

Original Research Article

Puerperal sepsis and maternal outcome in developing countries: an observational study

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ABSTRACT

Background: Puerperal sepsis is a major cause of maternal morbidity, mortality. Present study was conducted to know burden of severe puerperal sepsis, risk factors, maternal outcome.

Methods: Present observational cohort study was conducted in the Obstetrics and Gynecology department of rural tertiary center of Northern India over eight months (1st January-31st July 2018). All women who had delivered or aborted in an institution or those referred from outside within 42 days of delivery/abortion having clinical features, investigations suggestive of puerperal sepsis were enrolled. Socio-demographic factors, clinical features, examination findings, investigations, details of antecedent pregnancy, complications, risk factors, and maternal outcome were recorded. Statistical analysis was done using SPSS version 22 software.

Results: A total of 66 cases with severe puerperal sepsis were observed during the study period of which 55 (83.3%) were referred from outside. The most common mode of delivery in antecedent pregnancy was vaginal (42.4%) followed by cesarean section (33.3%) and one (1.5%) forceps delivery. There were 15 (22.7%) post-abortion cases. Maternal anemia was found to be significantly linked with sepsis and adverse maternal outcome ($p < 0.05$). Most common presenting features were fever (100%), tachycardia (100%), breathlessness (100%), malodorous vaginal discharge (100%), abdominal distention (53.0%), scar infection (16.7%), vaginal or rectal bleeding (16.7%), peritonitis (27.3%), septic shock (12.1%). A total of 38 (57.6%) cases required surgical intervention with seven (10.6%) developing multiorgan failure and 15 (22.7%) succumbed to death.

Conclusions: Though puerperal sepsis is a preventable condition, it continues to be one of the major causes of maternal morbidity, mortality.

Keywords: Abortion, Delivery, Fever, Pregnancy, Puerperal sepsis

INTRODUCTION

Puerperal sepsis is one of the leading causes of maternal morbidity and mortality worldwide. The world health organization (WHO) has defined puerperal sepsis as bacterial infection of female genital tract occurring at any time from rupture of membranes or onset of labor till the 42nd day postpartum with presence of two or more of the following clinical symptoms: fever (oral temperature

38.5°C/101.3°F or higher on any occasion), pelvic pain, abnormal vaginal discharge (pus-like), abnormal smell/foul-smelling lochial discharge or delay in rate of uterine involution.¹ Recently a new definition of maternal sepsis was given by WHO according to which, maternal sepsis is a serious condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or post-partum period.²

Worldwide, puerperal sepsis is the third most common direct cause of maternal mortality after hemorrhage and hypertensive disorders of pregnancy, accounting for approximately 11% of all maternal deaths annually.³ It was reported that the burden of maternal sepsis ranges from 15 to 19 million cases annually all over the world, accounting for an estimated 75,000 maternal deaths, especially in low-income countries.^{4,5} The incidence of maternal mortality is comparatively very low in developed countries, ranging from 0.1 to 0.6 per 1000 births.^{5,6} Furthermore, the majority of cases of maternal deaths due to sepsis come from Southern Asia (13.7%) and sub-saharan Africa (10.3%), as compared to very fewer cases from developed countries (4.7%).^{3,7} Moreover, when abortions and intra-uterine fetal demises are also included, the overall incidence of severe puerperal sepsis further increased from 11 per 10,000 pregnancies in 2001 to 26 per 10,000 in 2010, resulting in a 9.1% annual increment in sepsis-associated maternal deaths.⁸

Immunosuppressed state during pregnancy, makes women prone to the risk of grabbing various infections.⁸ Puerperal sepsis is polymicrobial in origin, with following organisms accounting for most of the cases: *Escherichia coli*, *Streptococcus pyogenes*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Clostridium tetani*, *Clostridium welchii*, *Methicillin-resistant, S. aureus* (MRSA), *Gonococci* or *Chlamydia*. The predisposing factors include anemia, malnutrition, obesity, immunosuppressed state or medications, poor hygiene, diabetes, prolonged spontaneous rupture of membranes, retained products of conception, pelvic infection, vaginal trauma, cesarean section or wound hematoma, amniocentesis or other invasive procedures, etc.^{6,9} Severe puerperal sepsis is characterized by septic shock or systemic inflammatory response syndrome secondary to an infectious process with resultant organ dysfunction or failure.⁸ Hence, the present observational study was conducted to know the burden of severe puerperal sepsis, its risk factors and overall maternal outcome associated with puerperal sepsis in a rural tertiary care center of Northern India.

