Case study

Acinetobacter Baumannii – A Rare Organism Causing Blood Stream Infection in a Five-Year Old Girl in South-East Nigeria

Abstract

Aim: *Acinetobacter baumannii* is an aerobic Gram-negative coccobacilli found in the environment, which causes predominantly nosocomial infections in humans. However, the incidence of community acquired infections is on the increase. It is characterized high resistance to the environment and the ability to develop resistance to commonly prescribed antimicrobials. Itsclinical features are non-specific and range from a benign transient bacteremia to fulminant septic shock. Carbapenems are recommended for first line treatment. This series presentation aims to increase awareness of this condition.

Presentation of cases: A case of a five-year old female who presented with features suggestive of an upper respiratory tract infection in Enugu State, South-East Nigeria is reported. She also had a history of recent travel to Europe. Serial haematologic investigations showed evidence of worsening bacteremia and blood culture revealed *Acinetobacter baumannii*. She was managed with intravenous Meroponem and was discharged sixteen days after presentation.

Discussion: in this case, the finding of *Acinetobacter baumannii* form blood culture followed an initial non response to conventional antibiotics and the history of recent travel to Europe. This organism has hitherto not been isolated in our environment, and is a significant cause of nosocomial infections with high morbidity and mortality. Isolation of this organism requires BACTEC culture methods. Its high resilience and multidrug resistance makes it difficult to treat.

Conclusion: The incidence of community acquired *Acinetobacter baumannii* is on the increase. Management involves a high index of suspicion, prompt and accurate isolation of infecting strains and the proper choice of antibiotic regimens.

Key words: Multi drug resistance, Community acquired infection, Bacteremia

Introduction

Globally, about 30 million people are affected by bloodstream infections (BSI) [1]. In 2017, almost half (20 million) of all estimated sepsis cases worldwide occurred in children under 5 years of age [2]. In Nigeria, studies have shown that the incidence of paediatric sepsis ranges from12.1 - 58.6% [3,4]. Aetiological agents for community acquired paediatric sepsis include*Salmonella typhi*, *Klebsiella pneumonia*, and *Staphylococcus aureus* [3,5].However, nosocomial infections can occur, usually in the setting of immune-compromise, prolonged hospital stay, prolonged use of antibiotics and the use of invasive therapies [6].

Acinetobacter are a group glucose-non-fermentive, non-motile, non-fastidious, catalase-positive, oxidase-negative, aerobic Gram-negative coccobacilli found in the environment, like in soil and water [7,8]. While there are many types, the most common cause of infections is *Acinetobacterbaumannii*, which accounts for most Acinetobacterinfections in humans [9].

*Acinetobacter baumannii*has emerged as a prominent nosocomial pathogen with high resistance to the environment(what does this mean?) and the ability to develop resistance to commonly prescribed antimicrobials [9-11]. Previous reports have placed the prevalence of *A. baumannii* infection within the range of 0.2 to 30 per 1000 (Cisneros JM, Tiller) with the incidence of community acquired infection gradually being on the increase [7]. In the USA, it is estimated that approximately 12,000 *A. baumannii* infections occur yearly with 500 deaths associated with these infections [12]. Despite being a low-grade pathogen, it is responsible for opportunistic wound infections, blood stream infections, ventilator associated pneumonias, urinary tract infections and meningitis,especially amongst critically ill patients in the intensive care unit (ICU) setting [13]. In such settings, it accounts for up to 20% of infections, is associated with high morbidity and mortality, and contributes to a prolonged hospital stay [13].However, the most significant infection caused by *A. baumannii* is bacteremia, followed by respiratory tract and surgical wound infections [10].Clinical manifestations of this infection are non-specific and range from a benign transient bacteremia to fulminant septic shock [10,11].

