RISK FACTORS AND ANTIBIOGRAM OF ORGANISMS CAUSING PUERPERAL SEPSIS IN A TERTIARY HEALTH FACILITY IN NIGERIA.

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ABSTRACT

Background: Puerperal sepsis is a common pregnancy related complication and is one of the leading causes of maternal morbidity and mortality in Sub-Saharan Africa. There is paucity of regional data on the antibiogram and risk factors associated with this condition.

Aim: To determine the risk factors, aetiological organisms and antibiogram patterns in patients with puerperal sepsis at a University Teaching Hospital in Nigeria.

Method: A descriptive cross sectional study of patients who presented with puerperal sepsis at the University of Port Harcourt Teaching Hospital. Relevant biodata, pregnancy history, types of organisms isolated from the endocervical swabs and their antibiogram were collated into a pre-structured proforma. Statistical analysis was done using statistical software SPSS for windows® version 19.0. Chi-square test was used to explore the association of risk factors with P value <0.05 at 95% confidence interval.

Result: The incidence of puerperal sepsis was 9.34%. The mean age of the women was 27 ± 5 years. There was a strong association between unbooked status, emergency caesarean section, labour initially monitored outside the health facility and prolonged labour with puerperal sepsis (p=0.00); OR (68.60, 166.79, 102.73 and 3774) respectively.The commonest microorganism isolated in this study was *Klebsiella species* (57.7%), *which* were highly susceptible to ceftriaxone, ceftazidime, ciprofloxacin, ofloxacin and gentamycin.

Conclusion: The risk of puerperal sepsis is increased in the unbooked patient, during prolonged labour, during emergency caesarean section and unsupervised labour. The third generation cephalosporin and quinolones (in the absence of breastfeeding) were identified as the choice of regimen for empirical treatment of puerperal sepsis pending the availability of the endocervical swab sensitivity results.

Keywords: puerperal sepsis, antibiogram, risk factors, UPTH

INTRODUCTION

Historically, puerperal sepsis has been a common pregnancy related complication associated with obstetric shock andmaternal mortality.[1,2] Along with preeclampsia and obstetric haemorrhage, it had formed the lethal triad of causes of maternal morbidity and mortality for many decades.[3]Though, puerperal sepsis has been one of the leading causes of

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maternal morbidity and mortality in many countries today, (as it was in the days of Semmelweiss, Lister and Alexander Gordon 200 years ago),[1-4]it has received little attention in recent years, especially in developing countries like Nigeria.[4,5]

Puerperal sepsis is defined as the infection of the genital tract occurring at any time between rupture of fetal membranes or labour and the 42nd day postpartum in which two or more of the following are present: pelvic pain, fever (oral temperature of 38.5 degrees centigrade or higher on any occasion),abnormal vaginal discharge, delay in the rate of involution of the uterus (less than 2 centimeters per day during the first 8 days).[1,5] It also includes chorioamnionitis and endometritis.[2,5]

Puerperal sepsis is the second most common cause of maternal deaths in Asia, Africa and the Carribeans.[4,6] Wide variations exist in its global incidence and that reflects the quality of maternal services provided in the regions concern. In the United kingdom and United States incidence of 0.2- .6%, El Salvador 9.3%[1] had been reported while in Africa incidence of 0.2-1.7% had also been documented.[8-12] The World health organization (WHO) estimates that puerperal sepsis contributes to 12% of maternal deaths and in Nigeria it contributes to about 9% of these deaths.[4,6] In the University of Port Harcourt and the University of Maiduguri Teaching Hospitals in Nigeria, puerperal sepsis occurred at the rate of 0.5 and 0.8%,respectively.[13,14]

Unhygienic home deliveries is a common practice in Nigeria which has increased the incidence of puerperal sepsis.[3,4] Other risk factors include low socio-economic class, anaemia, prolonged rupture of fetal membranes, frequent vaginal examinations, post partum haemorrhage, prolonged labour, caesarean delivery and history of previous infections.[3,5,14] The above mentioned increase the risk of introduction of organisms into the genital tract such as *Streptococcus pyogenes*, *Beta haemolytic streptococcus, Enterococcus faecalis, Anaerobic cocci, Clostridium perfringes, Bacteriodesspecies,Proteus mirabilis, Escherichia coli, Chlamydia trachomatis, Neisseria gonorrhea and Listeria monocytogenes.*[3,15-17]