METHODS

Study design

Observational cohort study.

Study setting and duration

The present study was conducted in the department of Obstetrics and Gynecology of a rural tertiary care center of Northern India over eight months (1st January to 31st July 2018).

Participants

A cohort of women with features of severe puerperal sepsis presenting within 42 days of delivery or abortion

admitted in the Obstetrics department were enrolled as study participants.

Inclusion criteria

All the women who had delivered or aborted in the institution or those who were referred from outside within 42 days of delivery or abortion having clinical features and investigations suggestive of puerperal sepsis including fever (38.5°C/101.3°F), foul-smelling vaginal discharge, bleeding per vaginum, uterine tenderness, abdominal pain, abdominal distention, signs of peritonitis, pelvic abscess, shock or multi-organ failure were enrolled as study participants.

Exclusion criteria

Women presenting with fever during antenatal period or after 42 days of delivery or abortion, women with fever due to other medical conditions like thrombophlebitis, urinary tract infection, viral fever, breast inflammation or infection, etc. and those not willing to be a part of the study were excluded

Method of selection

Consecutive sampling of all the cases was done till the desired duration of study.

Variables

Exposures

Institutional/home delivery, mode of delivery, delivery or abortion by trained or untrained personnel, comorbidities like Anemia, Hypertensive disorders of pregnancy, heart disease, intra-uterine fetal demise.

Predictors

Age, parity, booked/un-booked status, complications at the time of presentation like peritonitis, septic shock, end organ failure, multi-organ dysfunction syndrome, conservative or surgical management.

Outcomes

Maternal morbidity and mortality.

Data sources

The present study was conducted as per the strengthening the reporting of observational studies in epidemiology (STROBE) statement. After proper institutional ethical committee approval and informed written consent in their language from participants fulfilling inclusion criteria, various socio-demographic features like age, parity, antecedent pregnancy/abortion details, mode of delivery, post-delivery or post-abortion day at the time of presentation, any predisposing factors, booked/un-booked

status, delivery/abortion conducted by trained or untrained person, place of delivery, co-morbidities were recorded on a preformed data collection sheet by a trained nursing staff. The presenting clinical features including fever, abdominal pain, foul-smelling vaginal discharge or bleeding, etc. were recorded on the datasheet followed by a thorough general and physical examination for features of peritonitis, abdominal distention, organ injuries, single or multiple organ failure or shock. Detailed medical and family history of all the participants along with their vitals and routine investigations were also recorded.

The data thus obtained was analyzed to know the overall maternal outcome including maternal morbidity and mortality and various risk factors predisposing to the poor maternal outcome.

Study size

A total of sixty-six (66) women with features of severe puerperal sepsis were enrolled in the study. This study size was achieved by consecutive sampling of all cases for a duration of eight months enrolling all the cases with severe puerperal sepsis from 1st January to 31st July 2018.

Statistical analysis

The data was statistically analyzed by statistical package for the social sciences (SPSS) software version 22.0. The numerical data were presented as mean±standard deviation (SD) and categorical variables as frequencies or rates where ever needed. ANOVA/kruskal wallis test was used for comparison of more than two groups and the Chi-Square test was for a comparison of qualitative variables. A p-value of <0.05 was considered statistically significant.

RESULTS

Participants

Out of total 2,596 admissions in the department of Obstetrics and Gynecology, 66 had severe puerperal sepsis, which is 2.5%.

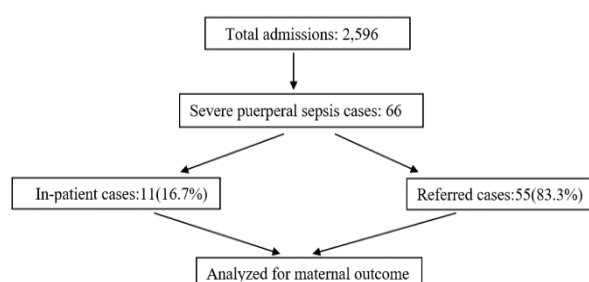


Figure 1: Flow chart depicting the distribution of puerperal sepsis cases and their analysis.

