

(RESEARCH ARTICLE)



Gas gangrene in pregnancy, delivery and abortions requiring urological and surgical management; our experiences in Port Harcourt, Nigeria

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Abstract

Introduction: In spite of a high contribution of 26.7% to 35.0% of sepsis to maternal mortality in our hospital, there is little or no documentation about pyogaseous infections in pregnancy in the area. We present here a series of cases of different forms and presentations of pyogaseous infections managed at designated hospitals in Port Harcourt and its environs.

Materials and Methods: Using a common proforma containing clinical and relevant laboratory tests, consecutive patients that presented to designated hospitals in Port Harcourt and its environs with normal and complicated pregnancies, deliveries and abortions were evaluated. Those with diagnosis of gas gangrene were treated and enlisted in this study. Socio-demographic and clinical data including outcome of all investigative and therapeutic procedures in pregnancy, puerperium and abortions were recorded. Results were presented.

Results: One thousand five hundred and eighty-three (n=1583) patients were evaluated. Five (5) patients (aged 19-35years) had features of gas gangrene. One patient had gas gangrene in the mid-trimester of pregnancy. In three the disease complicated abortions; one after Cesarean section done for complicated term pregnancy. Two patients survived. Three died in spite of treatment.

Conclusion/ Recommendations: High index of suspicion, early diagnosis, complete surgical excision of affected tissues, antibiotic therapy, maintenance of homeostasis and team work were needed for successful treatment. Intraoperative findings in one patient agree with observations of others that gastrointestinal etiology should be sought for gas gangrene of anterior abdominal wall. Recommendations are given on improvement of treatment of the lesion in affected rural areas.

Keywords: Gas gangrene in pregnancy; Delivery and abortions; Management; Port Harcourt; Nigeria

1 Introduction

Available records indicate that, apart from the major causes of maternal deaths in our hospital which include severe pre-eclampsia, eclampsia, hemorrhage and hypertensive diseases, puerperal sepsis over the years contributed to 26.7% to 35.0% of maternal deaths [1-3]. Despite this high contribution of bacterial infections to maternal mortality, which is sometimes accompanied by fetal and perinatal infant mortality, there is little documentation in the literature in respect of statistics of pyogaseous infections in pregnancies in our communities. It may not be enough to conclude that gas gangrene in pregnancy is rare or non-existent in these communities. This is because there is abundant evidence in the literature that almost all invasive investigations, transvaginal or transabdominal tests and therapeutic procedures in

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pregnancy, including normal deliveries may be risk factors for gas gangrene. For instance, it has been reported to have caused fetal death after genetic amniocentesis [4], and as a complication of degenerating uterine leiomyoma [5]. Evariste Gafumbegete et al [6] reported that gas gangrene caused spontaneous rupture of the spleen which resulted in profuse intraperitoneal bleeding in spite of early treatment. The rapidity of spread of myonecrosis, which may occur with early multiple organ and systemic involvement, makes team approach to affected patients' management sometimes inevitable. We present our experiences in managing and/ or evaluating patients with different forms and presentations of pyogaseous infections in pregnancy, and in outcome of pregnancy.

2 Material and methods

This study was done at University of Port Harcourt Teaching Hospital (UPTH) (15/9/2008 to 30/9/2021) and Daily Spring Hospital (DSH), Port Harcourt, Rivers State, Nigeria. Daily Spring Hospital Port Harcourt was used by the first author of this article (from 15/9/2008 to 30/12/2016) as a treatment and collation center for referred patients and information from rural clinics in Ogoni. It was also used for treatment of those who had no consent for service at UPTH.

Using a common proforma, data from patients were collected weekly from the designated rural hospital in Gokana, Ogoni, Rivers State, Nigeria, by the first contributor. Data were collected from consecutive patients treated directly by the contributors contemporaneously with on-going patient services. Case files of patients not directly treated by the contributors at the centers were studied using the common proforma. Some records were taken during clinical ward rounds and clinical presentations. Registers at antenatal clinics (ANC), post-natal, isolation, gynecology ward/clinics were gleaned for additional information.

