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Original Research Article

Clinicopathological study of puerperal sepsis including microbiological profile: at a tertiary health care centre

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ABSTRACT

Background: Puerperal sepsis in developing countries is a major health problem. Antenatal and labour related risk factors play a huge role in causing puerperal sepsis, many of which are modifiable. The aim of the present study is to study the risk factors, clinical features and outcomes of puerperal sepsis in the mother and determine the causative microorganisms involved.
Methods: A prospective observational study was conducted at the department of Obstetrics and Gynaecology, Assam Medical college and Hospital from 1st July 2016 to 30th June 2017.Peurperal sepsis cases were identified based on the WHO clinical definition. A total of 88 patients were identified. Information regarding occupation, antenatal care, delivery related events and outcome were recorded on a predesigned proforma. Mothers were followed up till discharge from the hospital.
Results: Out of 88 clinically diagnosed patients with puerperal sepsis, common risk factors associated with mortality were young age($p<0.001$),primiparity(p 0.005),tea garden workers(p 0.014),few antenatal check-ups and unbooked status (p 0.001) inadequate iron prophylaxis .Among labor related events intrauterine fetal demise (p 0.001), absent membranes on admission (0.001),late presentation (p 0.001) delivery by untrained birth attendant ($p <0.001$) were significant.24 patients expired due to the disease. Most common isolated in high vaginal swab and blood culture were *Klebsiella pneumoniae* and CONS respectively.
Conclusions: Proper antenatal care and institutional deliveries are the prime and only preventive measure to reduce the burden of puerperal sepsis in our setup.

Keywords: Microorganisms, Outcomes, Peurperal sepsis, Risk factors, Tertiary institute

INTRODUCTION

Motherhood is a distinct bio-psychosocial process that transforms and broadens the role of a woman into that of a mother. Peurperium is a period, where the experiences are intense physical and emotional stress due to exhaustion, anxiety and excitement.

In the oldest Japanese classic tale, Kojiki, the goddess Izanami no Mikoto, one of the creators of Japan, was killed by her last son, Kagutsuchi, a deity of fire who burned his mother's birth canal. It is proposed that this tale reflects the incidence of local puerperal infection and subsequent sepsis, the greatest health risk to mothers in ancient Japan.[1] Hippocratic writings contain references to childbed fever, as do some Hindu texts dating back to 1500 BC. Moreover the potential for birth attendants to initiate such infections seemed evident in some of the ancient writings, including those by the Greek physician Soranus and the Hindus as advice was offered on hygiene for the birth attendants.[2-4] It is responsible for approximately 10% of maternal deaths in Africa and

Asia.[5,6] According to reports of WHO, puerperal sepsis has been stated to be the second leading cause of maternal mortality in developing countries.[7]

With the above background the present study was carried out with a dedicated approach to find out the risk factors, clinical features and outcomes for puerperal sepsis and also to determine the exact pathogenic organisms with their antibiotic susceptibility in the Department of Obstetrics and Gynaecology in Assam Medical College and Hospital, Dibrugarh.

METHODS

The prospective observational study was carried out at Assam Medical College and Hospital, Dibrugarh with the following aims and objectives:

- To study the risk factors, clinical features and outcomes of puerperal sepsis in the mother.
- To identify the pathological microorganisms of puerperal sepsis and their sensitivity to antimicrobials.

The study was carried out in the Department of Obstetrics and Gynecology, Assam Medical College and Hospital, Dibrugarh, during the period commencing from 1st July 2016 to 30th June 2017.

A total of 88 patients were identified to have peurperal sepsis as per the WHO working definition. The inclusion criteria included all women presenting to the Department of Obstetrics and Gynaecology AMCH, for the concerned study period for labour and related issues and meeting the WHO criteria for the puerperal sepsis.

WHO case definition of Peurperal Sepsis

Infection of the genital tract occurring at any time between the rupture of membranes or labour and 42 days postpartum in which fever and one or more of the following are present[8]:

- Pelvic Pain.
- Abnormal vaginal discharge e.g. presence of pus
- Abnormal smell/foul odour of discharge
- Delay in the rate of reduction of size of the uterus (<2cm /day during the first 8 days)

Exclusion criteria

- Pre-existing infection prior to labour or rupture of membranes.
- Malaria and typhoid fever.
- Pyrexia due to causes other than due to genital tract sepsis or birth process
- Any major medical illness.

