

East African Medical Journal Vol. 94 No. 3 March 2017

INCIDENCE AND BACTERIOLOGICAL PATTERN OF PUERPERAL INFECTIONS WITHIN THE FIRST 120 HOURS POST CAESAREAN SECTION IN REDEMPTION HOSPITAL MONROVIA, LIBERIA

L. M. Kpoto, MBChB, MMed, Redemption Hospital, Monrovia, Liberia and Department of Obstetrics and Gynaecology, Omondi-Ogututu, MBChB, MMed, PGDRM, J. Karanja, MBChB, MMed and R. J. Kosgei, MBChB, MMed, PGDRM, MSc, Department of Obstetrics and Gynaecology, College of Health Sciences, University of Nairobi, P.O. Box 19671-00202, Nairobi, Kenya.

INCIDENCE AND BACTERIOLOGICAL PATTERN OF PUERPERAL INFECTIONS WITHIN THE FIRST 120 HOURS POST CAESAREAN SECTION IN REDEMPTION HOSPITAL MONROVIA, LIBERIA

L. M. KPOTO, OMONDI-OGUTU, J. KARANJA and R. J. KOSGEI

ABSTRACT

Background: Maternal infection contributes to 11% of all maternal mortalities globally, with most of these deaths in developing countries. This study was triggered by an anecdotal evidence of a high prevalence of puerperal infection following Caesarean sections at the Redemption Hospital, Monrovia Liberia.

Objective: To determine the incidence and bacteriological pattern of puerperal infections within the first 120 hours among women delivered by Caesarean section.

Design: Prospective descriptive cohort study.

Setting: Redemption Hospital in Monrovia, Liberia.

Subjects: Two hundred and thirty five immediate post Caesarean section mothers.

Results: The Mean (SD) age of study participants was 27 years. The incidence of puerperal sepsis was 21% (49/235), out of which 49% (24/49) met the clinical criteria of puerperal infection and 51% (25/49) had laboratory confirmed puerperal sepsis. Of the specimens cultured, 44% were *Staphylococcus aureus*, 44% were *Escherichia coli* and 12% *Pseudomonas aeruginosum*. About three quarters of *Staphylococcus aureus* and *Escherichia coli* infections are resistant to ceftriaxone, while more than half these infections are resistant to gentamicin.

Conclusion: The incidence of puerperal infection in Redemption Hospital, Liberia, within the first 120 hours after Caesarean section is 21%. *Staphylococcus aureus* and *Escherichia coli* were the most common pathogens isolated and showed resistance to ceftriaxone and gentamicin.

INTRODUCTION

Reduction of maternal mortality by 75% between 1990 and 2015 was a target for the fifth Millennium Development Goal (MDG) that was not achieved by most developing countries(1,2). Maternal infection is one of the direct causes of maternal mortality, and globally it contributes to 11% of all maternal mortalities. Most of these deaths are recorded in developing countries, accounting for 13% of all mortalities (1,3). Due to diagnostic limitations the estimates in developing countries could be higher(2), especially in Liberia which is ranked one of the ten countries with the highest maternal mortalities in the world. The maternal mortality ratio of Liberia can be as high as 890 maternal deaths for every 100,000 live births in some parts of the country(4).

There were no published studies on maternal or puerperal infection in Liberia. Anecdotal evidence however, shows that there is an increase in Caesarean

section associated puerperal infections. This observation is alarming since Caesarean section; one of the processes indicators for emergency obstetric care, is now a common abdominal surgical procedure across the world, and the single most important risk factor for postpartum infection(5-7). In a Nigerian study, the risk factors of puerperal infection include unbooked women, home delivery, perineal trauma, Caesarean section and maternal age more than 24 years(8). In another Nigerian study, post-Caesarean wound infection rate was 16.2% and the risk factors were identified as lower education status, multiple pelvic examination, offensive liquor at surgery and patients that are unbooked(9). Studies show *Staphylococcus aureus* and *Escherichia coli* as the common isolated pathogens in post-Caesarean section wound infections(8,10). Prophylactic antibiotics administered to women undergoing Caesarean section has been shown to reduce the occurrence of puerperal infections(11).