Last menstrual period. Parity and details of events in any previous/current pregnancies including labor and outcome/delivery up to 42nd days post-delivery were collated. Prenatal diagnostic and therapeutic procedures e.g. amniocentesis, cordocentesis, radiological diagnostic tests, ultrasonography and results were documented. Type(s) of delivery (spontaneous, vaginal delivery (SVD), assisted delivery including adjunctive procedures e.g. episiotomy, vacuum forceps etc. were noted. Use of caesarean sections, additional procedures, hysterectomies and complications of pregnancy and delivery were documented. Diseases occurring with pregnancy, hypertension, eclampsia, diabetes mellitus were noted. Per partum problems including, antepartum hemorrhage, post-partum hemorrhage, prolonged obstructed labor and cervical lacerations were documented. Detail of all types of abortions and outcome were recorded. These included methods of termination of pregnancy and outcome.

2.1 Scope of the Study

Gas gangrene affecting any part of the maternal or fetal body, from the first day of the last menstrual period, to the 42nd day post-partum were included. All reported invasive prenatal, intra-partum and post-partum interventions or procedures were studied. Gas gangrene complicating therapeutic procedures in pregnancy or abortions were included.

3 Results

One thousand five hundred and eighty-three patients (n=1583) comprising 1033(65.26%) consecutive patients treated in rural medical practice at Gokana Local Government Area, Nigeria; 514 (32.47%) and 36 (2.27%) patients were treated respectively at University of Port Harcourt Teaching Hospital, Port Harcourt, and Daily Spring Hospital Ltd, Port Harcourt. Five (5) patients (aged 19-35years) had features of gas gangrene and formed the basis of this report. Two patients were very ill and were referred from rural service to DSH and UPTH respectively for further management.

One patient had gas gangrene in the mid-trimester of pregnancy. Three had the disease as complication of septic abortion, while one manifested with the disease after Cesarean section in a term pregnancy complicated by prolonged obstructed labor, premature rupture of fetal membranes, maternal exhaustion and intrauterine fetal death. Two patients survived while three died in spite of treatment.

3.1 Presentations of Case Series

3.1.1 Patient 1

This patient was a 35-year old farmer and house wife who presented to our unit with complaints of a painful swelling in the right upper part of her abdomen of 4 days duration. The swelling arose spontaneously, rapidly progressed in size and extended towards the right iliac fossa. It was associated with fever, malaise and progressive lethargy. She also had

abdominal pain with no changes in bowel habits. She had cough which was productive of yellow sputum but there was no hemoptysis. She had total hematuria.

She was para 4 gravida 5. Her LMP was 31/3/08 and her EDD 07/01/09. She lost fetal kicks during the course of the illness. Her previous pregnancies were uneventful and she had spontaneous vaginal delivery of all her previous babies with no significant puerperal complications. She had uncomplicated appendectomy 4 years previously. She was not diabetic and had no other significant medical or surgical co-morbid conditions.

She looked young, ill and febrile with a temperature of 37.6°C. She was jaundiced with severe pallor. Her pulse rate was 122 /minute. The pulse was regular with low volume. Her blood pressure 120/60mmHg. Her heart sounds 1 and 2 were normal with no added sounds.

She had dyspnea, and tachypnea with coarse crepitation over the upper lobes of both lungs.

The abdomen was distended, generally tender with guarding. Maximum tenderness was over a mass 10cm x 10cm in the right upper quadrant. The mass had normal skin over it. There was tender hepatosplenomegaly and a left reducible inguinal hernia.

The fundal height corresponded to 22 weeks gestational size; the fetus was in longitudinal lie presenting breach. Fetal heart sounds were not heard on abdominal auscultation.

Her hemoglobin level was initially 8g/dl but fell to 6.7g/dl after 24hours. Her blood group was O D +. She had normal serum electrolytes, urea and creatinine concentrations. Her blood culture could not be done due to unfavorable local circumstances. She was sero-negative for HIV I and II, non- reactive to Hepatitis B surface antigens (HBsAg) and VDRL test.

Her abdominal ultrasonography showed that she had singleton normal 25-week live viable fetus of estimated weight 0.798kg. There was an anteriorly placed intramural fibroid 2.6cmx3.0cmx3.4cm in dimensions and what was described as 'a hemorrhagic twisted right ovarian cyst.' The liver was 165mm enlarged, had high amplitude echoes with perivascular thickening suggestive of sepsis.