Formats for case taking were made accordingly to facilitate accurate evaluations, interpretations and observations from the study.

After the cervical swab/high vaginal swab was taken, empirical antibiotics were then administered. Once the culture reports are available the antibiotics were changed accordingly. Blood cultures were taken as and only when deemed necessary. Wound swab was taken in infected wounds.

RESULTS

A total of 88 patients were selected based on the WHO criteria for puerperal sepsis. Majority of the women were of the 20-25 years age group and were primigravidae as shown in Figure 1 and 2. Tea Garden workers accounted for 78.4% of the patients.

As seen in the antenatal characteristics shown in Fig 3, 24 women were unbooked and 39 women did not have the basic 2 doses of TT immunisations.88% of women did not have the mandatory 100 tablets of iron and folic acid supplements in pregnancy. Foul smelling discharge was the most common symptom in these women,26 % of women were delivered by untrained birth attendant as shown in Figure 9.

Mortality was seen in 24 women. *Klebsiella pneumonia* and CONS and Enterococcus were the most common organism isolated on high vaginal swab and blood culture respectively as shown in figure 11 and 13. It was observed from the Figure 1, the highest number of cases were noted in the 20-25 years of age group (60.23%) followed by <20 years of age group (28.41%).

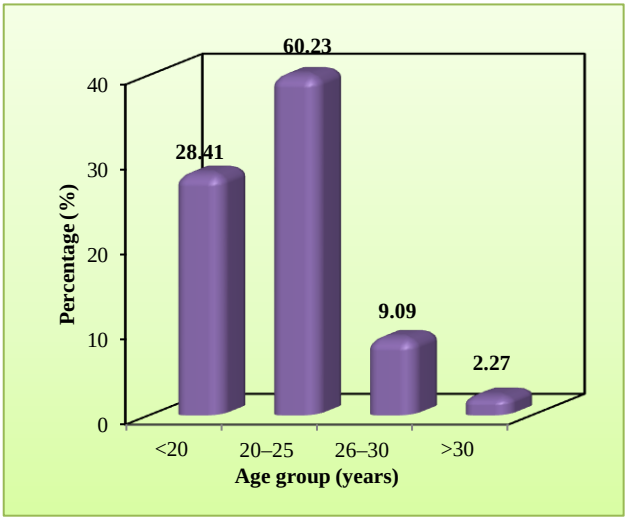


Figure 1: Age distribution of various patients in the study

Primigravidae accounted for 75% of cases whereas multigravida accounted for the remaining 25% of cases as shown in Figure 2.

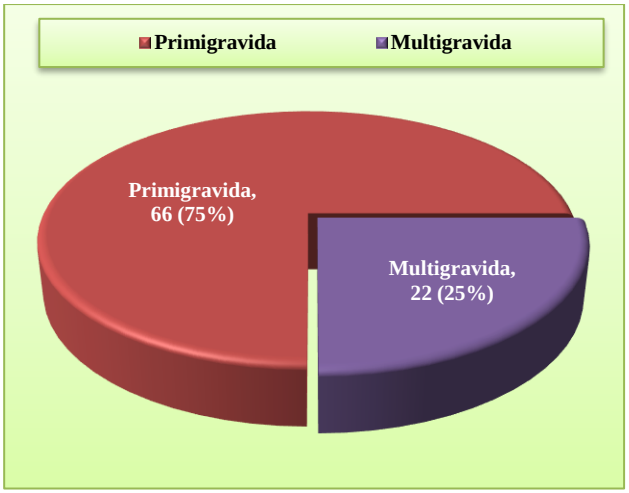


Figure 2: Primiparity and multiparity based classification of the patients.

In the study a total of 64 cases (72.73%) were booked cases i.e. had the basic recommended 4 antenatal visits.24 cases had fewer than four antenatal visits with 7 cases (7%) having no antenatal checkup of any sort.39 cases had not taken the recommended 2 antenatal TT toxoid doses.88% of the cases (78) did not taken the recommended iron supplements as shown in the Figure 3.

