

Original Article

Bacteriological profile and sensitivity pattern of Septic Induced Abortion at University of Calabar Teaching Hospital. Calabar.

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ABSTRACT

Objective: The study aimed to determine the bacteriological profile and sensitivity pattern of endocervical isolates in septic abortion patients at the University of Calabar Teaching Hospital (UCTH) Calabar. **Method** This was a prospective cross-sectional study of 98 women with septic induced abortion at UCTH between the 15th of August 2019 to 14th March 2020. Endo-cervical swab for microscopy, culture and sensitivity (M/C/S) was collected. The micro-organisms isolated were cultured and sensitivity pattern determined by running a cross tabulation of isolates and antibiotics. The data obtained was analyzed using SPSS, version 20.0. **Result:** Many patients were between the ages of 20-29 years (57.2%), single (59.2%), employed (55.1%), with tertiary level of education (44.9%) and nulliparous (59.1%). A total of 45.9% presented to hospital more than 7 days after procuring abortion. Many procured abortions because they were not ready to be parents (39.7%) and 63.3% did not use any form of modern contraception. The cultures yielded 41.8% gram positive and 37.8%-gram negatives. Staphylococcus aureus and Escherichia coli were the predominant organisms isolated, and Ciprofloxacin was found to be the most sensitive antibiotic agent. **Conclusion:** Endocervical isolates from women with septic induced abortion were polymicrobial and Ciprofloxacin was the most sensitive antibiotic.

KEY WORDS: Septic induced abortion, bacteriology, microorganisms, sensitivity.

INTRODUCTION

Maternal deaths are still unacceptably high in many low-income countries, where pregnancy and childbirth are high-risk events that constitute major public health challenge.¹ Consequently, concerted efforts have been made, including long-term goals and programs aimed at improving maternal morbidity and mortality,² like the Millennium Development Goals (MDGs), Goal 5 and the more

recent Sustainable Development Goals (SDGs) 3 target 1.^{3,4}

Progress toward achieving the MDG five was slow in developing countries, where evidence suggests direct consequences of pregnancy and childbirth which are largely preventable continued to account for most maternal deaths. These as an outcome of a complex web of social, economic, educational, political, and cultural factors.⁵

Nigeria actively pursued the achievement of the millennium development goal five. Some progress was made when Maternal Mortality Ratio (MMR) in Nigeria reduced from 800 per 100,000

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live births in 2010 to 576 per 100,000 live births in 2013. (NDHS, 2013).⁶ However, this reduction in MMR was far from the MDG target of 250 per 100,000 live births by 2015. Worse still, with the Sustainable Development Goals (SDGs) in focus the potential to reduce the maternal mortality ratio to the SDG 3 target (3.1) of less than 70 per 100 000 live births by 2030 seems even more difficult.⁴

Unsafe abortion remains one of the major contributors of maternal mortality in developing countries.⁷ WHO estimates that 68,000 women die annually due to complications of unsafe abortion, in Nigeria the estimated maternal deaths from unsafe abortion are about 20,000 annually.^{8,9,10} In addition to maternal deaths, acute complications such as hemorrhage, infection, uterine and bowel perforation, pelvic abscess, endotoxic shock and renal failure occur while others suffer long term morbidities which include ectopic pregnancy, chronic pelvic pain and infertility with grave implications for future reproductive health of the women.^{7,11,12}

Tragically, death from unsafe abortion is preventable and predominantly caused by sepsis.^{9,12} Barriers to addressing the challenges of unsafe abortion cluster around restrictive abortion laws; poor access to contraception, limited resources, and political and religious sensitivities about abortion related issues.^{13,14,15}

Septic induced abortion is due to infection by virulent micro-organisms which may be confined to the uterine cavity or may involve adjacent structures or distant spread by the hematogenous route.^{16,17} The infection could be due to direct inoculation of the uterine cavity with micro-organisms at unsafe abortions or ascending bacteria from the vagina or perineum.^{5,11,18}

The bacteriology of septic abortion is usually polymicrobial with organisms that become virulent and release endotoxins (gram negative organisms) or exotoxins (gram positive organisms) from the site of infection or the blood in cases of bacteremia which stimulate the immune cells such as macrophages and neutrophils to release the endogenous mediators of sepsis such as the tumor necrosis factor (TNF).¹⁹ This triggers the cascade of events which ultimately cause multiple organ dysfunction which may be followed by septic shock and a very high death rate.^{19,20,21.}