A preliminary diagnosis of inflammatory wall tumor in pregnancy with SIRS was made. She was transferred from the rural clinic where the initial assessment was done to DSH for further management

She was placed on intravenous ceftriaxone, metronidazole and adequate intravenous fluid therapy including blood transfusions. She was catheterized for fluid input/output monitoring and management of hematuria. An exploratory laparotomy was done for her on the second day of presentation at DSH with the following findings (1) a hemorrhagic tumor involving the muscles of the right lateral abdominal wall which extended from the right hypochondrium to the right iliac fossa. The hemorrhagic muscle mass was foamy and had bubbles of gas and crepitus. She also had (2) hepatomegaly with liver span up to the right iliac fossa (3) splenomegaly (4) grossly inflamed ascending colon which bled freely on contact and was held by fibrinous adhesions and the omentum to the parietal lateral abdominal wall. The small intestine, transverse colon and the descending colon were normal (5). Fallopian tubes and the ovaries were normal. Other findings were (6) 24-week sized, pink gravid uterus with palpable fetal parts, and (7) hemorrhagic peritoneal fluids. The right hypochondriac tumor and all the involved muscles of the right lateral abdominal wall with crepitus and gas bubbles were excised. Hemostasis was maintained and the abdomen closed appropriately. She had adequate post-operative monitoring, antibiotics and fluid therapy with intravenous ceftriaxone and metronidazole, intravenous crystalloids, blood transfusions and pentazocine for analgesia.

Fever persisted for 2 days post-operatively, became intermittent on the third day and subsided on the 5th day. The urethral catheter still drained urine with altered blood by the 5th post-operative day and cleared by the 7th day. Fetal kicks returned on the second day after operation. A repeat abdominal ultrasonography was done on the third day after operation to confirm fetal viability. She was discharged home on the 9th day after operation following satisfactory recovery, and on confirmation of fetal viability. Histology reports showed that the excised lesion was an acute inflammatory mass of muscles with tissue necrosis. She had spontaneous vaginal delivery of a baby boy at term. She however developed incisional hernia of the right lateral abdominal wall which was scheduled for repair. After 2 years of follow up she was alleged to have been shot dead by unknown gun men (assassins) near her community on her way from yam market where she had gone to purchase yam seedlings for sale and planting.

Figure 1A, B, C are the pre-operative ultrasound scan graph, and intraoperative photographs respectively of Patient1.