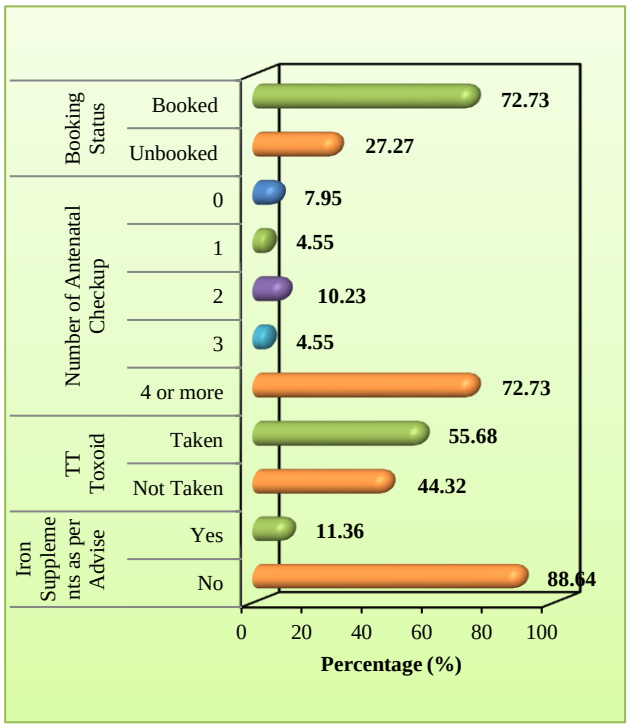
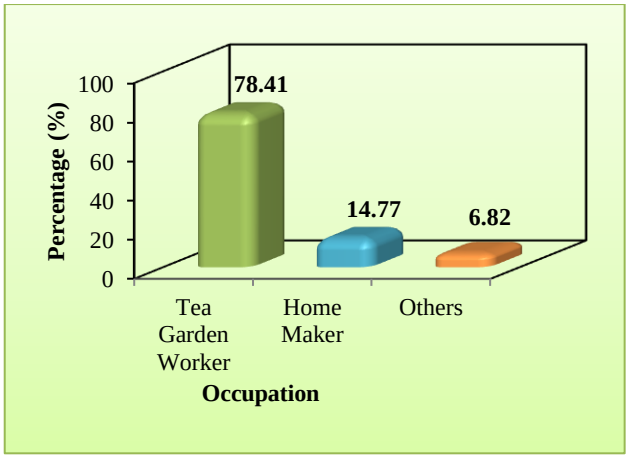
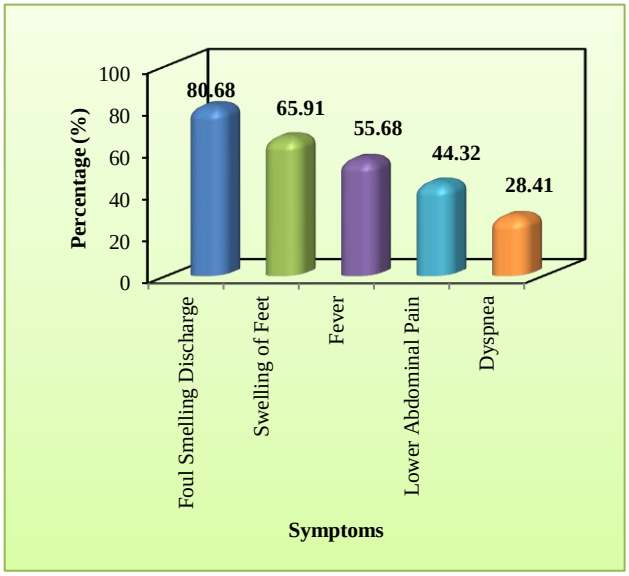


Figure 3: Antenatal characteristics of the various patients.

Tea Garden workers accounted for the majority of the cases (78.41%).13 cases were found to be home makers as shown in Figure 4.



It was observed in the study that the most common symptom of presentation was foul smelling discharge accounting for 71 cases (80.68%) followed by swelling of feet (65.91%), fever (68%), lower abdominal pain (44.32%) and dyspnea (28.41%) as shown in Figure 5.



As shown in Figure 6 on examination odema was seen in 76 cases (86.36%). Foul smelling discharge and anemia were also commonly seen 80 and 79% of cases respectively. Least common noted was subinvolution of uterus as seen in 17 cases. Hypertension were noted in 22.73% of cases. In the study most of the patients (79%) presented early on day 1 of the illness.11 patients (12.5%) presented late on or after day 3 of the illness as shown in Figure 7.