The process of microbiological culture and sensitivity in a low resource setting is not only expensive but will take 48 hours to 5 days to complete and patients may require urgent treatment.¹ In such situations the knowledge of microbiological flora involved in septic abortion will guide the choice of antibiotic treatment and also guide the antibiotic prophylaxis during or after uterine evacuations to prevent super impose sepsis.^{22,23} Haphazard trials of antibiotics is unscientific and may lead to development of resistance.^{24,25} The aforementioned therefore underscore the need to study the bacteriological profile and the antibiotic sensitivity pattern in septic induced abortion patients at the University of Calabar Teaching Hospital (UCTH). The outcome of this study could be used as a template for more comprehensive research, to postulate an evidence-based antimicrobial treatment of septic induced abortion, to institute first-line antibiotic regimen while awaiting results of culture.

MATERIALS AND METHODS

This was a cross sectional study conducted in the Department of Obstetrics and Gynecology of the University of Calabar Teaching Hospital (UCTH), Calabar, over a seventh month period starting from 15th of August 2019 to 14th March 2020. Patients who had induced abortion complicated by sepsis and satisfied the inclusion criteria were recruited for the study. Exclusion criteria were unconscious patients and patient with heavy vaginal bleeding or spontaneous miscarriage and patients already on antibiotics treatment.

The sample size was determined using the Cochran's formula,²⁶ at 95% confidence interval and sampling error of 2.5%. The prevalence rate in the population was based on previous study in the literature (6.7%)¹⁷ assuming a non-response rate of 10 percent. A sample size of 106 was projected. The study was carried out after obtaining approval from the Ethics and Research Committee of University of Calabar Teaching Hospital.

A semi structured questionnaire was administered to the patients by the researcher/research assistants in the emergency room and gynecological ward after informed consent was obtained for collection of biodata and clinical information and endocervical swabs and blood samples taken before commencement of antibiotics. Samples were collected with sterile

cotton tipped swabs on wooden applicator sticks encased in plastic tubes. The swabs were immediately placed in Bijou bottles containing Stuart’s transport medium.

Blood agar or MacConkey agar was used to culture the organisms. The various media that were used in this study were manufactured by OXOID LTD 159.²⁷ The inoculated agars were incubated aerobically at 37^{0c} for 24-48 hours. After incubation, isolates were observed, read morphologically and gram stained for identification of organisms.

The data obtained were processed and analyzed using Statistical Package for Social Sciences (SPSS) Version 20. Frequency tables were presented for all variables. Susceptibility patterns of all isolated organism were determined by running a cross tabulation between the isolates and antibiotics.

RESULTS

There was a total of 1,095 gynecological admissions during the study period out of which 112 were septic induced abortions, giving a prevalence of 10.2%.

Table 1: Socio-demographic characteristics of participants (n = 98).

| Age (in years) | Frequency | Percentages (%) |
|---|-----------|-----------------|
| 16-19 | 12 | 12.2 |
| 20-24 | 24 | 24.5 |
| 25-29 | 34 | 34.7 |
| 30-34 | 23 | 23.5 |
| ≥ 35 | 5 | 5.1 |
| Marital Status | | |
| Single | 58 | 59.2 |
| Married | 34 | 34.7 |
| Cohabiting | 6 | 6.1 |
| Occupation | | |
| Unemployed | 18 | 18.4 |
| Student | 26 | 26.5 |
| Employed (Artisans, Traders, Public servants) | 54 | 55.1 |
| Educational status | | |
| No formal education | 5 | 5.1 |
| Primary | 21 | 21.4 |
| Secondary | 28 | 28.6 |
| Tertiary | 44 | 44.9 |
| TOTAL | 98 | 100.0 |

Table 2: Reproductive health characteristics of patients (n = 98)

| Variable | Frequency | Percentage (%) |
|--|-----------|----------------|
| Parity | | |
| Nulliparous | 58 | 59.1 |
| Primiparous | 13 | 13.3 |
| Multiparous | 27 | 27.6 |
| Use of Contraception prior to index pregnancy | | |
| Yes | 62 | 63.3 |
| No | 36 | 36.7 |
| Reason for Abortion | | |
| Not Ready for childbearing | 39 | 39.7 |
| To limit size of family | 24 | 24.4 |
| Student | 21 | 21.4 |
| Partner denial | 14 | 14.2 |
| Interval before presentation | | |
| ≤ 7 days | 20 | 20.4 |
| 4-7 days | 32 | 32.7 |
| > 7 days | 46 | 46.9 |
| TOTAL | 98 | 100.0 |