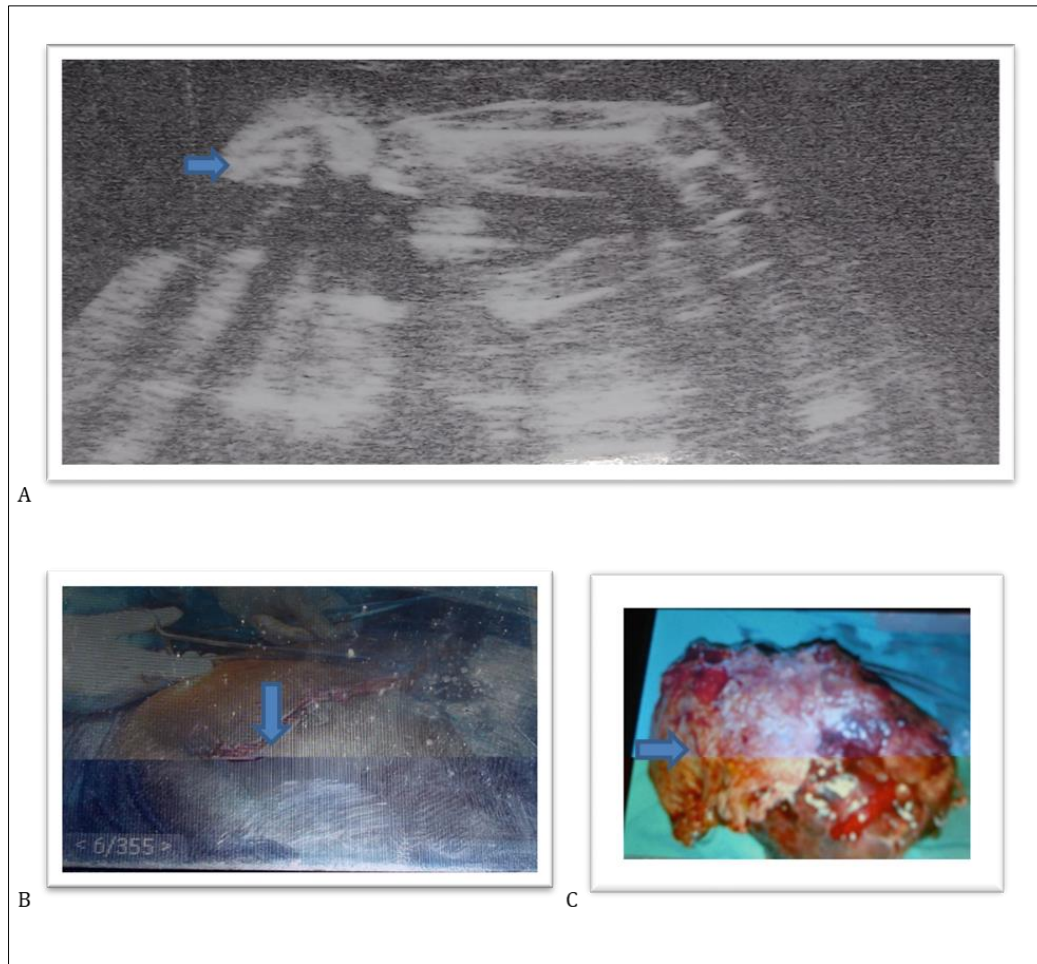


Figure 1 A, B and C 1A is an obstetric ultrasound scan graph of Patient 1 showing single fetus in longitudinal lie presenting breech with no obvious fetal abnormality. Estimated gestational age (EGA) was 25 weeks. Estimated weight of fetus was 0.798 Kg. Position of placenta was posterior and fundal. Liquor was of normal volume and color. Arrow points at the head of the fetus. 1B abdominal wall surgical wound closure (mass closure) before placement of skin stitches).1C. Excised muscles with affected tissues of the right lateral abdominal wall. The inflammatory tumor with all involved muscles were crepitant and foamy

3.1.2 Patients 2

This was a 21-year old gravid para 0+2 single woman, who presented to a private clinic in company of her mother with complaints of vaginal bleeding of four weeks duration. Her last menstrual period was 22 weeks before presentation. The bleeding was intermittent and occurred with abdominal pains. Her past medical history was unremarkable. However, she had two previous induced abortions at 6 and 8 weeks respectively. She changed vaginal pads one to two times daily.

She was ill-looking and short-statured. Her fundal height corresponded with 20-22 weeks gestational size. Fetal heart sound were heard. She had yellowish vaginal discharge. A diagnosis of threatened abortion was made. She was admitted and requested to have bed rest and put on tablets diazepam 5mg daily, folic acid 0.5mg daily and ferrous sulphate 200mg twice daily. One week later she started passing foul-smelling bloody fluids through the vagina with increasing abdominal pains and uterine contractions. On review, a diagnosis of ruptured fetal membrane with inevitable abortion was made. She was placed on metronidazole 400mg 8hourly, intravenous ceftriaxone 1g daily and intravenous oxytocin 10mg in 1litre 5% dextrose/water regulated at 10 drops/ minute. Forty-eight hours later there was no satisfactory expulsion of the products. Rather her clinical state worsened with hyperpyrexia, swinging temperatures, abdominal pains and distension, and features of peritonitis. She was referred to UPTH at its temporary site for further management. There she was evaluated. A provisional diagnosis of ruptured uterus with severe sepsis and peritonitis was made. An exploratory laparotomy was performed. The uterus was described as “sloughy and foamy” She had total abdominal

hysterectomy, peritoneal lavage and drainage. She died second day post-operation due to severe sepsis with toxic shock syndrome.

3.1.3 Patient 3

The patient was a 35-year old prim parous woman (gravida 1 para0+3) who was brought to the peripheral hospital with complaints of labor pains which started 6 days previously. She was having intermittent painful uterine contractions for 2 weeks previously. The pregnancy was not supervised. She was brought to the clinic by the mother, both of them from a neighboring state where her labor. She was being managed in labor by a traditional birth attendant and herbalist at their home state. She was not married but was resident with the mother. Her past medical history revealed no additional significant information.