Table 1: Socio-demographic features.

Parameter	N (%)	Relative risk (RR)
Age (years)		
≤20	02 (3.0)	-
21-30	57 (86.4)	
>30	07 (10.6)	
Parity		
Nulliparous	25 (37.9)	1.64
Multiparous	41 (62.1)	
Booking status		
Booked	11 (16.7)	5.00
Referred	55 (83.3)	
Place of delivery/abortion		
Institutional	44 (66.7)	0.50
Home	22 (33.3)	
Person conducting delivery/abortion		
Trained	44 (66.7)	0.50
Un-trained	22 (33.3)	
Mode of delivery		
Vaginal	28 (42.4)	-
Cesarean	22 (33.3)	
Instrumental	01 (1.5)	
Abortions		
First trimester	08 (12.1)	1.14
Second Trimester	07 (10.6)	
Precipitating Factors		
Anemia	63 (95.5)	21.0
Retained Placenta	05 (7.6)	0.08
Retained Products of Conception	03 (4.5)	0.05
Unsafe practice	24 (36.4)	0.14
Intrauterine fetal demise	06 (9.1)	0.10
Mop left inside abdominal cavity	04 (6.1)	0.07
Co-morbidities		
Anemia	63 (95.5)	21.0
Hypertension	03 (4.5)	0.05
Tuberculosis	04 (6.1)	0.06
Hepatitis	03 (4.5)	0.05
Heart disease	02 (3.0)	0.03

Descriptive data

Most (86.4%) of these cases belonged to 21-30 years age group with average ($\pm$ SD) age of all the cases 25.42 ± 4.004 years and were multiparous (62.1%). The majority of them had vaginal delivery 28 (42.4%), followed by cesarean section 22 (33.3%) and one (1.5%) case of instrumental delivery. There was a total of 15 (22.7%) cases of abortions, eight (53.3%) first trimester and seven (46.7%) second-trimester abortions respectively. The average ($\pm$ SD) days after which the cases presented was 8.53 ± 5.27 with the majority of cases (39.4%) presenting between 0-5 days after delivery or

abortion. The various socio-demographic features are depicted in (Table 1).

Outcome data

All the patients (100%) presented with high-grade fever (101.3°F), tachycardia, breathlessness, and foul-smelling vaginal discharge at the time of admission. Of total 66 cases, 35(53.0%) presented with abdominal distention, 11 (16.7%) with scar site infection, 11 (16.7%) had vaginal or per rectal bleeding, 18(27.3%) presented with features of peritonitis (abdominal pain with distention, guarding

and rigidity on palpation) and eight (12.1%) had septic shock at the time of presentation. Of all the cases, 10 (15.2%) patients developed end-organ failure due to sepsis, seven (10.6%) developed multi-organ dysfunction syndrome (MODS), 16 (24.2%) had organ injuries [ten (62.5%) had single organ and six (37.5%) multiple organ injuries (uterus, bowel and or ureteric)]. Eighteen (27.2%) patients required intubation and ventilatory support at the time of admission. The correlation of need for ventilatory support in women with severe puerperal sepsis and various risk factors and maternal outcome is depicted in (Table 2).

Table 2: Univariate analysis of severe maternal morbidity (ventilatory support) with various factors.