Puerperal sepsis is a largely preventable condition with standard practice of good antenatal care, aseptic delivery practices and proper postpartum care of paturients. Once diagnosed delay or inadequate treatment will result in a rapid progression to endotoxic shock, peritonitis,abscess formation, generalized sepsis and death. Long-term complications of secondary infertility and chronic disabilities are also associated with this condition[1,5]

It is thus imperative that health facilities identify the specific causative organisms causing puerperal sepsis in their locality and determine their antibiogram to eliminate prescription of antibiotics which the organisms are not sensitive to; avoid prolonged recovery time and high cost of therapy.

Aim: To determine the risk factors and antibiogram of organisms causing puerperal sepsis in the University of Port Harcourt Teaching Hospital in Nigeria.

Methodology: This was a descriptive cross-sectional study to determine the risk factors and antibiogram of organisms causing puerperal sepsis in the University of Port Harcourt Teaching Hospital in Nigeria.All Patients with clinical diagnosis of puerperal sepsis in the obstetric department of the Teaching hospital were counseled about the study and informed consent obtained for the study. Clinical diagnosis of puerperal sepsis was made onthe basis of the following clinical findings: fever of≥ 38.5degree centigrade within six weeks following delivery, pelvic pain with offensive and /or purulent vaginal discharge, abdominal pain, tender uterus, sub involution of the uterus and septic shock.Patients having two or more of the above

features were considered eligible for the study. **Patients who withheld their consent for inclusion in the study,** had fever from any identifiable cause other than puerperal sepsis and patients presenting with fever more than forty-two days after delivery were excluded from the study.

The sample size for this study (N) was calculated using the fish formula

$N = (Z^2P(1-P)/d^2)$ [18]

Where Z is the proportion of normal distribution corresponding to the required significance level (5%), which is 1.96, P is equivalent to incidence ofpuerperal sepsis in the University of Port Harcourt Teaching Hospital in 2011[13] and d- degree of accuracy/ precision expected (0.05). With the degree of precision expected, set at 0.05 and giving allowance for 10% attrition, the minimum sample size for the study was therefore 120women. A total of 130 women were used for the study.

Based on observation, from pilot survey, it was observed that 20 cases of puerperal sepsis occurred per month. It took a six - months period to achieve the required sample size. All consecutive patients who had puerperal sepsis, who satisfied the eligibility criteria and consented to this study, were recruited as they presented until the desired sample size was obtained.

Sample collection and processing

After due consent wasobtained, the patient was placed in dorsal position on an examination couch, a sterile bi-valve Cusco's vaginal speculum was introduced into the vagina to visualize the cervix under sufficient light by the investigators. An endocervicalswab was taken from the mucosa of the endocervix using a sterile cotton swab and sent to the Medical Microbiology laboratory. A dedicated laboratory scientist processed the specimens for the research. Cervical swab was inoculated into Blood agar, Chocolate and MacConkey's media and incubated at 35-37°C for 16-18 hours aerobically.

The isolates were identified on the basis of colony morphology, gram staining and appropriate biochemical tests, like catalase, coagulase, urease, CAMP and citrate tests. All the isolates were subjected to antibiotic susceptibility test by Kirby-Bauer disc diffusion technique following the Clinical Laboratory Standard Institute guideline.[19-21] They were tested against the following antibiotics: penicillin, cloxacillin, tetracycline, gentamycin, cefuroxime, ceftriaxone, chloramphenicol, ofloxacin, ciprofloxacin, cefotaxime, erythromycin, clindamycin, ceftazidime, genticin, amoxicillin-clavulanic acid. The gram staining was carried out using staining procedure, described in 1884, by the Danish physician Hans Christian Gram.[21,22]

DATAANALYSIS

Data regarding age, marital status, educational status, address, occupation,parity, antenatal care,rupture of fetal membranes, place and mode of delivery, complications during delivery, number of vaginal examinations, medical illness and outcome of baby, nature of vaginal discharge and types of bacteria isolates from the endocervical swabs were collated into a semi-structured proforma, and statistical analysis done using statistical software (SPSS for windows® version 19.0, SPSS Inc.; Chicago, USA).Chi-square test was used to explore the association of risk factors to puerperal sepsis. P value <0.05 at 95% confidence interval.