As shown in Figure 8 55 cases were associated with a prolonged hospital stay of 7 days or more. As seen in the study labor was induced in 9 cases (10%). Membranes were intact in 54 cases whereas membranes were absent in 32 cases. Intrauterine fetal death was seen in 32 cases (36.36%). Vaginal and caesarean section accounted for 46 cases and 41 cases respectively.27 cases delivered at home and were delivered by a family member in 23 cases

and by a trained birth attendant in 4 cases as shown in Figure 9.

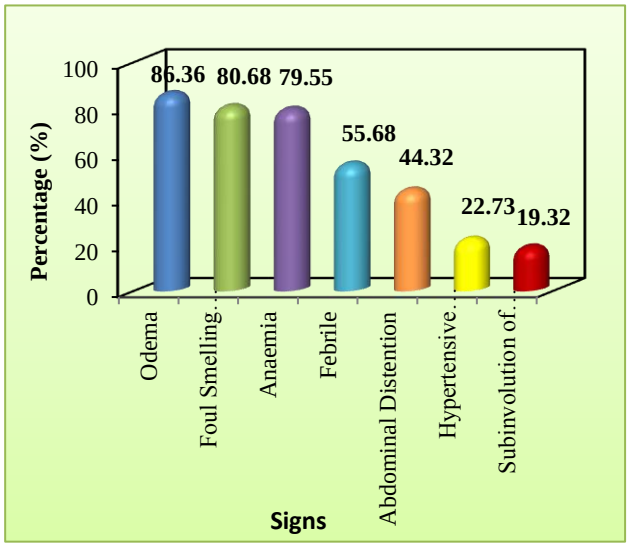


Figure 6: The various signs observed in various patients.

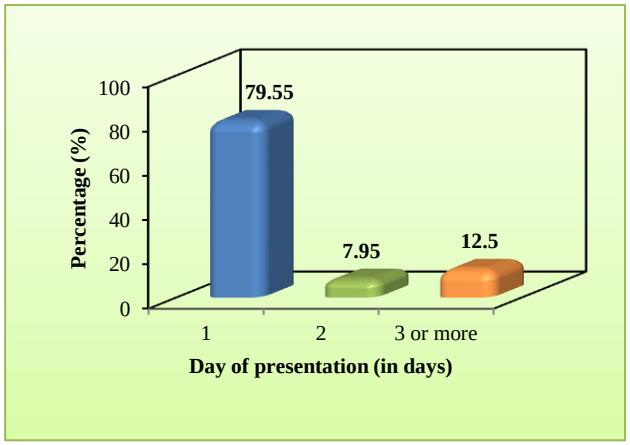


Figure 7: Day of presentation of various patients.

As shown in Figure 10, 24 cases had expired in total (27% of cases).72% of cases (64 cases) successfully recovered. In the study *Kleibsiella pneumoniaee* was the most common organism isolated in high vaginal swab i.e. in 22.73% of cases followed by CONS in 14 cases (15.91%). No organisms were seen in 32 cases (36.36%) as shown in Figure 11.

Septicemia was the most common cause of death (21 cases), acute kidney injury, anemia and cardiac failure accounted for the deaths in one case each as shown in Figure 12. However, in blood culture reports CONS was most commonly seen in 17.05% of cases followed by Enterococcus in 15.91% of cases. A sterile blood culture report was observed in 56 cases as shown in Figure 13.

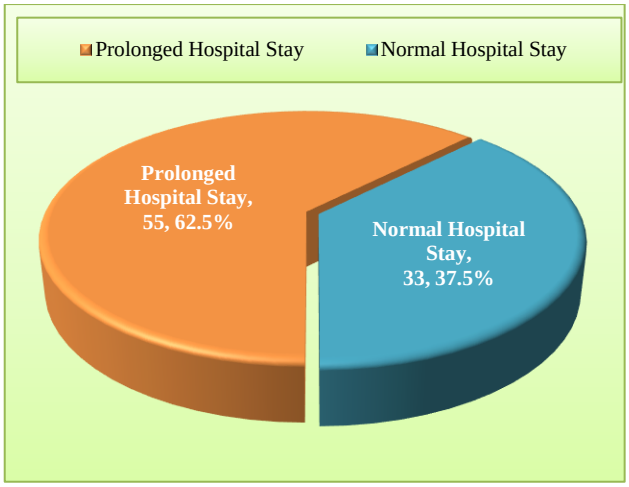


Figure 8: Proportion of patients having a prolonged hospital stay beyond 8 days.