Parameter	Need for Ventilator and HDU*		Total	Chi-square test	P value	Odds ratio	95% CI
	No (n=48)	Yes (n=18)					
Age (years)							
<30	44 (74.6)	15 (25.4)	59 (89.4)	0.96	0.33	0.45	0.09-2.27
>30	04 (57.1)	03 (42.9)	07 (10.6)				
Parity							
Nulliparous	18 (72.0)	07 (28.0)	25 (37.9)	0.01	0.92	1.07	0.35-3.23
Multiparous	30 (73.2)	11 (26.8)	41 (62.1)				
Abortion							
1st Trimester	07 (87.5)	01 (12.5)	08 (12.1)	0.01	0.92	0.86	0.04-16.85
2nd Trimester	06 (85.7)	01 (14.3)	07 (10.6)				
Mode of delivery							
Vaginal delivery	16 (57.1)	12 (42.9)	28 (42.4)	7.12	0.03	-	-
Cesarean section	19 (86.4)	03 (13.6)	21 (33.3)				
Instrumental delivery	00 (0)	01 (100)	01 (1.5)				
Post-delivery/abortion day at presentation							
<10 days	29 (67.4)	14 (32.6)	43 (65.2)	1.74	0.19	2.29	0.65-8.03
>10 days	19 (82.6)	04 (17.4)	23 (34.8)				
Booking status							
Booked	09 (81.8)	02 (18.2)	11 (16.7)	0.55	0.46	1.85	0.36-9.51
Referred	39 (70.9)	16 (29.1)	55 (83.3)				
Place of delivery/abortion							
Institution	32 (72.7)	12 (27.3)	44 (66.7)	0.00	1.00	1.00	0.31-3.15
Home	16 (72.7)	06 (27.3)	22 (33.3)				
Person conducting delivery/abortion							
Trained	32 (72.7)	12 (27.3)	44 (66.7)	0.00	1.00	1.00	0.31-3.16
Untrained	16 (72.7)	06 (27.3)	22 (33.3)				
Co-morbidities							
Anemia	46 (73.0)	17 (27.0)	63 (95.4)	0.06	0.81	1.35	0.06-8.68
Moderate anemia	30 (78.9)	08 (21.1)	38 (60.3)	1.75	0.19	0.48	0.16-1.44
Severe anemia	13 (65.0)	07 (35.0)	20 (31.7)	0.86	0.35	1.71	0.54-5.36
Very severe anemia	03 (60.0)	02 (40.0)	05 (7.9)	0.44	0.51	1.87	0.28-12.26
TB	04 (100)	00 (0)	04 (6.1)	1.59	0.21	-	-
Hepatitis	02 (66.7)	01 (33.3)	03 (4.5)	0.06	0.81	1.35	0.14-15.90
Hypertensive disorders of Pregnancy	00 (0)	03 (100.0)	03 (4.5)	8.38	0.02	-	-
Cardiomyopathy	01 (50.0)	01 (50.0)	02 (3.0)	0.54	0.46	2.76	0.16-46.7
Complications							
Abdominal distention	30 (85.7)	05 (14.3)	35 (53.0)	6.34	0.01	0.23	0.07-0.75
Peritonitis	15 (83.3)	03 (16.7)	18 (27.3)	1.40	0.24	0.44	0.11-1.75
Septic Shock	02 (25.0)	06 (75.0)	08 (12.1)	10.45	0.00	11.50	2.06-64.34

Continued.

End organ failure	06 (60.0)	04 (40.0)	10 (15.2)	0.96	0.33	2.00	0.49-8.13
Multi-organ dysfunction syndrome	00 (0)	07 (100)	07 (10.6)	20.88	0.00	-	-
Management							
Surgical	32 (84.2)	06 (15.8)	38 (57.6)	5.96	0.01	0.25	0.08-0.79
Conservative	16 (57.1)	12 (42.9)	28 (42.4)				
Surgical Management							
Hysterectomy	03 (75.0)	01 (25.0)	04 (6.1)	0.28	0.59	1.93	0.16-22.49
Hysterectomy+bowel repair	05 (83.3)	01 (16.7)	06 (9.1)	0.00	0.95	1.08	0.10-11.32
Hysterectomy with ureteric reconstruction	01 (100)	00 (0)	01 (1.5)	5.47	0.16	-	-
Uterine repair	02 (100)	00 (0)	02 (3.0)	0.39	0.52	-	-
Uterine repair+ileostomy	02 (100)	00 (0)	02 (3.0)	0.39	0.52	-	-
Ileostomy	02 (66.7)	01 (33.3)	03 (4.5)	0.75	0.38	3.00	0.23-9.61
Abdominal wound repair	01 (100)	00 (0)	01 (1.5)	0.19	0.66	-	-
Dilatation and evacuation	04 (100)	00 (0)	04 (6.1)	0.84	0.36	-	-
Pyometra drainage	01 (50.0)	01 (50.0)	02 (3.0)	1.86	0.17	6.20	0.22-15.9
Abdominal wash	08 (88.9)	01 (11.1)	09 (13.6)	0.19	0.66	0.6	0.06-5.93
Mop removal from abdominal cavity	04 (100)	00 (0)	04 (6.1)	0.84	0.36	-	-
Maternal mortality							
Yes	02 (13.3)	13 (86.7)	15 (22.7)	34.52	0.00	59.8	10.37-344.37
No	46 (90.2)	05 (9.8)	51 (77.2)				

*HDU: High Dependency Unit

Table 3: Maternal mortality in women with severe puerperal sepsis and its correlation with various factors.