RESULTS

The total number of deliveries in the hospital within the period of this study was 1392.There were a total of 130 women with puerperal sepsis. The incidence of puerperal sepsis was .9.34%

The sociodemographic characteristics of patients indicate that the mean age of the women was 27 ± 5

years with an age range of 16-40. Eighty-nine (68.5%) had secondary education, 28(21.5%) had primary education while 13 (10.0%) had tertiary level of education. One hundred and twenty eight (98.5%) of patients were married. Forty-four (33.8%) of these patients were nulliparous where as eight (6.1%) were grandmultiparous. As regard, the booking status, 87.7%(114) of patients were unbooked while 16(12.3%) were booked. Other aspects of the sociodemographic characteristics are shown in table 1

Concerning the first point of care during the labour process, women who developed puerperal sepsis were first attended to in the following places: 38 (29.3%)by traditional birth attendants homes, 36 (27.7%) in General Hospitals, 31 (23.9%) in churches, 15(11.5%) by maternity homes, 6(4.6%) in the UPTH, private hospitals 2.3%(3) and at home 0.8%(1).

Emergency caesarean section and first point of care during labour outside the UPTH accounted for 17.6%(120) each of the risk for puerperal sepsis, one hundred and eighteen (17.6%)who had puerperal sepsis had prolonged rupture of fetal membranes and frequent vaginal examinations (≥ 5). The frequency of other risk factors are shown in table 2

There is a very strong association between unbooked status, sepsis, emergency caesarean section, First Point of care during labour outside health facility and prolonged labour to the occurrence of puerperal sepsis in the subjects studied (p=0.00) eachwith OR of 68.60, 166.79, 102.73 and 3774, respectively as outlined in tables 3.

0ne hundred (76.9%) of the patients that developed puerperal sepsis were irregular with their prescribed empirical antibiotics within the first seventy two hour of prescription because of non availability while only thirty (23.1%) were regular on their antibiotics medication. The non-availability was as a result of inability of the patients to afford the prescribed medications

Micro-organisms isolated from the endocervical swab of patients with puerperal sepsis

In majority of the endocervical swabspecimen, one hundred and three (79.2%) grew Gram -negative bacilli, twenty two (16.9%) yielded Gram positive isolates while four (3.1%) had mixed growth, and one (0.8%) had no growth after 48 hours of incubation.. Seventy-five (57.7%) of the Gram negative isolates were identified as *Klebsiella species,* 22.3% were *Escherichia coli*, while 0.8% were *Proteus species*. Nineteen (14.6%) of the Gram-positive isolates were *Staphylococcus aureus* and 0.8% were*Streptococcus pyogenes.*

Rate of antibiotic sensitivity(s) of different isolated bacteria

The antibiotic sensitivity (s) of the different microbials isolated is outlined in table 4 below and it showed that all the isolates of*Klebsiella species* and*Escherichia coli* were 100% sensitive to ceftriaxone, ceftazidime, ciprofloxacin, ofloxacin and gentamycin. All the isolates of *Staphylococcus aureus*were 100% sensitive toceftriaxone, ceftazidime, ciprofloxacin and ofloxacin, and 94% sensitive to gentamycin.

DISCUSSION

Puerperal sepsis is a preventable cause of maternal morbidity and mortality that is still prevalent in Nigeria.[23] The incidence of puerperal sepsis in this study was 9.34% , this is higher than that which was earlier reported from, Nigeria, United States and Britain.[1,7,24]This high prevalence of puerperal sepsis may be explained by the fact that the facility is a major referral hospital in Rivers State without any restrictive policies on admissions. In additional,majority of the women who had puerperal sepsis had their labour elsewhere in t churches, their homes, maternity homes and the homes of the traditional birth attendants where

hygienic measures are not practised.[14,25]

An age profiling of the mothers that developed puerperal sepsis showed that about 77% of them are within the age 21-30 which is the reproductive peak. The observation that most of them had unskilled birth attendants during their delivery increased their risk to puerperal sepsis and on the long term infertility and its sequelae.