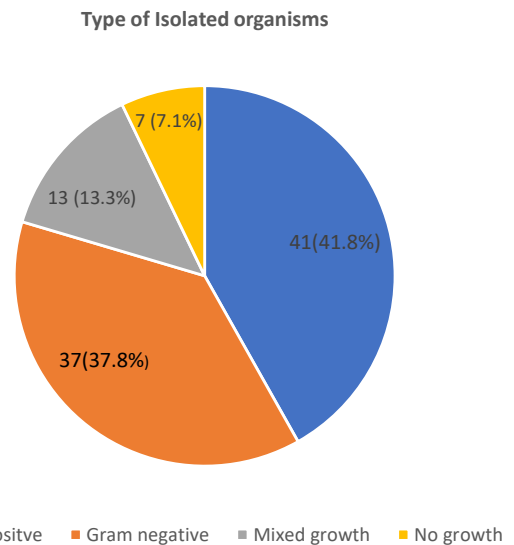


Figure 1: A pie chart showing the pattern of the isolates from patients with septic induced abortion.

A total of 106 patients met the inclusion criteria and gave consent and were recruited for the study. However, 98 patients completed the study. The age range of patients was 18 to 36 years with a mean of 26.68±3.99 (table 1). Majority of the patients were 24- 29 years 34(34.7%), single 58(59.2%),

gainfully employed 54(55.1%) and 44(44.9%) had tertiary education. Table 2 showed that more than half of the patients were nulliparous

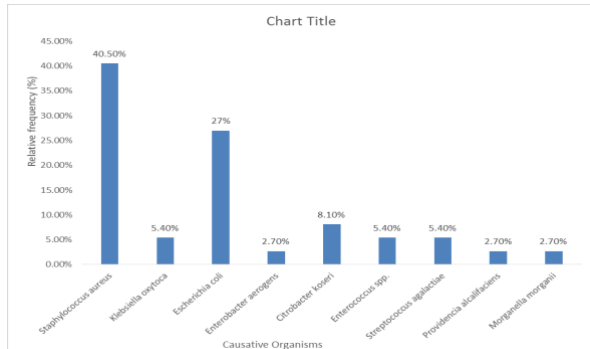


Figure 2: A bar chart showing the relative frequency of occurrence of causative organism of septic induced abortion

58(59.1%), and majority 62(63.3%) did not use any form of contraceptive before index pregnancy and abortion. A total of 45(45.9%) presented to hospital more than 7 days after procuring abortion. Many procured abortions because they were not ready to be parents 39(39.7%) and to limit family size 24(24.4%).