Due lack of published data on puerperal infections after Caesarean section in Liberia, we sought to determine the incidence and bacteriological pattern of puerperal infections within the first 120 hours among women delivered by Caesarean section at Redemption hospital in Monrovia, Liberia.

MATERIALS AND METHODS

Study Design: This was a hospital based descriptive cohort study which women delivered by Caesarean section were followed up. This was a one sample population without exposure or control groups and participants were followed until 120 hours after delivery outcome data were collected among immediate post Caesarean women at five time points 24, 36, 72, 95 and 120 hours after delivery.

Study Setting: The study was done in the Redemption Hospital, Monrovia, Liberia. This is a ministry of health facility located in one of the peri-urban settlement in Monrovia and services are offered free-of-charge. The obstetrics ward has 40 beds. Each month on average, about 370 vaginal deliveries and 80 Caesarean sections are conducted. Majority of patients served in the facility are from low socio-economic status. The compliment of health care workers in the Obstetric unit include: two Obstetrician/Gynaecologists, 10 midwives and eight nurses. The unit has only one fully functional theatre that also serves other clinical Departments, like General Surgery.

Infection control strategies are weak and non-standardised in the facility. Prophylactic antibiotics are not administered pre-operatively and intra-operatively. Wound care at the hospital is erratic in nature with no standardised protocol. The hospital has a functional laboratory for culture and sensitivity, however anecdotal evidence show that majority of patients with puerperal infection are treated based on clinical findings and not guided by culture and sensitivity results. All post Caesarean section patients in the hospital are discharged home after five days as standard of care.

Study Population: All postnatal mothers who delivered by Caesarean section at the Redemption Hospital, Monrovia, Liberia, March-May, 2014. Those who gave informed consent and within the first 24 hours post-delivery were included in the study. Those who underwent Caesarean section in another facility and referred to Redemption Hospital were excluded from the study.

The Sample Size and Sampling Procedure: A total of 235 participants were included in this study. The sample size was calculated to give a power of 80%. All consecutive eligible women were included in the study.

Data Collection and Management : A one day training of research assistants was done on the study protocol and ethical issues before the commencement of the study. The research assistants included two resident doctors, and four midwives.

Eligible participants were recruited and enrolled to the study in the post-natal ward. Data collection were collected using a structured pretested questionnaire which was completed at five-time-points within the first 120 hours after Caesarean section at: 24 hours, 36 hours, 72 hours, 94 hours and 120 hours. In all the time points, participants were clinically examined. Additional data were abstracted from participants' case file.

For this study a clinical diagnosis of puerperal infection was fever (temperature $\geq 38^{\circ}\text{C}$) with purulent lochia, post-surgical wound infection from Caesarean section /episiotomy, urinary tract infection or breast abscess. Samples for culture and sensitivity were collected from all participants who were clinically diagnosed with puerperal infections. The samples collected included endocervical swab, wound swab and urine as was deemed necessary.

Data from the questionnaires were entered into a Microsoft Access database with in-built consistency and validation checks. Data were cleaned and stored in a password protected external storage device (USB/disc) accessible only to the researchers.

Data Analysis: De-identified data were analysed using Statistical Package for Social Scientists Version 17.0. Descriptive data is reported using mean, mode and frequencies.

Ethical Consideration: Ethics approval to carry out this study was obtained from the Kenyatta National Hospital/University of Nairobi Ethics and Scientific Review Committee and the Ministry of Health Liberia Research and Ethics Committee. Permission to carry out the study was given by the Redemption Hospital, Monrovia, Liberia.

Confidentiality was upheld at all levels, all patients diagnosed with puerperal infection were managed according to hospital standard of care, the diagnosis of puerperal infection was done according to internationally acceptable standards. Any patient who declined to be part of the study was not denied the care they required. Study results from this study were placed in the database of the ministry of health and social welfare. Raw data (unanalysed data) after the study was given to the research unit of the Ministry of Health and Social welfare.