The study revealed a very strong association between emergency caesarean section and puerperal sepsis. Bako*et al*[14]had similar finding which correlated with other previous reports.[26-29]Basically, circumstances that led to caesarean section and how frequent patients are receiving their postoperative antibiotics medications may be the major determinant of the occurrence of puerperal sepsis. Puerperal sepsis occurs with increasedfrequency where caesareansections are performed forobstructed labor, prolonged labour with background chorioamnionitis.[30,31]Majority of the patients who developed puerperal sepsis, post caesarean section were irregular on their antibiotics medications as they couldn't afford it.

The study revealed a strong association between the labour outside the health facility in unhygienic places like patient's homes, maternities, churches and homes of traditional birth attendants with puerperal sepsis. This is supported by the report of previous studies.[14,30]This is not surprising becausetwo-thirds of births in Nigeria take place outside the health facility, the majoritywithout the assistance of a healthcareprofessional or skilled birth attendant[4].Both maternal and neonatal mortality are lower in countries where deliveries are conducted by skilled birth attendants with the requisite equipment, drugs and othersupplies needed for the effective and timely management of complications.[6]

This study also noted that puerperal sepsis was associated with prolonged rupture of fetal membranes and prolonged labour. This was similar to findings in previous studies.[24,32] Prolonged rupture of fetal membranes impairs natural mechanical barriers to ascending infection from the vagina. Also the duration of labour directly contributes to development of postnatal sepsis as obstructed labour with repetitive vaginal examinations leads to sepsis.[30]

Other risk factors associated with puerperal sepsis in this studyincluded anaemia, positive human immunodeficiency status, retained placenta, obesity and diabetes mellitus. These were similar to findings in previous studies.[5,7, 24, 32] These reduce the general body immune defense system to fighting infections, thus encourage ascending infections from the vagina to the uterus.

The commonest micro-organism isolated was *Klebsiella species*followed by *Escherichia coli* and *Staphylococcus aureus*. This is similar to that reported by Ekwempu*et al*[33] in Zaria northern Nigeria but in contrast to other reports from Nigeria where *Staphylococcus aureus*was the most common micro-organism.[5,15,24,34]The variation of bacteria isolated from genital tract causing puerperal infection as endogenous source may represent regional variation of genital flora.[35] In addition, the source of infection might be exogenous where pathogens from nearby skin flora or from contact with contaminated instruments, dressings or pads are implanted in the mucosa of genital tract.

Also contrary to previous reports from the western world which showed that puerperal sepsis are generally polymicrobial reflecting vaginal colonization, this study did not show significant mixed growth. This correlates with the report of Bako et al in Maiduguri; Nigeria.[14] This could be because our specimens were taken from the endocervix and therefore devoid of vaginal contamination. The fewer infective micro-organisms may suggest that our patients may be more responsive to antimicrobial agents and

therefore a better chance of reducing the scourge of the disease with early commencement of antibiotic therapy.

The isolated micro-organisms were highly susceptible (≥ 94%) to ceftriaxone, ceftazidime, ciprofloxacin,ofloxacin and gentamycin, as revealed by this study means that these antibiotics should be included in choice of regimen for empirical treatment of puerperal sepsis in this hospital pending the availability of the endocervical swab sensitivity result thereby reducing the scourge of the disease. It must however be stated that the quinolones should not be used except in the presence of infant death or when the mother is not breastfeeding. Thus Ciprofloxacin and ofloxacin should be avoided in breastfeeding mothers because of the potential for arthropathies and other serious toxicity in the infant.[34]Ceftriaxone, ceftazidime and gentamycin, have broad-spectrum antimicrobial activity and because of their safety in breast feeding mothers.[36], they can be used for all patients except those with hypersensitivity to them.

This study has potential limitations related to the isolated microorganisms, which are aerobic organisms. Anaerobes were not identified because of the absence of the facilities for their culture.Another limitation is the non-suitability of quinolones in lactating mothers as part of the antibiotics studies, however in the presence of severe infections relative benefits against complications should be assessed before use. This study is largely hospital based thus community based studies are advocated to determine the magnitude of the problem in the country though cumbersome and expensive in design and implementation. This study was done in the University of Port Harcourt Teaching Hospital, which is the largest referral health facility in Rivers State and a leading tertiary hospital in the South-South of Nigeria. Therefore given a permissible error margin, the results of this study should give the true reflection of the association of the risk factors to puerperal sepsis.