She was in moderate painful distress. Her height was 1.63m. She looked anxious, dehydrated and afebrile. Her pulse was regular at 85/minute, blood pressure 140/80mmHg. Her heart sounds 1 and 2 were normal with no additional sounds. The fundal height corresponded with 37-38 weeks gestational size. Fetus was single, in longitudinal lie and presented cephalic with head positioned left occipitolaterally. Fetal heart sounds were not heard. She was draining straw-colored bloody fluid with foul smell per vaginam. The cervix was 2cm dilated. A provisional diagnosis of antepartum hemorrhage, prolonged obstructed labor with premature rupture of fetal membranes (PROM), and intrauterine fetal death (IUFD) with maternal exhaustion was made. She was admitted into the peripheral hospital. Course of labor was monitored quarter- hourly. Intravenous infusion of 5% dextrose in water alternating with 0.9% saline solution was set up. She was catheterized per urethram for fluid monitoring which was done quarter-hourly. A seven-day intravenous ampiclox 500mg 6-hourly and 500mg metronidazole 8-hourly was commenced on her. She declined consent for an emergency Caesarean (CS) section for which she was advised. On the second day of admission fetal heart sounds was still not heard. On further counselling an emergency lower segment Caesarean section was done for her on the 8th day of admission as she was not making good progress in labor. The baby was male but a still-born with birth weight 3.4 kg.

On the 6th day after surgery she complained of fever with rigors and passing pussy fluids and increased vaginal bleeding. She was quite ill-looking febrile with temperature of 38.6°C and pale.

The abdomen was distended guarded, very tender and tympanitic. Wound dressing was soaked with bloody foul-smelling fluids. There was subcutaneous crepitus. The wound edges were edematous sloughy and dusky. Wound discharge was putrid and foul-smelling. A diagnosis of surgical site infection (necrotizing fasciitis with myonecrosis) was made. She was taken into the theatre extensive wound debridement was made. The uterine wound had broken down. The uterus was dusky and sloughy. All necrotic tissues were excised to ensure free bleeding at the edges of the uterine wound and the abdominal wall incision line. The uterine cavity was sucked clear of hematoma and sloughs through uterine wound opening. The uterine and abdominal wounds were closed. There was no consent for total hysterectomy. She was transfused 2 units of whole blood and given antimalarial and supportive treatment. Response to treatment was transient. On 10th day after CS there was recurrence of pyrexia and profuse bleeding through the vagina and the abdominal wound. She had total hematuria. The patient died in spite all further efforts at resuscitation.

3.1.4 Patient 4

This was a 19-year old gravid para0+2 who was said to have been bleeding through the vagina for about 7 days with marked intermitted abdominal pains. Her last menstrual period was about 8 weeks previously. She presented to a rural clinic in Gokana, Ogoni where she had an evacuation indicated by inevitable abortion. Following the procedure she could not stand or walk due to severe lower abdominal pains. Not satisfied with services, she immediately proceeded to a second clinic where she was admitted and managed conservatively on intravenous fluids, antibiotics and analgesics. On the 8th day of admission her clinical state deteriorated with fever, abdominal pain and abdominal distension. She was again transferred to a third medical center. On review there she was toxic-looking, febrile with a temperature of 39.°c deeply jaundiced and pale. Her pulse was 110/minute, regular and had low volume. The blood pressure was 100/60 mmHg. Her heart sounds 1 and 2 were normal with no added sounds. The abdomen was generally distended with no movement with respiration. There was generalized guarding with tenderness, marked ascites and faint bowel sounds. She had total hematuria. A provisional diagnosis of uterine perforation, peritonitis, cystitis with toxic shock syndrome and intravascular hemolysis was made. She was admitted.

Her hemoglobin concentration was 7.0g/dl. Urinalysis revealed no glycosuria but protein was positive. Urine pH was 5.5. Samples were collected for serum electrolytes, urea and creatinine, and blood grouping and cross-matching. She was transfused 2 units of blood and commenced on intravenous (IV) ceftriaxone 1g daily, IV metronidazole 500mg 8-hourly, IV paracetamol 1g 8-hourly and infusion normal saline 1 liter 8-hourly to alternate 5% dextrose in water.