Parameter	Survived (n=51)	Expired (n=15)	Total	Chi- square test	P value	Odds ratio	95% CI
Age (years)							
<30	45 (76.3)	14 (23.7)	59 (89.4)	0.32	0.57	1.87	0.21-6.85
>30	06 (85.7)	01 (14.3)	07 (10.6)				
Parity							
Nulliparous	17 (68.0)	08 (32.0)	25 (37.9)	1.97	0.23	2.29	0.71-7.36
Multiparous	34 (82.9)	07 (20.6)	41 (62.1)				
Abortion							
1st Trimester	07 (87.5)	01 (12.5)	08 (12.1)	0.94	0.33	-	-
2nd Trimester	07 (100)	00 (0)	07 (10.6)				
Mode of delivery							
Vaginal delivery	18 (64.3)	10 (35.7)	28 (42.4)	5.71	0.06	-	-
Cesarean section	19 (90.5)	03 (14.3)	21 (33.3)				
Instrumental delivery	00 (0)	01 (100)	01 (1.5)				
Post-delivery/abortion day at presentation							
<10 days	31 (72.1)	12 (27.9)	43 (65.2)	1.85	0.17	2.58	0.65-0.30
>10 days	20 (86.9)	03 (1.3)	23 (34.8)				
Booking status							
Booked	10 (90.9)	01 (9.1)	11 (16.7)	1.39	0.24	3.42	0.40-9.11
Referred	41 (74.5)	14 (25.5)	55 (83.3)				
Place of delivery/abortion							
Institution	33 (75.0)	11 (25.0)	44 (66.7)	0.39	0.53	0.67	0.18-2.40
Home	18 (81.8)	04 (18.2)	22 (33.3)				
Person conducting delivery/abortion							
Trained	33 (75.0)	11 (25.0)	44 (66.7)	0.39	0.53	0.67	0.18-2.40
Untrained	18 (81.8)	04 (18.2)	22 (33.3)				
Co-morbidities							

Continued.

Parameter	Survived (n=51)	Expired (n=15)	Total	Chi- square test	P value	Odds ratio	95% CI
Anemia	49 (77.8)	14 (22.2)	63 (95.4)	0.20	0.65	0.57	0.05-6.78
Moderate anemia	33 (86.8)	05 (13.2)	38 (60.3)	4.67	0.0	0.2	0.08-0.92
Severe anemia	12 (60.0)	08 (40.0)	20 (31.7)	4.88	0.03	3.71	1.12-2.37
Very severe anemia	04 (80.0)	01 (20.0)	05 (7.9)	0.23	0.88	0.84	0.09-8.13
TB	04 (100)	00 (0)	04 (6.1)	1.25	0.26	-	-
Hepatitis	02 (66.7)	01 (33.3)	03 (4.5)	0.21	0.65	1.75	0.15-0.75
Hypertensive disorders of Pregnancy	01 (33.3)	02 (66.7)	03 (4.5)	3.45	0.13	7.692	0.65-1.56
Cardiomyopathy	00 (0)	02 (100)	02 (3.0)	7.01	0.05	-	-
Complications							
Abdominal distention	31 (88.6)	04 (11.4)	35 (53.0)	5.42	0.04	0.24	0.06-0.84
Peritonitis	16 (88.9)	02 (11.1)	18 (27.3)	1.90	0.17	0.34	0.07-1.67
Septic Shock	04 (50.0)	04 (50.0)	08 (12.1)	3.86	0.07	4.27	0.92-9.80
End organ failure	07 (70.0)	03 (30.0)	10 (15.2)	0.36	0.55	1.57	0.35-7.01
Multi-organ dysfunction syndrome	00 (0)	07 (100)	07 (10.6)	26.62	0.00	-	-
Management							
Surgical	34 (89.5)	04 (10.5)	38 (57.6)	7.59	0.008	0.18	0.05-0.66
Conservative	17 (60.7)	11 (39.3)	28 (42.4)				
Surgical management							
Hysterectomy	03 (75.0)	01 (25.0)	04 (6.1)	0.99	0.32	3.44	0.26-4.32
Hysterectomy+bowel repair	05 (83.3)	01 (16.7)	06 (9.1)	0.29	0.59	1.93	0.16-2.49
Hysterectomy with ureteric reconstruction	01 (100)	00 (0)	01 (1.5)	0.12	0.73	-	-
Uterine repair	02 (100)	00 (0)	02 (3.0)	0.25	0.62	-	-
Uterine repair+ileostomy	02 (100)	00 (0)	02 (3.0)	0.25	0.62	-	-
Ileostomy	03 (100)	00 (0)	03 (4.5)	0.38	0.54	-	-
Abdominal wound repair	01 (100)	00 (0)	01 (1.5)	0.12	0.73	-	-
Dilatation and evacuation	04 (100)	00 (0)	04 (6.1)	0.53	0.47	-	-
Pyometra drainage	01 (50.0)	01 (50.0)	02 (3.0)	3.49	0.06	-	-
Abdominal wash	08 (88.9)	01 (11.1)	09 (13.6)	0.004	0.95	1.08	0.09-1.92
Mop removal from abdominal cavity	04 (100)	00 (0)	04 (6.1)	0.53	0.47	-	-