Acinetobacter baumannii is currently considered one of the pacesetters in the antibiotic resistance crisis and is generally characterized by resistance to quinolone, cephalosporin, β-lactam, aminoglycoside, and carbapenem families of antibiotics [12]. It is one of the common and serious multidrug resistant pathogens, being encompassed with others with the acronym "ESKAPE," standing for *Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa* and *Enterobacter*spp [8]. Poor outcomes have been linked to immunosuppression, drug resistance, severity of underlying illness, inappropriate antimicrobial therapy, septicemia and prior antibiotic exposure [13]

Case Presentation

Miss AD is a five-year old who presented to our facility on account of a three-day history of cough, nasal discharge and fever. The cough was distressing, did not occur in bouts and was not worse at any particular time of the day. She also had a watery nasal discharge, but with no nasal congestion or excessive sneezing. The fever was of gradual onset, high grade, present throughout the day and was initially worse at night. For these, she received antipyretics and anti-histamines only. However, when the fever worsened, she was brought to our facility. At presentation, she was afebrile, while both general and systemic examination were non revealing. Her Complete Blood Count (CBC) showed a total White Blood Cell (WBC) count of 4.5 x 10^9/L (neutrophils 50.7%, lymphocytes 41.2%, monocytes 5%, basophils 2.2%, eosinophils 0.8%), platelets 320 x 10^9/l [Appendix 1]. He peripheral blood film showed trophozoites of Plasmodium Falciparum (+) [Appendix 1]. A diagnosis of Acute Malaria with Upper Respiratory Tract Infection (? Viral) was made. Oral antimalarials, antipyretics and cough syrup were prescribed. The next day, she returned to the hospital with abdominal pain. This was periumbilical, of moderate severity and worsened following meals.An additional history of having returned from holiday in Europe three days prior to the onset of symptoms, was obtained. During this time, she swam severally with her parents, on one occasion in a creek. On examination, she was calm, febrile (T 37.8^{0}C), with mild epigastric tenderness. There were no other significant findings on examination. Her CBC showed an increase in her WBC count [5.7 x 10^9/L0 and

neutrophil percentage [59.2%], and her C-Reactive Protein was elevated (18.8mg/dl)(Appendix 1). A diagnosis of Sepsis and Acute Malaria, with Gastritis was made and she was admitted. Samples for a stool analysis, stool microscopy, culture and sensitivity (m/c/s), blood m/c/s and urine m/c/s were collected. She was then commenced on IV Ceftriaxone/Tazobactam, IV Artesunate, an antacid and antipyretics. Over the next three days, fever subsided, but abdominal discomfort worsened. She was also noted to have several episodes of unprovoked vomiting. There was no loose stool, feeling of bloating or increased flatulence. On examination, she was weak and mildly pale. She also had epigastric tenderness and normoactive bowel sounds. Serum electrolyte, urea and creatinine values were within normal limits and CRP had reduced to 5.5mg/L. (Appendix 1). She was commenced intravenous maintenance fluid, IV Omeprazole and antibiotics were continued. On the sixth day however, fever relapsed, was high grade and continuous. Investigations showed an increasing WBC count (8.9 x 10^9/L)and marked neutrophilia (89.5%), with a markedly elevated CRP (111.9mg/dl) (Appendix 1). She also had ring forms of Plasmodium falciparum (+),Intravenous Ceftriaxone/Tazobactam was changed to IV Meroponem and Quinine infusion was commenced. She continued to have high grade continuous fever and uncontrollable vomiting over the next two days for which IV Vancomycin and IV Ondansetron were also commenced. She also did an abdominal ultrasound which was non-revealing. By the ninth day, fever subsided and she was no longer having abdominal discomfort. Her feeding and activity had also improved. IV antibiotics were de-escalated to IV Levofloxacin. However, on the tenth day, fever recurred, with chills and rigors. Blood culture results showed *A. baumannii*with sensitivity patterns as shown in Figure 1. Intravenous Meroponem was recommenced which she received for the next 72 hours. A complete blood count done on the thirteenth day showed that the neutrophil count had returned to normal and the CRP was 13.9mg/l (Appendix 1). Antibiotics were then de-escalated to IV Ceftriaxone which she received for three days. A repeat CRP was <1mg/dl on the 16th day on account of which she was discharged on oral cefixime.