Urethral catheter was passed and fluid input/ output monitored. On the third day of admission she had exploratory laparotomy with findings of generalized peritonitis with pussy hemorrhagic peritoneal fluids. Intestinal loops were matted together, freely bleeding on contact. The uterus was dusky, had necrotic patches and foamy with crepitus. There was extension of the foamy gaseous inflammation of tissues to the pelvic side walls, the urinary bladder and the retroperitoneum. Her clinical state was considered too poor for further extensive pelvic and retroperitoneal dissections after abdominal hysterectomy. She had cardiac arrest once during the surgery (and had to be resuscitated) in addition to uncontrollable primary hemorrhage during dissection. The abdomen was cleared of pus and hematoma as much as possible and closed with peritoneal drainage. She had continuous monitoring with volume resuscitation. The patient was lost within 24 hours of surgery. .

3.1.5 Patient 5

This was a 25- year old prim parous secondary school female who was brought to the hospital by her step mother. Both parents were late. She presented with complaints of abdominal pains of sudden onset which started 6 days previously. Her last menstrual period was unknown. Her past medical history suggested that she had poliomyelitis in childhood which explained a marked deformity and shortening of her right lower limb occurring with a tilt in her pelvis.

She was young, sweaty, and in labor pains, afebrile, anicteric but pale.

Her pulse rate was 84 and her blood pressure 130/80 mmHg. The pregnancy was term. Uterine contractions were strong and regular (one in 2 to 5 minutes). Fetus was in longitudinal lie presenting cephalic. The fetal head position was occipito-anterior. The labia were edematous. The cervix was fully dilated and effaced. Part of the fetal membranes with its amniotic fluid content bulged (away from an edematous caput succedaneum) through the tight vulvar soft tissues that had obstructed delivery of the baby. The urinary bladder was distended.

A diagnosis of prolonged obstructed labor with maternal exhaustion was made. The blood hemoglobin concentration was 9g/ dl. The urinary bladder was catheterized and emptied of urine. Urinalysis showed significant ketonuria and proteinuria. There was no glycosuria. Intravenous 5% dextrose in water was set up on her. Five milligrams of oxytocin was added to the infusion and regulated at 20 drops per minute. A left posterolateral episiotomy was given and she delivered a male baby. The third stage of labor was normal.

The baby had Apgar scores of 8 in 1min and 10 in 5minutes. Episiotomy was sutured. She was put on capsules ampicillin and oral metronidazole and paracetamol. Both baby and mother were in stable condition.

Five days later she developed fever and complained of pain and swelling at the site of episiotomy, that she could neither sit nor stand.

She was ill-looking and had rigors. She was febrile and had pyrexia with temperature of 38.2°C. The episiotomy site was swollen, discharging foul-smelling brown fluids. There were dark necrotic sloughs and patches advancing into the ipsilateral ischio-rectal fossa. A clinical diagnosis of necrotizing fasciitis was made. Immediate local circumstances did not favor wound biopsy for histology and collection of materials for antimicrobial susceptibility testing. She was immediately taken to the theatre. Intravenous infusion 0.9% saline infusion was set up on her. Under intravenous anesthesia (ketamine hydrochloride with diazepam) all wound stitches were removed. Adequate wound debridement was done and continued daily. All necrotic tissues were excised to ensure free bleeding at the wound edges. The wound was left exposed for the next 72 hours. Intravenous antimicrobial therapy comprising 80mg gentamicin 8-hourly for 5 days; 1g ceftriaxone daily and 500mg metronidazole 8-hourly were given her for 7 days. She also had 12-hourly Sitz baths (sitting in basin half-filled with warm hypertonic saline every 12 hours. Wound healing was satisfactory. She was discharged in good clinical condition 22 days after admission.

4 Discussion

Pyogaseous infections in pregnancy are considered rare but such conclusions may not apply uniformly to all settings, communities, regions and countries worldwide. In our rural settings and similar communities worldwide where sepsis still contributes significantly to poor outcome of pregnancies, such conclusions may be understatement of the magnitude of the problem. Gas gangrene in pregnancy has high morbidity and mortality. The case series presented in this study shows part of a spectrum of risk factors associated with the infection which include normal deliveries, invasive tests and therapeutic perinatal procedures in pregnancy.