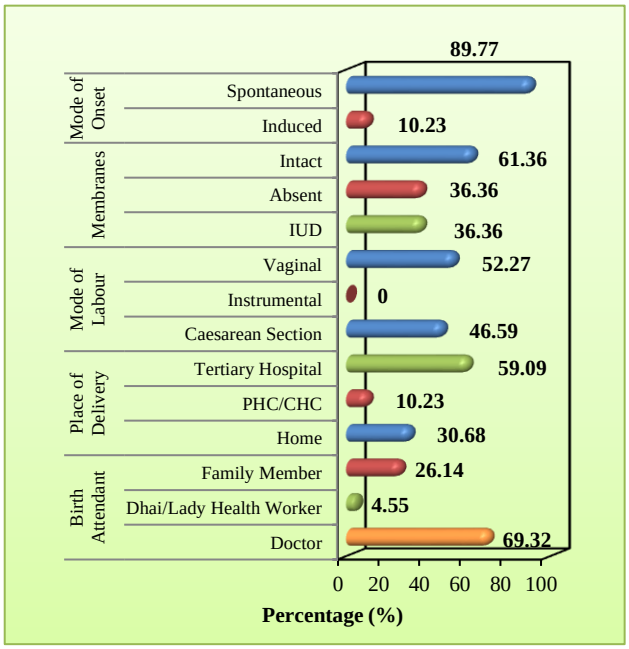


Figure 9: Figure showing the various characteristics of the labor events of the patients.

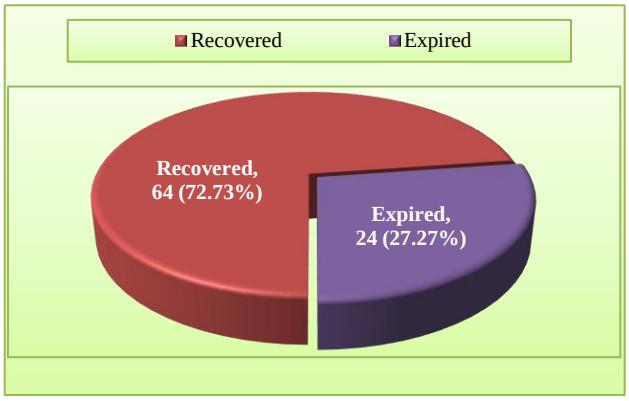


Figure 10: Figure showing outcome of the patients with respect to mortality

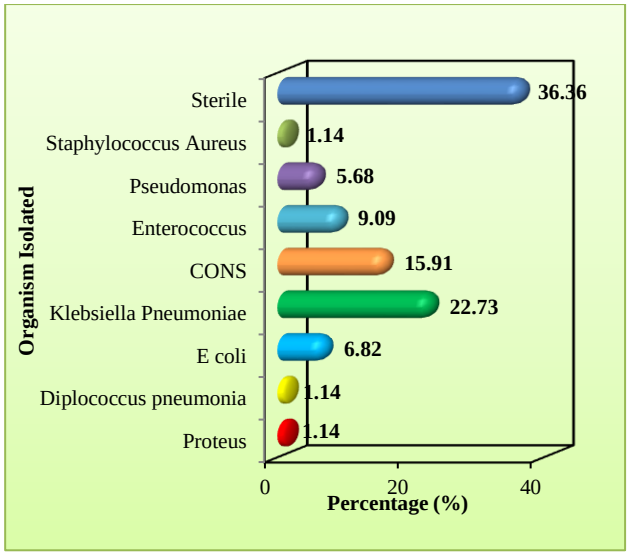


Figure 11- Figure showing organisms isolated in the high vaginal swab.