RESULTS

A total 235 women who underwent Caesarean section during the study period and met the eligibility criteria were analysed. The Mean (SD) age of study

participants was 27 years. Table 1, summarises the socio-demographic characteristics, 54% (127/235) of the study participant were aged between 20-29 years, 31% (73/235) were more than 30 years of age and only 15% (35/235) were aged between 16 and 19 years. Most of the study participants were Christians (79%), had the highest level of education as high school (53%), single (71%), unemployed (52%) and lived in a rental house (76%).

Table 2 shows clinical characteristics of the study participants. Most (97%) of the study participants attended antenatal care, 12% (28/235) had a history of abortion, 3% (8/235) had a history of ectopic pregnancy

and the median (IQR) of antenatal visits was 3(3-6). Nearly all mothers knew their HIV test result, 90% (211/235) were HIV negative, 7% (17/235) were HIV unknown and 3% (7/235) were HIV positive. Of the study participants 51% (121/235) had membranes ruptured in the hospital, 15% (35/235) had their membranes ruptured at home and 10% (23/235) had their membranes ruptured on the way to hospitals. Most (84%) of the mothers used a sanitary pad after rupture of membranes. Only 18% (43/235) had foul smelling liquor and the median (IQR) number of vaginal examination was 3(2-4).

Table 1

Socio-demographic characteristics of women who underwent Caesarean section in Redemption Hospital, Liberia, March-May 2014

Variable	N=235	%
Mean(SD) age in years	27(7)	-
Age Group	35	15
16 – 19 years	127	54
20 – 29 years	73	31
>30 years		
Religion	185	79
Christian	50	21
Muslim		
Education level	41	17
Elementary/primary	124	53
High school	9	4
College	61	26
None		
Marital status	167	71
Single	68	29
Married		
Occupation	113	48
Employed	122	52
Unemployed		
Housing	178	76
Rental	57	24
House owner		

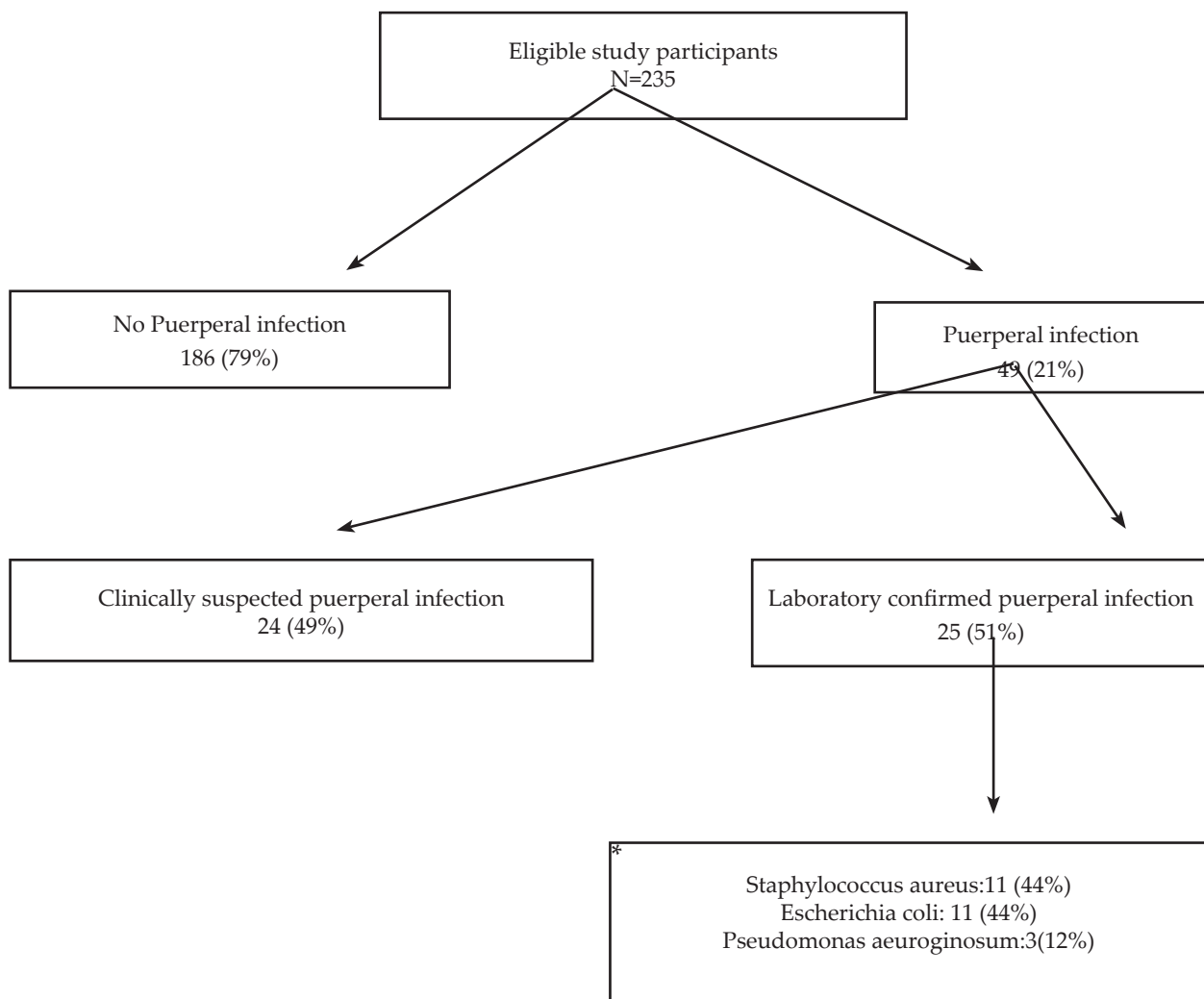
Table 2
Clinical characteristics of women who underwent Caesarean section in Redemption Hospital, Liberia, March-May 2014