Gas gangrene is a pathological condition in which there are invasion and multiplication of pathogens (most commonly clostridium species) and characterized by exotoxin production into the tissues and the systemic circulation, rapid tissue inflammatory responses and/ or massive tissue necrosis with putrefaction, usually with gas formation in the tissues [7]. Clostridium perfringens, one of the most ubiquitous of these organisms, is usually found in intestinal and vaginal cavities of 25% of healthy women and has short incubation period [8]. In the case of Clostridium septicum, a very deadly specie, incubation period is less than 24 hours [9]. Pathogenic clostridium organisms are Gram positive, sub-terminal spore-bearing, toxin-producing, rod-shaped obligatory anaerobes and are commonly classified as saccharolytic or proteolytic. Saccharolytic clostridia breakdown carbohydrates contents of tissues and produce lactic acid, hydrogen and carbon dioxide [10], and include Clostridium perfringens (previously called Clostridium welchii), Clostridium novy, Clostridium oedematiens and Clostridium septicum, while proteolytic clostridia breakdown proteins to form foul-smelling gas which include ammonia, and hydrogen sulphide [10]. Other organisms that have been reported to have caused gas gangrene include Group A streptococcus species [11], and Toxoplasma gondii (in synergy with clostridia) [12]. Predisposing factors include large collections of tissue debris, hematoma and tissue ischemia, wound fecal contamination which frequently occurs during parturition, foreign bodies in tissues and deep-seated wounds with low oxygen tension [13]. Clostridium organisms act in synergism with oxygen-depleting aerobic organisms [14].

Causation of diseases by these organisms may occur spontaneously, or be the recurrence of a previous infection, or may be post traumatic consequent upon accidental, assault-related or iatrogenic surgical trauma [15]. Patients may present with one of a spectrum of clostridia lesions which include wound contamination or simple wound infection, anaerobic cellulitis, necrotizing fasciitis as occurs in Fournier's gangrene. Advanced stages the infection are clostridium myonecrosis with putrefaction. This is usually rapidly progressive with poor prognosis, and toxic shock syndrome which may occur with multisystem or multi-organ failure [16]. In pregnancy clostridium species may cause endometritis, myometrial necrosis with putrefaction and or fatal fetal infection [17].

In this study we included gas gangrene affecting the fetus and/ or any part of the maternal tissues. Gas gangrene in Patient 1 had certain notable features: - spontaneity of occurrence, non-specific nature of early clinical presentations, rapid development of toxic shock syndrome and intravascular hemolysis. This was evidenced by rapid development of hepatosplenomegaly, jaundice and anemia. These features agree with findings in different studies recorded in the literature [6, 18, and 19]. Although gas gangrene occurred spontaneously in this patient intra-operative observations revealed the precipitating etiological lesion to be a small perforation of the ascending colon walled off from the peritoneal cavity by a tuft of omentum and fibrinous adhesions. This walling off occurred in continuity to the acute inflammatory tumor of the right hypochondrium. This is similar to observations of Monneuse O et al [20] that spontaneous gangrene of the anterior abdominal wall was associated with precipitating gastrointestinal etiologies of *"perforated sigmoid diverticulitis, perforated appendicitis, acute pancreatitis occurring with perforation of the caecum and perforated colorectal cancer"*. The lesson from these, as also observed by these same workers, Monneuse O et al [20], is that precipitating gastrointestinal etiologies should be sought for when there is spontaneous gas gangrene of the anterior abdominal wall. Treatment strategies that enhanced the survival of the mother and baby were the transfer to DSH 50km away in Port Harcourt City center with better facilities, prompt surgical excision of the focus of infection, appropriate volume resuscitation including blood transfusion and good response to antimicrobial therapy.

The case of Patient Number 3 was pathetic but preventable. The pregnancy was unsupervised. At presentation she had maternal exhaustion, prolonged obstructed labor, antepartum hemorrhage, premature rupture of fetal membranes. These combinations of complications of pregnancy might have made decision-making challenging, especially in the face of intrauterine fetal death. However, some authorities have continued to maintain that intrauterine fetal death alone should not be an indication for immediate Cesarean section, that complication rates were lower with vaginal delivery [21,22]