There were 15 (22.7%) women who could not be revived after all efforts and succumbed to death due to complications of severe puerperal sepsis. The most common predisposing factor observed was anemia (95.5%) followed by unsafe delivery practices (36.4%). Surgical management was required in 57.6% of cases. The overall maternal outcome and its correlation with various risk factors are depicted in (Table 3).

Main results

The multivariate analysis of need for ventilatory support in women with severe puerperal sepsis with various risk factors and overall maternal outcome revealed that women presenting with features of septic shock were 12.8 times more prone for high dependency unit (HDU) admission and need for ventilation ($p=0.03$, 95%, CI:1.2-136.79). Furthermore, women on ventilatory support were 46.8 times more at risk of dying as compared to those not requiring ventilatory support ($p=0.00$, 95% CI:6.35-345.28). Other risk factors were not found to be

significantly correlated with maternal death on multivariate analysis of maternal death with various risk factors.

DISCUSSION

Puerperal sepsis is one of the common and preventable causes of maternal morbidity and mortality all over the world, especially in developing countries like India. In the present study, we observed that 2.5% of all the admissions in the Obstetric ward had severe puerperal sepsis. Most of the patients (86.4%) belonged to 21-30 years of age group and 62.1% were multiparous. The most common mode of delivery in antecedent pregnancy was vaginal delivery (42.4%) followed by cesarean section (33.3%). The majority (83.3%) of these cases were referred from outside and delivered either at home or peripheral hospitals and most of them (39.4%) presented between 0-5 days post-delivery or abortion. This was similar to the results of a recent study which also observed that the overall incidence of puerperal

sepsis in their institution was 2.5% and most of the women with sepsis belonged to 20-30 years of age group and were multigravidas. Most of the cases (94%) were referred from outside after delivery at home or from peripheral centers. In their study, the most common mode of delivery from antecedent pregnancy was cesarean section and the majority of them presented within first 72 hours of delivery, with chief complaints of fever (100%), abdominal pain (70%), foul-smelling vaginal discharge and abdominal distension (64%). This was similar to our observations. Another similar study also reported that most of the women with puerperal sepsis (65.11%) were 31 years of age and multiparous (78.29%). Around 75.96% were un-booked and referred from outside. The most common mode of delivery was vaginal (60.46%).¹⁰ A recent study also reported the same findings that puerperal sepsis was more common in un-booked patients (76%), women between 21-30 years of age (66%), multiparous (78%) and was associated with anemia (68%).¹¹ Similar results were reported by another study conducted in Ethiopia which also found that maximum cases of puerperal sepsis belonged to 25-29 years of age group, were multiparous, referred from outside and had a spontaneous vaginal delivery.¹²