Discussion

A case of a five-year old whose initial symptoms were mild and non-specific is presented. Initial investigations findings were also non-specific and she was treated in line with local regimens for upper respiratory tract infections and acute uncomplicated malaria. However, worsening of symptoms and the history of recent travel necessitated further investigations. Blood culture eventually yielded *A. baumannii*, an organism which hitherto had never been isolated in our practice. A subsequent literature search revealed that this organism has also not been reported in this part of Nigeria. This informed the case report.

Similar to findings documented in literature, this case presented initially with non-specific signs and symptoms [10,11] The infection is blood borne, is usually acquired in the ICU setting and affects mostly patients with prolonged hospital stay, with invasive procedures and who are on respiratory support [14]. This case however seemed to have been acquired outside of the hospital setting. The discovery of recent travel to Europe strengthened this suspicion. *A. baumannii* infections have been a substantial clinical issue in many parts of Europe for several years with intercontinental spread with other countries being a consequence of airline travel [15] In addition, the organism has been associated with aquatic environments, to which this case was exposed [16]. Furthermore, it has been documented that the incidence of community acquired *A. baumannii*infection is gradually increasing [7]. The possibility of hospital acquired infection (HAI) was also considered. However, the symptoms preceded presentation to the hospital and patient had no features suggestive of immunosuppression. In addition, no invasive procedures were carried out and the hospital has a strict hand washing/hand sanitizer use protocol. Furthermore, by definition HAI's are infections acquired during hospital care

which are not present or incubating at admission [17]. They include infections occurring more than 48 hours after admission [17]This case did not fit into any of these criteria.

Laboratory investigations carried out in this case showed total WBC counts and CRP levels which were in increasing with worsening clinical symptoms and signs. C-reactive protein is an acute phase reactant which has been documented as a very sensitive but non-specific marker of inflammation [18]. In children, values >10mg/dl are acceptable as significant [18]. C-reactive protein is also a useful tool for monitoring response to therapy and was used in this case for that reason [18].

The finding of plasmodium falciparum parasitaemia was also of particular interest in this case. Having returned from a twoweek holiday in a non-malaria endemic environment would have created doubts to this possibility. However, incubation periods of up to 7-40 days have been reported. [19]. Thus, it is likely that the infestation occurred prior to travelling [19]. Treatment for this was carried out using first line parenteral antimalarials and subsequently artemisinin based combination therapy.

A blood culture carried out early in the management of this case. Blood cultures are the gold standard for the diagnosis of blood stream infections (BSI). According to the World Health Organization(WHO) blood culture is a priority specimen for Antimicrobial Resistance (AMR) surveillance and it is recommended to prioritize key clinical specimens in resource-limited settings [20]. In Nigeria, blood culture has also been prioritized by the National Action Plan for AMR [20] for diagnosing BSIs. Blood culture in this case was carried out using BACTEC as this has been found to give faster and more accurate results, and also be able to isolate a greater number of organsisms with their sensitivity patterns than conventional blood culture systems.

The choice of Ceftriaxone/Tazobactam as initial antimicrobial therapy in this case was guided by previous studies in this environment [21,22]. These have found a good proportion of apparently healthy children to be nasopharyngeal carriers of beta-lactam drug resistant strains of *S. pneumoniae*[21]. More recently, Ughasoro et al [22] isolated *S. pneumonia* and *S. aureus* sensitive to Imipenem, Levofloxacin, Ceftriaxone, Azithromycin and Amoxicillin/Clavulunic acid as the commonest organisms causing acute tonsillitis in children under 14 years of age in South-East Nigeria.

The use of meroponem in this case was guided by theculture sensitivity result obtained. Carbapenems are effective antibiotics to treat *A. baumannii* infections [13]However, due to the immense ability of the organism to acquire or upregulate antibiotic drug resistance determinants, the rate of carbapenem-resistance has been increasing gradually [13]. Other treatment options include β-lactamase inhibitors (piperacillin/tazobactam, polymyxins (colistine), aminoglycosides (amikacin), piperacillin/tazobactam, colistin and tigecycline [13].