Details of events at the management of labor by the traditional birth attendants at a different state in the region were sketchy and largely unknown but might have had significant impact on the outcome of this case. The absolute cause of the unfortunate intrauterine fetal death was not ascertained. There was no consent for post mortem examinations. Abruptio of the placenta with antepartum hemorrhage and/ or intrauterine fetal clostridia infections were likely causes. Intrauterine fetal death (IUFD) carries some risk of disseminated intravascular coagulation (DIC) [23] which subsequently occurred. Although histopathological and microbiological diagnosis of clostridia infection were not available, the setting had overwhelming risks for development of endometrial necrotizing fasciitis and myometrial myonecrosis. The prompt recognition of this infection and wound debridement was a right decision by the surgeon who performed the Cesarean section but wound exposure would probably have been salutary. When confronted by a similar scenario due to clostridia septicum infection which caused necrotizing fasciitis and toxic shock syndrome Rimawi BH et al [24] treated their patient successfully and advocated (i) daily debridement of the involved wounds of the anterior abdominal wall and the necrotic/gangrenous hysterotomy site. Each session of extended wound debridement should

ensure free bleeding at the edges of both wounds. (ii) Exposure of the wounds at the ends of debridement. They however advised that such extensive and serial wound debridement and abdominal wound exposure required good motivation, dedication, patience and judicious supportive and antimicrobial therapy. They emphasized multidisciplinary team work comprising “surgeons and infectious diseases consultants and intensive care services with adequate multisystem support”.

All the cases reported here at some points required intensive care services and multidisciplinary team work. Such a desirable practice at the time of data collection (and currently) was handicapped by dearth of trained, qualified and specialized staff and facilities including equipment and infrastructure. This informed the referral of patients to Port Harcourt City, about a distance of 50 km, for specialized treatment. Lesions that required multidisciplinary team work in these patients include hematuria, urinary tract infections, peritonitis, bowel perforation, anterior abdominal wall gangrene, incisional hernia, (observed in Patient 1), necrotizing fasciitis and myometrial myonecrosis, toxic shock syndrome due to systemic toxemia, psychological and cosmetic sequelae as well as multiple organ failure.

Limitations of this study

A limitation of this study is the lack of confirmatory histopathological and bacteriological diagnosis. Diagnosis in four cases was based on clinical and intraoperative findings of combinations of tissue gas, macroscopic features of tissue necrosis and putrefaction. However, based on macroscopic features of gas formation alone, a number of cases of clostridium myonecrosis might have been missed because gas formation is not invariable in this lesion. Gases may not form in severe myonecrosis and vice versa [10]. In clinical practice, for very rapidly lethal infections as clostridium myonecrosis, the prior consideration is ensuring patients’ survival with prompt surgical treatment once the pathological lesion has been clinically ascertained. However, specific bacteriological diagnosis (knowing the organisms involved) may make the course of a disease reasonably predictable and informs appropriate choice of therapeutic options. Another limitation was inadequate documentation of service delivery. Gokana Local Government Area where all the reported cases were seen has an area of 126km² and comprises 17 towns. It was made a Local Government Area of Rivers State, Nigeria in 1991 [25]. It had a population of 233,813 in 2006 [26]. The Local Government Area has 18 public primary health centers, two public secondary health care centers (General hospitals) and few private clinics and medical centers. [27] There are no tertiary hospitals and support healthcare institutions in the area. The extent to which these limitations can affect management of patients with these lethal infections and service delivery requires another study.

5 Conclusion/ Recommendations

The capacity for specialized multidisciplinary team services for managing patients with these severe infections is currently limited. Appropriate registration, regular accreditation of available private and public healthcare institutions and improved documentation of service delivery in Gokana are recommended to determine and sustain the capacity for service delivery at each institution. Critical healthcare centers need to be cited in this area. Synergy should exist between private and public hospitals, clinics and health centers in the area in form of regular academic meetings, development of local guidelines for service delivery, based on existing statutes and patterns of diseases. If such synergy had sufficiently existed Patient 4 would probably have benefited from early exploration.

Since these severe infections in pregnancy often simulate common diseases, a high index of suspicion is necessary for early diagnosis and treatment. Current treatment strategies emphasize early diagnosis, prompt surgical excision of primary source of infection and all involved tissues. Sometimes this may require repeated surgeries. Other goals of treatment include prompt detection of early features of systemic toxicity, appropriate correction of volume deficits, including use of blood transfusion and effective antimicrobial therapy. Intensive care therapy, use of vasopressors may be life-saving in severe cases. There is the necessity for the development of capacity (manpower training, equipment and infrastructure) for the management of these severe infections in pregnancy.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest.

Statement of ethical approval

We complied with requisite ethical standards defined by our Hospital Ethics Committee. This work does not contain any experimentation with use of animals or human subjects by any of the authors.

Statement of informed consent

Informed consent was obtained from all individual participants included in this study.

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