them were unbooked with no prior antenatal supervision, having delivered at home or in outside hospitals; hailing mostly from lower socioeconomic background. Maximum females thus came as referral cases from peripheral centres following unnecessary labour induction and substandard sterilization practices by less skilled practitioners. In under-resourced settings like India, there is a vital need to segregate unbooked/referred cases coming to hospitals from those who develop the ailment in the hospital setting; since the former indicates a lack of basic infrastructural facilities, or failure in access to the facilities in the peripheral hospitals and/or to the referral chain, indicating that such first referral units should be made equipped with ample resources and organization to be able to manage such emergent predicaments [15].

These aforesaid observations were in consonance with the available reviews in literature from both developing and developed countries, which emphasizes that this consortium of women endures most of the infectious morbidities [3,4,15,16]. It may be further attributed to poverty, illiteracy, malnutrition, early age at marriage and subsequently first conception. This cohort of women is ignorant about availability of family planning services, concept of high risk pregnancy, hygiene and safe health care practices. Moreover, as such, they are clinically malnourished and may have associated comorbidities like tuberculosis and anaemia; the present study also observed anaemia in 42% of cases.

There was a high incidence of sepsis following LSCS done at peripheral hospitals (22/24 term deliveries) in the current study. This is a relatively novel observation when equated with work in literature [1,3,4,7-12,14]; highlighting the fact that increasing number of obstetric surgeries, in developing countries like India, are still being done by untrained personnel's for extraneous reasons, who fail to follow the accredited norms of disinfection during surgeries, unaware of safe surgical practices. Similarly, lack of awareness among women at the grass-root level about contraception leads to unwanted pregnancies; compelling them to resort to unsafe abortions in absence of widespread cheap safe abortion services.

Study	Type of study	Sample population/ duration	Criteria	Conclusion
Regmi C et al., [18]	Retrospective	70 cases/three year	Unsafe abortion	52% high grade sepsis; most recovered, eight maternal deaths.
Madhudas C et al., [3]	Retrospective	230 patients/ two years	Puerperal sepsis following delivery/LSCS only, not included post abortion cases	Puerperal sepsis= 6.28% of 3656 admissions; risk factors =anemia, unbooked status, frequent vaginal examination, home delivery and prolonged rupture of membranes; Mortality=21.68%.
Acosta CD and Knight M [4]	Case control study	13 years	Pregnant, intrapartum and postpartum women with sepsis or severe sepsis	Obesity, operative vaginal delivery and age <25 years are significant risk factors for sepsis and should be considered in clinical obstetric care.
Rocca CH et al., [10]	Cross-sectional study	527 women presenting with complications from induced abortion/ 10 years, four hospitals	Septic abortion	Majority had undergone medically induced abortions using unknown substances acquired from uncertified sources.
Ahmed MI et al., [8]	Prospective cohort	170 women/One year	Sepsis during labor or in puerperal period; not included abortions	Out the 124 pathogen positive cases, aerobes were the predominant ;Higher rate of infections followed vaginal delivery compared to Cesarean section 121 (97.6%), 3 (2.5%) respectively.
Al-Ostad G et al., [7]	Retrospective	study cohort consisted of 5338 995 women/ 10 years	Sepsis during labour, postdelivery and post abortion sepsis	Incidence of maternal sepsis=29.4 per 100, 000 births black women >35years and who smoke were high risk; association found with diabetes mellitus, cardiovascular disease, eclampsia, preterm birth, hysterectomy, puerperal infection, post-partum hemorrhage, transfusion and chorioamnionitis.
Present study 2016	366 cases/six months	six months study duration	Only severe puerperal= postdelivery /LSCS and postabortal cases	2.5% sepsis, 9% severe sepsis. Unsafe abortion, anaemia, prolonged labour, delivery by untrained person risk factors. 70 % mortality, mostly due to Multiorgan dysfunction syndrome.

[Table/Fig-8]: Comparative evaluation of observations of all researches on sepsis.