Conclusion

Acinetobacter baumannii infection remains a rare but increasingly common community acquired blood stream infection in children. Clinical manifestations of this infection are non-specific and range from a benign transient bacteremia to severe sepsis and death. Physicians should thus be increasingly aware that such infections can occur. Management involves a high index of suspicion, prompt and accurate isolation of infecting strains and the proper choice of antibiotic regimens.

Consent

Parents of the case gave consent for this case study.

References

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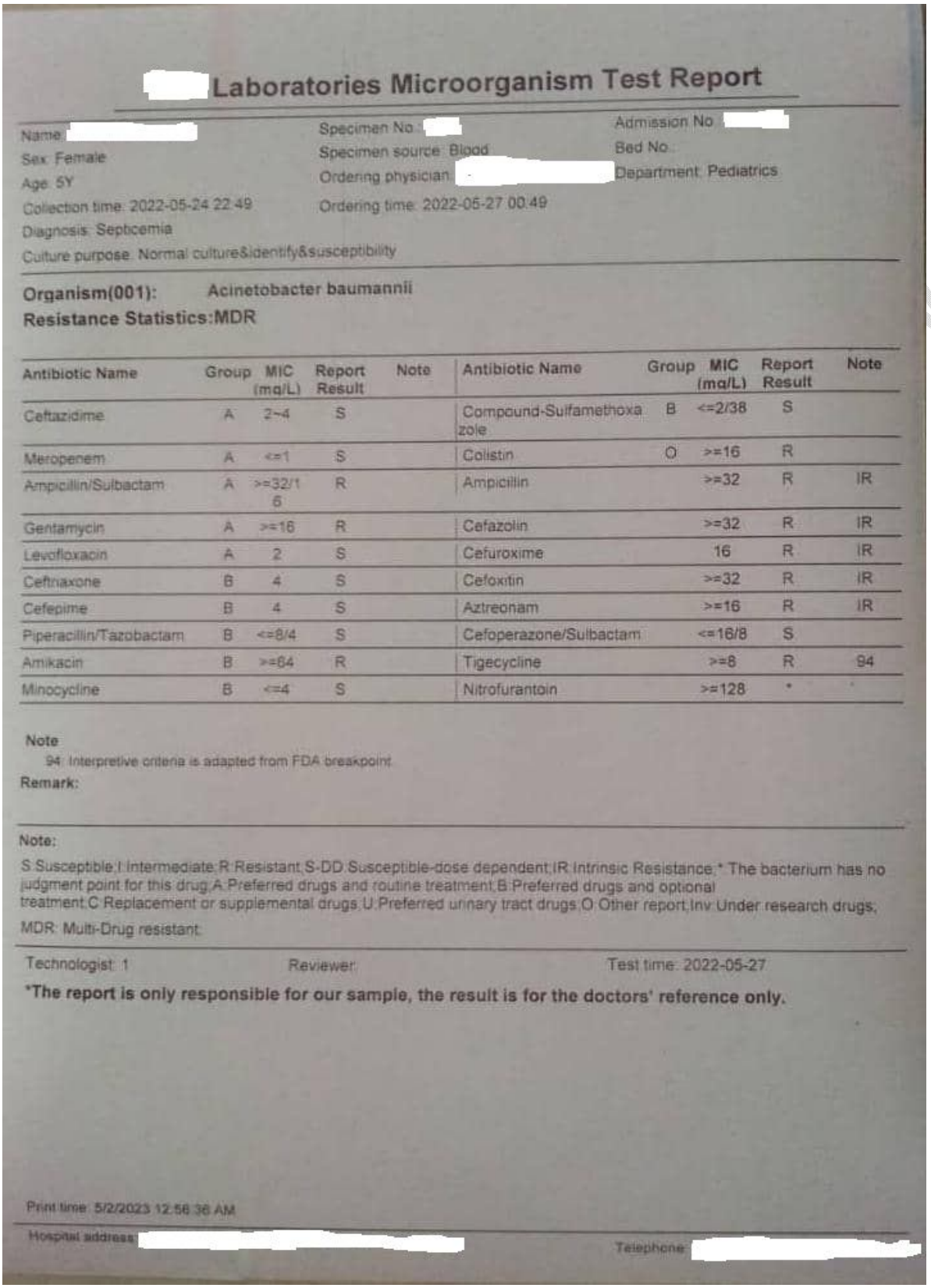
Appendix 1: Serial Complete Blood Count and C-Reactive Protein levels