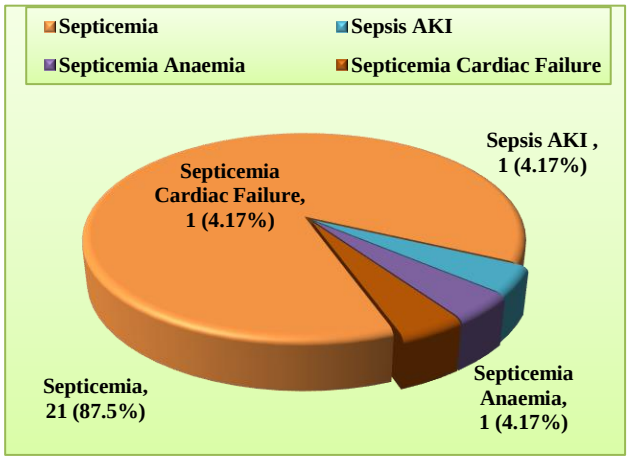


Figure 12: Cause of death

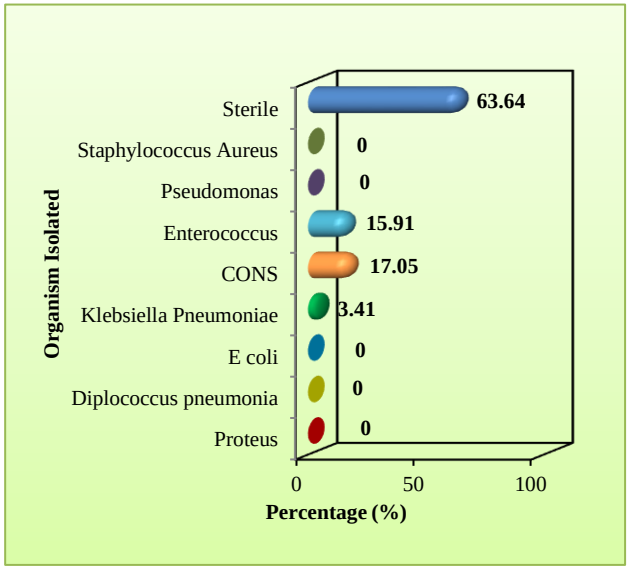


Figure 13: Organism isolated in blood culture

DISCUSSION

Majority of the patients belonged to the age group of 20-25 years. Teenage pregnancies accounted for 28.41% of total number of cases. This was also seen in recent studies done by Fernandez, Madhudas C, Al-Ostad, Rocca et al, Khaskheli MN, Bauer ME, Shamshad (66% in age group of 15-25 years), Tamboli et al.[7,9-15] This reflects an early age of marriage in the Indian subcontinent. Most of these patients are unbooked with no prior antenatal supervision, having delivered at home or in outside hospitals hailing from low socioeconomic status.

Table 1: Test of significance of various factors involved in puerperal sepsis

Variables	P value	Significance
Age <20 years	<0.001	Extremely statistically significant
Primiparity	0.005	Statistically significant
Tea garden workers	0.014	Statistically significant
Unbooked cases	0.001	Extremely statistically significant
<4 antenatal check-ups	0.001	Extremely statistically significant
Tetanus toxoid not taken	0.001	Extremely statistically significant
Iron supplements not taken	0.14	Not significant
Late presentation	0.001	Extremely statistically significant
Induced labor	0.25	Not significant
Absent membranes	0.001	Extremely statistically significant
Intrauterine fetal demise	0.001	Extremely statistically significant
Caesarean delivery	<0.05	Not quite statistically significant
Home delivery	<0.05	Not quite statistically significant
Untrained birth attendant	<0.001	Extremely statistically significant
Organism isolated on High vaginal swab	0.008	Extremely statistically significant
Organism isolated on blood culture	0.008	Extremely statistically significant

Primigravidae accounted for 75% of cases with multigravidae accounting for 25% of cases, the reason being young inexperienced mothers land up in the hands of traditional birth attendants and mostly deliver outside health facility due to lack of education regarding health care, antenatal visits and delivery in well-equipped medical facilities. They are unfamiliar with the process of labour, its length and complications hence undergo trials in various hands before reaching the health facility.[16] Shamshad et al also reported low parity (63%) to be significantly associated with sepsis.[14] Kaur et al also reported primigravidae to be significant.[17] Bako in Nigeria 18 too showed primi to be a risk factor.[18] Pradhan et al in Nepal also found primigravida to be associated with increased puerperal sepsis.[19]

Authors found maximum number of cases (78.4%) to be tea garden workers with homemakers being second most common accounting for 14% of cases. This is evident from the fact that most of these daily wage workers are unable to afford the cost of health facilities. For many women poverty combines with cultural constraints that build a social wall around them where health care facilities and personnel cannot reach.[16] Many consider birth to be a physiological process hence prefers a home delivery where the eldest member conducts and controls the delivery. This is also reported in study conducted by Khaskheli et al in Pakistan.[12] Other studies done by Shamshad et al and Tamboli et al also showed low socioeconomic status to be significant.[14,15]