RECOMMENDATIONS

There is a need for proper implementation of protocols for antenatal, intranataland postnatal care.Continuing perinatal education programs for midwives, traditional birth attendants and doctors,on proper management during labour, aseptic measures, prophylactic antibiotics, proper hand washing, avoidance of unnecessary repeated vaginal examinations, prolonged labour, proper use of partogram and timely referrals to health facility will go a long way to reducing the incidence of puerperal sepsis.

The observation that most patients with puerperal sepsis could not afford the prescribed antibiotics calls for a change of hospital policy to provide drugs for the indigent patients during the emergency period. This would likely improve the general outcome of the patients in the centre of study. The government should also implement policies that will improve general socioeconomic status of the entire populace to improve outcome.

In conclusion it is advised that Ceftriaxone, ceftazidime, ciprofloxacin, ofloxacin and gentamycin should be included in the choice of regimen for empirical treatment of puerperal sepsis pending the availability of the endocervical swab sensitivity result to hasten patient's recovery time and reduce expenditure on treatment while taking into consideration safety profile of the drugs.

TABLE I: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE WOMEN

Characteristics (Age)	Frequency (N)	Percentage (%)
16-20	6	4.6
21-25	50	38.5
26-30	50	38.5
31-35	14	10.8
36-40	9	6.9
	1	8
Educational status		
Primary	28	21.5
Secondary	89	68.5
Tertiary	13	10.0
No formal Education	0	0
Marital status		
Single	1	0.8
Married	128	98.5
Divorced	1	0.8
Religion		
Christianity	125	96.2
Islam	5	3.8
Others	0	0
Parity		
1	44	33.8
2	42	32.3
3	22	16.9
4	14	10.8
≥5	8	6.1
Occupation		
Professional	12	9.2
Non professional	118	90.8
Booking status		
Unbooked	114	87.7
Booked	16	12.3

TABLE 2: RISK FACTORS ASSOCIATED WITH PUERPERAL SEPSIS

Risk Factors	Frequency (N)	Percentage (%)
Emergency caesarean section	120	17.6
Labour monitored ou tside health facility	120	17.6
Prolonged labour (> 12 hours)	120	17.6
Prolonged rupture of fetal membranes	118	17.3
Frequent vaginal examination (>5)	118	17.3
HIV	34	5.0
Anaemia	17	2.5
Retained placenta	11	1.6
Obesity	10	1.5
Perineal tears	4	0.6
Diabetes mellitus	3	0.4
Elective caesarean section	2	0.3
Episiotomy	2	0.3
Assisted vaginal Delivery with:		
➢ Vacuum	2	0.3
➢ Forcep	0	0

TABLE 3 -ASSOCIATION OF RISK FACTORS TO PUERPERAL SEPSIS

Puerperal sepsis	Unbooked	Booked	Chi square(p-value	Odds ratio
+ve	116	14	489.3 (0.000)	68.60
-	136	1126		
	Emergency caesarean section	Elective caesarean section		
+ve	120	2	261.3 (0.000)	166.79
-ve	336	934		
	First point of care during labour outside the health facility	First point of care in the health facility		
+ve	120	10	532.54 (0.000)	102.73
-ve	132	1130		
	Prolonged labour	Normal labour		
+ve	120	10	1229.1 (0.000)	3774
-ve	4	1258		

TABLE 4: RATE (%) OF ANTIBIOTIC SENSITIVITY(S) OF DIFFERENT ISOLATED BACTERIA

Antibiotics	Staphylococcus aureus	*Streptococcus pyogenes*	Escherichia coli	Klebsiella species	Proteus species
Amoxicillin-clavulanic acid	88.2	100	80.1	98.2	66.6
Ceftriaxone	100	100	100	100	100
Cefuroxime	100	100	100	100	100
Ciprofloxacin	100	90.4	100	100	70
Gentamycin	94	100	100	100	100
Ofloxacin	100	92.2	100	100	78.2
Penicillin	90.2	90	82.0	70.2	56.8

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