In our study the most common presenting features were fever (100%), tachycardia (100%), breathlessness (100%), foul-smelling vaginal discharge (100%), abdominal distention (53.0%), scar site infection (16.7%), vaginal or per rectal bleeding (16.7%), features of peritonitis (27.3%), septic shock (12.1%). Around 15.2% patients developed end-organ failure, 10.6% MODS, 27.3% uterine perforation, 3.0% bowel injuries and 1.5% had ureteric injury. A similar study also reported that the chief presenting symptoms were fever (90.69%), wound infection (39.53%), and abdominal distention (21.70%). Serious complications including septicemia (27.13%) disseminated intravascular coagulation (17.82%) were observed and 11 (8.52%) women died of puerperal sepsis, indicating very high morbidity and mortality associated with this condition.¹⁰

The most common risk factor associated with severe puerperal sepsis in this study was anemia. It was associated with 95.5% of all cases, furthermore, it was significantly associated with increased risk of maternal morbidity and mortality. Around 60.3% had moderate anemia, 31.7% severe and 7.9% very severe anemia at the time of presentation. This was similar to the results of a study which also reported that anemia was one of the most common risk factors associated with puerperal sepsis.¹⁰ Centre for maternal and child enquiries (CMACE) conducted a study to know the causes for maternal death in the United Kingdom also reported that anemia is one of the common risk factors for puerperal sepsis in addition to obesity, impaired immunity, diabetes.⁹ Another similar study also reported that the common predisposing factors for puerperal sepsis include un-booked status, cesarean section, anemia, repeated vaginal examination and prolonged rupture of

membranes.¹³ Similar results were reported by other studies also.¹⁴

In the present study majority (57.6%) of the patients were managed surgically with 6.1% requiring hysterectomy alone, 9.1% hysterectomy with bowel repair, 3.0% uterine repair, 6.1% underwent removal of mop from abdominal cavity, 13.6% abdominal wash only, etc. Similar results were reported by another study also where majority of puerperal cases were managed surgically (75%).¹⁴

In the present study out of a total of 66 patients with severe puerperal sepsis 27.3% required ventilatory support and 22.7% could not be revived and succumbed to death, leading to the very high maternal mortality rate from puerperal sepsis. Similar results were reported by another study which also observed that puerperal sepsis was associated with a high incidence of Intensive care unit admission (73%), intubation and maternal mortality. Around 85% of women succumbed to death due to multi-organ failure (24%) and pulmonary edema (36%) resulting from sepsis.¹⁴ Another study also reported that puerperal sepsis was associated with increased risk of mortality (78%), mechanical ventilation (54%) and need for intensive care unit admission and advanced life support (7%).¹⁵ Another recent study has reported that puerperal sepsis (30.9 %) is the most common cause of maternal mortality followed by obstetric hemorrhage (21.6 %) and hypertensive disorders in pregnancy (14.4 %).¹⁶ A systematic analysis carried out between 2003 and 2009 by WHO also reported that hemorrhage, hypertensive disorders, and sepsis were major causes of maternal mortality and responsible for more than half of maternal deaths worldwide.³

Limitations

The present study was conducted for a shorter duration and included only those patients who had features of severe puerperal sepsis. Also, we didn't include all those cases which were managed at private hospitals. In the future we can plan to conduct the study over a longer duration including all cases of puerperal sepsis and a multicentric study, covering all nearby hospitals. We can also try to find out other reasons like the impact of socio-economic status, regular antenatal check-up, literacy, etc. on the incidence of puerperal sepsis. Furthermore, we will try to follow these patients for any long-term complications.

CONCLUSION

Hence, puerperal sepsis is one of the preventable causes of high maternal morbidity and mortality especially in developing countries like India. It can be prevented to a large extent by creating awareness amongst people about the need for regular antenatal check-ups throughout pregnancy, adequate dietary intake, regular Iron supplementation, to prevent the development of anemia, hospital deliveries, and proper hygiene during the

puerperal period and training of midwives and trained birth attendants for proper sterilization techniques. All antenatal women should be made aware of the warning signs and symptoms in the puerperal period, so that they can report early to the hospital for better intervention, thereby reducing maternal morbidity and mortality.

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