Table 3: Sensitivity pattern of isolated organisms

| ORGANISMS | ANTIBIOTICS | | | | | | | | | Total organism |
|----------------------|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------|----------------|
| | PENI | GENTA | CEFOX | CLIN | ERYTH | CIPRO | CEFTA | MEROP | AMPI | |
| Staph. Aureus S | 3(5.5%) | 26(47.2%) | 2(3.6%) | 2(3.6%) | 6(10.9%) | 40(72.7%) | 6(10.9%) | 15(27.2%) | 3(5.4%) | 55(100%) |
| R | 52(94.5) | 26(52.8) | 55(96.4%) | 55(96.4%) | 49(89.1%) | 15(27.2%) | 49(89.1%) | 49(72.8%) | 52(94.6) | |
| E. coli S | 0% | 10(60.0%) | 0(0%) | 0(0%) | 0(0%) | 13(39.3%) | 10(30.3%) | 0(0%) | 0(0%) | 33(100%) |
| R | 33(100%) | 23(29.4%) | 33(100%) | 33(100%) | 33(100%) | 20(60.7%) | 23(69.7%) | 33(100%) | 33(100%) | |
| Klebsiella S | 1(14.2%) | 4(57.1%) | 0(0%) | 0(0%) | 4(57.1%) | 3(42.8%) | 2(28.5%) | 0(0%) | 0(0%) | 7(100%) |
| R | 6(85.8%) | 3(42.9%) | 7(100%) | 7(100%) | 4(57.2%) | 4(57.2%) | 7(100%) | 7(100%) | 7(100%) | |
| Enterococcus S | 0(0%) | 2(33.3%) | 0(0%) | 0(0%) | 0(0%) | 2(33.3%) | 0(0%) | 2(33.3%) | 0(0%) | 6(100%) |
| R | 6(100%) | 4(66.7%) | 6(100%) | 6(100%) | 6(100%) | 4(66.7%) | 6(100%) | 6(66.7%) | 6(66.7%) | |
| Citrobacter S | 0(0%) | 3(60%) | 0(0%) | 0(0%) | 0(0%) | 2(40%) | 0(0%) | 2(40%) | 0(0%) | 5(100%) |
| R | 3(100%) | 2(100%) | 3(100%) | 3(100%) | 3(100%) | 3(100%) | 3(100%) | 3(100%) | 3(100%) | |
| Strept. Agalactiae S | 0(0%) | 0(0%) | 3(50%) | 0(0%) | 0(0%) | 2(50%) | 0(0%) | 0(0%) | 0(0%) | 4(100%) |
| R | 4(100%) | 4(100%) | 3(50%) | 4(100%) | 4(100%) | 3(50%) | 4(100%) | 4(100%) | 4(100%) | |
| Enterobacter S | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 2(100%) | 0(0%) | 0(0%) | 0(0%) | 2(100%) |
| R | 2(100%) | 2(100%) | 2(100%) | 2(100%) | 2(100%) | 0(0%) | 2(100%) | 2(100%) | 2(100%) | |
| Providencia S | 0(0%) | 2(100%) | 0(0%) | 1(50%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 2(100%) |
| R | 2(100%) | 0(100%) | 2(100%) | 1(50%) | 2(100%) | 2(100%) | 2(100%) | 2(100%) | 2(100%) | |
| Morganella S | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 0(0%) | 2(100%) | 0(0%) | 0(0%) | 0(0%) | 2(100%) |
| R | 2(100%) | 2(100%) | 2(100%) | 2(100%) | 2(100%) | 0(100%) | 2(100%) | 2(100%) | 2(100%) | |

S = Sensitivity; R = Resistance.

KEY: CIPRO=Ciprofloxacin; CEFTA=Ceftriaxone; GENTA=Gentamicin; CEFOX=Cefoxitin; PENI=Penicillin; CLIN=Clindamycin; ERYTH=Erythromycin; MEROP=Meropenem; AMPI=Ampicillin

Most of the isolates grown were Gram positive (+ve) organisms 41(41.8%), and Gram negative (-ve) organisms accounted for 37(37.8%). However, 7(7.1%) of the isolates did not grow any organism as shown in figure 1. The commonest Gram-positive organism cultured was Staphylococcus aureus (40.5%), while that of Gram-negative

Table 4: Antibigram of various organisms isolated from septic induced abortion.

| Antibiotics | Sensitivity (%) | Resistant (%) |
|---------------|-----------------|---------------|
| Ciprofloxacin | 56.8 | 43.2 |
| Gentamicin | 40.5 | 59.5 |
| Meropenem | 16.4 | 83.6 |
| Ceftriaxone | 15.5 | 84.5 |
| Erythromycin | 8.6 | 91.4 |
| Penicillin G | 3.4 | 96.6 |
| Cefoxitin | 3.4 | 96.6 |
| Ampicillin | 2.6 | 97.4 |
| Clindamycin | 2.6 | 97.4 |

organisms was E. coli (27.0%) as shown in figure 2. The sensitivity pattern of isolated organisms to common antibiotics is as described in Table 3. Out of all the isolates that grew Staphylococcus aureus, 72.7% were sensitive to Ciprofloxacin, and 47.2% to Gentamicin while of the isolates with E. coli, 39.3% were sensitive to Ciprofloxacin, whereas 60.6% was sensitive to Gentamicin and 30.3% to Ceftriaxone. The Antibigram of the various organisms isolated showed that they were mostly sensitive to Ciprofloxacin (56.8%) and Gentamicin (40.5%). In the same vein, resistance was mostly seen with Ampicillin (97.4%) and Clindamycin (97.4%), Cefoxitin (96.6%), Erythromycin (91.4%) with the least resistance seen with Ciprofloxacin (43.2%). As shown in Table 4

DISCUSSION

The contribution of septic induced abortion to maternal mortality and morbidity remains unacceptably high in developing countries.^{27,28,29} This study gives an insight to the causative pathogens of septic induced abortion in our hospital and their sensitivity pattern.