Akin to observations of the earlier investigators, most common presenting complaints in our patients were fever followed by pain in abdomen and abdominal distension [7,8,11-18]. Hence, a prompt and thorough evaluation for impending sepsis is warranted which would go a long way in preventing end organ damage and minimizing sepsis related morbidity and mortality in the country.

The breakup of risk factors for sepsis is comparable to various surveys in the preceding times with malnourishment and pre-existing anaemia emerging as the leading factors among all cases [11-14]. This reflects poor maternal health services in the region, including shortage of awareness, accessibility, availability and ignorance on the part of the patients.

The extant study also witnessed high incidence of prolonged rupture of membranes, frequent pelvic examinations and poor hygiene as the plausible causative factors instrumental in generating sepsis in women. These conclusions were analogous to those of previous canvassers, from developing countries [15-17]. It advocates maintenance of hygiene and asepsis during examination in parturient women by both doctors and *dais*, besides judicious use of antibiotics. It further mandates upgrading of their knowledge of midwifery abreast with innovative and new fangled protocols in infection control.

The above observations also necessitate provision of safe and accessible abortion services in the country in order to minimize postabortion infection rate. Additionally, women presenting with signs and symptoms of infection after abortion procedures require prompt evaluation and management to avoid septic complications. Besides, the latest infection control guidelines should be strictly adhered to in all the health facilities across the nation to decrease the incidence of sepsis and nosocomial infections [19,20]. Recently, utilization of antiseptic washes to the vaginal area during labour has also gained interest of many clinicians, though the evidence of establishing their role in preventing maternal infection is still inconclusive [19,20].

Parallel to erstwhile reports on puerperal sepsis, a large proportion of women in the current research required surgical exploration for management [11-18]. However, all of these women had already been treated by many clinicians outside, before being referred to our tertiary hospital. These annotations re-emphasize that deficient surgical expertise in peripheral smaller hospitals (first referral units) needs to be parted with, by audacious efforts at both the state and national level to boost the maternal health in the long run.

Majority of these patients were admitted in ICU of the hospital while another 18%, though requiring intubation, could not get the same due to non availability of ICU beds. This reflected the severity and gravity of women at the time of admission and the burden on the health care facilities, especially in government sector. Hence, all healthcare infirmaries should have regular internal audits to assess the magnitude of patients requiring critical care, to upgrade their support services from time to time.

The high rate of morbidity and mortality in our study could be attributed to surgical complications (27%), considerable delay in diagnosis of same by index physician (39%), lack of recognition of gravity of ailment by the caregiver (36%) and deferment in referral of patient to tertiary care hospital (33%). This elevated rate of mortality, in contrast to former explorations, stems from the fact that Safdarjung Hospital, being one of the largest tertiary care hospitals of India, caters to a sizeable chunk of critically ill referred cases from neighbouring states in Northern India. Characteristic problems related to infection control including wrong antibiotics prescribing practices, poorly functioning laboratory services at the smaller peripheral hospitals were also instrumental. In general, most serious postabortion infectious complications can be avoided by improving health education, imparting awareness among general public and equipping the smaller hospitals with best facilities to handle emergency and essential obstetric care besides, augmenting the first referral units.

LIMITATION

Our conclusions having been drawn from a relatively smaller study population cannot be an actual and precise representative of the disease entity at the national level. It being a retrospective study, research is limited by the accuracy and completeness of data that had been entered in the case files. Also, this being a single centred hospital based study; it cannot reflect data at national level completely.

CONCLUSION

Under-reporting of cases of severe puerperal sepsis, especially those following unsafe abortion, leads to underestimation of its contribution to maternal death. An early diagnosis along with intensive care resourcing influences the efficacy of goal directed therapy. There is a need to enlighten the populace on the need for safe abortion practices, regular antenatal supervision, trained and skilled birth attendant, and preferably institutional delivery under aseptic conditions. Modification of risk factors and prevention of unplanned and unwanted pregnancies (by sex education and access to safe and sustainable family planning methods) and penetration of health services to the lowest echelons, including awareness building and health education would be crucial in tackling this menace.

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