Variable	N=235	%
Antenatal Care		
ANC attendance		
Yes	229	97
History of abortion		
Yes	28	12
History of ectopic pregnancy		
Yes	8	3
HIV test results		
Positive	7	3
Negative	211	90
Unknown	17	7
ANC visits		
Median (IQR)	5 (3 – 6)	
Intra-partum care		
Where membranes ruptured		
Home	35	15
Hospital	121	51
Way to hospital	23	10
Not applicable	56	24
Sanitary material used after ROM		
Sanitary pad	151	84
Cloth	16	9
Others	8	5
Not known	4	2
State of the Lochia		
Foul smelling	43	18
Non foul smelling	192	82
Number of vaginal examination		
Median (IQR)	3(2-4)	

From figure 1 of the study participants, 21% (49/235) had *Puerperal sepsis*, out of which 49% (24/49) had clinically suspected puerperal infection and 51% (25/49) had laboratory confirmed puerperal sepsis. Of the specimens cultured, 44% were *Staphylococcus aureus*, 44% were *Escherichia coli* and 12% *Pseudomonas aeruginosum*. *Staphylococcus aureus* was sensitive to

ciprofloxacin, gentamicin and ceftriaxone in 73%, 46% and 27% of infections respectively. *Escherichia coli* was sensitive to ciprofloxacin, gentamicin and ceftriaxone in 46%, 46% and 27% of infections respectively. *Pseudomonas aeruginosum* was sensitive to ciprofloxacin, gentamicin and ceftriaxone in 100%, 100% and 67% of infections respectively.

Figure 1
Incidence of Puerperal infections, bacteriological pattern and antibiotic sensitivity, 120 hours after Caesarean section in Redemption Hospital Liberia, March – April 2014



*

Staphylococcus aureus: sensitive to ciprofloxacin, gentamicin and ceftriaxone in 73%, 46% and 27% of infections respectively

Escherichia coli: was sensitive to ciprofloxacin, gentamicin and ceftriaxone in 46%, 46% and 27% of infections respectively

Pseudomonas aeuroginosum: was sensitive to ciprofloxacin, gentamicin and ceftriaxone in 100%, 100% and 67% of infections respectively

DISCUSSION

The incidence of puerperal infection in Redemption Hospital, Liberia, within the first 120 hours after Caesarean section is 21%. *Staphylococcus aureus* and *Escherichia coli* were the most common pathogens isolated among those who had bacteriological evidence of infection. *Pseudomonas aeruginosum* was also isolated in few samples. About three quarters of *Staphylococcus aureus* and *Escherichia coli* infections are resistant to ceftriaxone, while more than half these infections are resistant to gentamicin.