The septic induced abortion prevalence of 10.2% in UCTH was higher than some other studies.^{30,17,11} Prevalence of septic abortion varies between developing and developed countries and depends upon literacy, awareness, legislation and socioeconomic status of the population.

In this study the mean age of patients was 26.6years with many of the respondents in the age range of 25-29 years with a frequency of 34.7%. This finding was similar with the study in Port Harcourt.¹¹ but differ with the report by Osazuwa

and Aziken in Benin Nigeria which had a larger proportion of respondents for induced abortion as adolescents aged between 16-19 years 59.1%.³¹ Teenagers and their parents in our environment would prefer accessing care in hidden private clinics, than Government hospitals (the study centre) to ensure privacy and avoid social condemnation and stigmatization and this could explain the low proportion of adolescents in the study. This study showed that many of the patients 59.2% were single. This was similar to the study in Abakaliki South-East Nigeria.³² finding is in contrast to the report by Malik et al in Bangladesh, where a higher percentage of the women 96.7% were married.³³ The preponderance of single women may be because of the socio-cultural implication of keeping a pregnancy while single, as well as the lack of economic support to cater for the pregnancy.

Many of the patients (44.9%) had tertiary education which is in contrast to previous studies in Abakaliki and India, where majority of patients had primary education.^{32,34} It is a known fact that the level of education has a linear relationship with contraception awareness thereby reducing the rate of unwanted pregnancies.

Nulliparous women have the highest rate of septic induced abortion in this study with a rate of 59.1%. The reason could be the patients were more interested in pursuing careers and were not ready to become parents. As corroborated in this study, where the reason why most of the women procured abortion was because they were not ready to be parents (39.7%).

It was observed in this study that a large proportion of the patients 63.3 % did not use any form of contraceptive before their index pregnancy, this was similar to study by Malik et al. in Bangladesh.³³ This may be due to poor awareness and lack of access to Family planning facilities, myths surrounding the use of contraceptives, perceived side effects, and Religious and Cultural barriers. Little wonder that the contraception prevalence of Nigeria still remains at 27.5%, according to 2018 National Demographic Health Survey.⁶

This study has depicted the polymicrobial nature of septic induced abortion, and this is in agreement with the work of Grimes et al. and Stubblefield and Grimes.^{8,35} It was noted that staphylococcus aureus with a frequency of 40.5% was the commonest organism implicated in septic induced abortion in this study, followed by

Escherichia coli (27.0%). These organisms have also been generally reported to be the common organisms implicated in septic abortion.^{11,34} These two organisms are virulent with the release of endotoxins that can cause septic shock and maternal death.

A careful look at the overall antibiogram of this study showed that ciprofloxacin (56.8%) is the most effective antibiotic, followed by Gentamicin (40.5%). Gram reaction of the organisms in this study also showed that Ciprofloxacin, a brand of quinolones with bactericidal property was most effective against gram negative rod and gram-positive cocci and this qualifies it as a broad-spectrum antibiotic. This drug should be considered in a low resource setting where simple gram staining can be done to select the appropriate antibiotics for septic induced abortion without waiting for a full-scale laboratory work.

It is significant to note in this study that the sensitivity of endocervical isolates was highest to quinolones (ciprofloxacin)56.8%, followed by Gentamycin and lowest with Clindamycin 2.6%, This is similar to the findings by Udo et al.³⁶ in Calabar who reported poor outcome in patient with septic abortion treated with Clindamycin compared to those treated with a combination of Gentamicin and penicillin. Surprisingly, the very expensive brand of antibiotics Meropenem a brand of carbapenem had lower sensitivity (16.4%) compared to 56.8% of Ciprofloxacin.

CONCLUSION

Maternal deaths from Induced abortion are disproportionately due to infections with delay in treatment as a major reason. Endocervical isolates from women with septic induced abortion in this study were multi microbial and sensitive to Ciprofloxacin. Hence, ciprofloxacin may be recommended as a first line drug for the management of septic induced abortion in our environment while awaiting results of microscopy culture and sensitivity.

LIMITATION OF THE STUDY

Organisms such as Chlamydia and Anaerobic organisms which are also implicated in genital tract infections were not cultured in this study due to complexity of the procedure involved in their culture and cost.

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