	COMPLETE BLOOD COUNT								**C-Reactive Protein** (mg/dL)
	WBC (x 10^9/L)	Neutrophil (%)	Lymphocyte (%)	Monocytes (%)	Basophils (%)	Eosinophils (%)	Platelets (x 10^9/L)	Haemoglobin (g/dl)	
Day 1	4.5	50.7	41.2	5	2.2	0.9	320	10.4	
Day 2	5.7	59.2	34.2	3.3	2.3	1	675	11.9	18.8
Day 5	3.6	59.4	36.2	3	0.8	0.6	299	11.8	5.5
Day	8.9	89.5	7.4	2.2	0.5	0.4	211	10.7	111.9

6									
Day 10	9.4	57.4	36.7	3.4	1.3	1.2	142	10.3	61.2
Day 13	9.7	35.2	58.4	3.8	1.7	0.9	327	10.3	13.9
Day 15	7.3	39.7	48.1	9.0	2.1	1.1	186	10.4	
Day 16	6.0	30.8	61.7	5.6	1.3	0.6	277	11.0	<1.0



[redacted] Laboratories Microorganism Test Report

Name: [redacted]
Specimen No.: [redacted]
Admission No.: [redacted]
Sex: Female
Specimen source: Blood
Bed No.:
Age: 5Y
Ordering physician: [redacted]
Department: Pediatrics
Collection time: 2022-05-24 22:49
Ordering time: 2022-05-27 00:49
Diagnosis: Septicemia
Culture purpose: Normal culture&identify&susceptibility

Organism(001): Acinetobacter baumannii
Resistance Statistics:MDR

Antibiotic Name	Group	MIC (mg/L)	Report Result	Note	Antibiotic Name	Group	MIC (mg/L)	Report Result	Note
Ceftazidime	A	2~4	S		Compound-Sulfamethoxazole	B	<=2/38	S	
Meropenem	A	<=1	S		Colistin	O	>=16	R	
Ampicillin/Sulbactam	A	>=32/16	R		Ampicillin		>=32	R	IR
Gentamycin	A	>=16	R		Cefazolin		>=32	R	IR
Levofloxacin	A	2	S		Cefuroxime		16	R	IR
Ceftriaxone	B	4	S		Cefoxitin		>=32	R	IR
Cefepime	B	4	S		Aztreonam		>=16	R	IR
Piperacillin/Tazobactam	B	<=8/4	S		Cefoperazone/Sulbactam		<=16/8	S	
Amikacin	B	>=64	R		Tigecycline		>=8	R	94
Minocycline	B	<=4	S		Nitrofurantoin		>=128	*	

Note
94: Interpretive criteria is adapted from FDA breakpoint.
Remark:

Note:
S:Susceptible;I:Intermediate;R:Resistant;S-DD:Susceptible-dose dependent;IR:Intrinsic Resistance;* The bacterium has no judgment point for this drug;A:Preferred drugs and routine treatment;B:Preferred drugs and optional treatment;C:Replacement or supplemental drugs;U:Preferred urinary tract drugs;O:Other report;Inv:Under research drugs;
MDR: Multi-Drug resistant.

Technologist: 1 Reviewer: Test time: 2022-05-27

***The report is only responsible for our sample, the result is for the doctors' reference only.**

Print time: 5/2/2023 12:56:36 AM

Hospital address: [redacted] Telephone: [redacted]

Figure 1: Blood Culture result