The incidence of puerperal infection in our study is higher than that found in the Nigerian study of 16.2%(9). Similar to other studies, the most common pathogens isolated were *Staphylococcus aureus* and *Escherichia coli*(8, 10). *Staphylococcus aureus* is a common endogenous flora of the skin; hence its isolation in the samples of our study participants is a pointer to a lapse in pre-operative skin preparation (11, 12). There is evidence of antibiotic resistance to the commonly used antibiotics especially to *Staphylococcus aureus* and *Escherichia coli*, which is worrying.

This study is limited by a small sample size of those with bacteriological confirmed puerperal infections. Despite this limitation, this is the first study in Liberia to document the burden of puerperal infections within the first 120 hours post-Caesarean section, which was made possible by the standard of care protocol of discharging patients after 120 hours after surgery.

From a policy perspective, there is need to strengthen infection prevention practices during Caesarean section and more studies are needed to evaluate antibiotic resistance.

In conclusion, the incidence of puerperal infection in Redemption Hospital, Liberia, within the first 120 hours after Caesarean section is 21%. *Staphylococcus aureus* and *Escherichia coli* were the most common pathogens isolated among those who had bacteriological evidence of infection, and showed resistance to ceftriaxone and gentamycin.

REFERENCES

1. Say, L., Chou D., Gemmill, A., Tuncalp, O. *et al.* Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health* 2014. **2**:e323-33.
2. Kassebaum, N.J., Bertozzi-Villa, A., Coggeshall, M.S., *et al.* Global, regional, and national levels and causes of maternal mortality during 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014 **384**:980-1004.
3. Filippi, V., Chou, D., Ronsmans, C. *et al.* Levels and Causes of Maternal Mortality and Morbidity. In: Black, R.E., Laxminarayan, R., Temmerman, M., Walker, N., .ditors. Reproductive, Maternal, Newborn, and Child Health: Disease Control Priorities, Third Edition (Volume 2). Washington (DC)2016.
4. Moseson, H., Massaquoi, M., Bawo, L. *et al.* Estimation of maternal and neonatal mortality at the subnational level in Liberia. *Int. J. Gynaecol. Obstet.* 2014 **127**:194-200.
5. Group CTC. The CORONIS Trial. International study of Caesarean section surgical techniques: a randomised fractional, factorial trial. *BMC Pregnancy Childbirth* 2007; **7**:24.
6. Lobis, S., Fry, D. and Paxton, A. Program note: applying the UN process indicators for emergency obstetric care to the United States. *Int. J. Gynaecol. Obstet.* 2005 **88**:203-7.
7. Declercq, E., Barger, M., Cabral, H.J., E. *et al.* Maternal outcomes associated with planned primary Caesarean births compared with planned vaginal births. *Obstet Gynecol.* 2007 **109**:669-77.
8. Bako, B., Audu, B.M., Lawan, Z.M. and Umar, J.B. Risk factors and microbial isolates of puerperal sepsis at the University of Maiduguri Teaching Hospital, Maiduguri, North-eastern Nigeria. *Arch. Gynecol.Obstet.* 2012 **285**:913-7.
9. Morhason-Bello, I.O., Oladokun, A., Adedokun, B.O. *et al.* Determinants of post-Caesarean wound infection at the University College Hospital Ibadan Nigeria. *Niger. J. Clin. Pract.* 2009 **12**:1-5.
10. Bagratee, J.S., Moodley, J., Kleinschmidt, I. and Zawilski, W. A randomised controlled trial of antibiotic prophylaxis in elective Caesarean delivery. *BJOG* 2001 **108**:143-8.
11. Smail, F.M and Gyte, G.M. Antibiotic prophylaxis versus no prophylaxis for preventing infection after Caesarean section. *Cochrane Database Syst. Rev*(1): CD007482.
12. Emmons, S.L., Krohn, M., Jackson, M. and Eschenbach, D.A. Development of wound infections among women undergoing Caesarean section. *Obstet. Gynecol.* 1988 **72**:559-64.