Membranes were absent in 32 cases. Absent membranes usually signify increased chance of ascending infection from the vagina to the uterine cavity. This was also seen in studies conducted by Khaskheli et al.[12] Home delivery is related to the triad of poverty, illiteracy and social constraints. Traditional birth attendants do not practice aseptic measures like hand washing and antiseptic delivery techniques.[12] Shamshad et al showed up to 50% of puerperal sepsis cases are delivered by untrained attendants.[14] Meharun Nissa et al showed 74% of puerperal sepsis patients to be either mismanaged or delivered by untrained persons.[12] Tamboli et al showed approximately 31% of cases in home.[15]

Most common cause of death was septicemia. On calculating the significance of various factors involved it was seen that young age < 20 years ($p<0.001$), primiparity ($p<0.005$), tea garden workers ($p<0.014$), unbooked cases ($p<0.001$), inadequate iron supplements intake ($p<0.14$), late presentations >3days (p 0.001), absent membranes (p 0.001), intrauterine fetal demise (p 0.001), caesarean section ($p <0.05$), home delivery ($p < 0.05$), delivery by untrained birth attendant ($p <0.001$) and to have an organism isolated by blood culture/high vaginal swab (p 0.008) to be significant factors associated with mortality. Mortality rates in other studies were as follows: Shamshad et al showed 14.2%, Meharun Nissa showed 8.5%.[12,14] The higher mortality rate in present study could be attributed to the late presentation of many cases in which the disease process has already crossed the point of no return.

In the study *Kleibsiella pneumoniae* was the most common organism isolated in high vaginal swab. However, the high prevalence of CONS could be explained due to a faulty blood sample collection technique as CONS is a common commensal in skin of patients. Kaur et al in her study showed Staphylococcus aureus and *Escherichia coli* to be the two most common organisms isolated accounting for 36% and 29.8% of cases.[17] Tamboli et al isolated *Kleibsiella aerogenes* and *Escherichia coli* to be the most common organisms in his study.[15] Venugopal et al in his study isolated Escherichia coli to be the most common organism.[20] In Sudan a study done by Mohd Issa et al showed Staphylococcus aureus, Staphylococcus epidermis and Clostridium perfringes to be the most common organisms.[21] Salma Ahmed et al in Bangladesh isolated *Escherichia coli* and *Escherichia fecalis* to be the most common organism. Shafgufta et al in Aligarh isolated group B Streptococcus to be the most common organism followed by Escherichia coli.[22,23] In present study Staphylococcus aureus was isolated in 1 case and Escherichia coli in 6% of cases. This could be explained based on regional variation of causative microorganisms.

In the study no, specific pattern could be concluded regarding what antibiotics work best for the sepsis. Hence it is best to start with empirical antibiotics after sending for a high vaginal swab/blood culture and then change the antibiotic based on culture sensitivity reports. This was also supported by Mohd Issa et al who concluded saying treatment based on cultures remains the only solution to reduce maternal morbidity.[21] The study is not large enough and has encompassed a diverse group of patients belonging to various strata in a short time frame of one year and was carried out within the limits of the laboratory, so it is very difficult for one to draw a definite black and white conclusion.

The merits of the study are it gives a glance at the important factors responsible for causing puerperal sepsis in the modern era. Being performed at a tertiary institute with a wide case load from a wide referral base gives us a bird eye's view of the magnitude of the disease.

CONCLUSION

In conclusion puerperal sepsis is still a burning issue in the North eastern states of India. The principles of management include proper antenatal care, adhering to proper asepsis techniques during delivery and appropriate clinical diagnosis and laboratory tests and use of sensitive antimicrobials.

Recommendations

Among the important predisposing factors, a special mention is to be given regarding some important

preventive aspects. As already seen anemia, teenage pregnancies, unbooked cases, improper antenatal care and prophylactic measures like consumption of iron and folic acid tablets, home delivery by untrained birth attendants and late presentation to the health care centre are important predisposing factors for puerperal sepsis. Hence there should be increased awareness camps and proper strengthening of health care facilities at grass root level. More important would be upliftment of "At risk group" of tea garden workers who account for 78.4% of cases.

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