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Case Report

Paediatrics Section

Achromobacter xylosoxidans Causing Late-onset Sepsis with Pneumonia in a Term Neonate

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ABSTRACT

Achromobacter xylosoxidans (A. xylosoxidans), is an aerobic gram negative motile bacillus that rarely causes infection in healthy adults and is exceptionally rare in neonates. *A. xylosoxidans* is ubiquitous in nature, causing nosocomial infections especially in debilitated and immunocompromised patients. Few outbreaks caused by this organism were reported in Neonatal Intensive Care Units (NICU) along with sporadic cases in neonates. A 3-week-old term neonate presented with late-onset sepsis and pneumonia caused by *A. xylosoxidans* that was successfully treated with antibiotics and supportive care. Awareness regarding this uncommon pathogen and initiation of appropriate antibiotic therapy would improve the outcome and prevent mortality.

Keywords: Antibiotics, Bacillus, Nosocomial infection

CASE REPORT

A 3-week-old term male neonate weighing 3050 grams was born to a 25-year-old primigravida mother by emergency caesarean section (Indication: foetal distress) at 39 weeks of gestation. The mother had noticed decreased foetal movements but there is no history of maternal fever, urinary tract infection or rupture of membranes. Liquor was clear. APGAR scores were 8 and 9 at 1 and 5 minutes of age respectively. Baby was exclusively on breastfeeds. He developed cough and hurried breathing on 21st day of life and was admitted in a private hospital. He was treated with antibiotic (cefotaxim) and supplemental oxygen through nasal cannula for 4 days. The child was then referred for further care in view of persistent respiratory distress.

On examination, the neonate weighed 3360 grams and was febrile with temperature of 101°F. His respiratory rate was 72/min, with subcostal retractions and DOWNE score was 4/10. Sepsis screen was positive [C-Reactive Protein (CRP)]: 23.8 mg/L]. He required Fraction of Inspired Oxygen (FiO_2) of 0.50 to maintain Oxygen saturation (SpO_2) of 96%. Chest X-ray showed bilateral patchy opacities and air bronchograms suggestive of pneumonia. Blood culture was sent and antibiotics (Piperacillin-Tazobactam and Amikacin) were commenced in view of pneumonia. The baby continued to have intermittent fever for next 5 days. Blood culture done on BACTEC 9050 (BD Diagnostic Systems, USA) was positive at 24 hours. Gram stain showed presence of gram negative bacilli. Subculture on MacConkey's agar showed catalase and oxidase positive, motile, gram negative rods isolated in pure culture in a concentration of >10^6/mL that oxidised xylose and glucose. Automated bacterial identification and antimicrobial susceptibility testing were done using MicroScan autoSCAN-4 (Siemens, Germany). The isolate was identified as *A. xylosoxidans*, which was sensitive to piperacillin-tazobactam, fluoroquinolones, cefoperazone, carbapenems, colistin and resistant to gentamicin, amikacin, ampicillin, amoxicillin, cefotaxime and ceftriaxone.

Antibiotics were changed to meropenem and levofloxacin as per culture sensitivity report. He responded well to higher antibiotics, became afebrile, accepted feeds well and was weaned to room air. Head ultrasound, urine examination and Cerebrospinal Fluid (CSF) examination were normal. The infant did not have any seizures or encephalopathy. He required supplemental oxygen for 1 week. Repeat septic screen was negative (CRP: 5.8 mg/L). Baby received 10 days of higher antibiotics and was discharged after 14 days of NICU stay. The neonate had normal growth and development at 6 months of age.

DISCUSSION

A. xylosoxidans, an aerobic gram negative motile bacillus is first isolated in 1971 from purulent ear discharges and named by Yabuuchi E and Oyama A for seven strains of gram negative, non fermentative bacteria with peritrichous flagella that produce acid from xylose [1]. They had described the unique characteristics of 55 strains of *A. xylosoxidans* isolated from a wide range of clinical material. It's role as a pathogen is underestimated as it is often confused with *Pseudomonas* species, but unlike *pseudomonas*, *Achromobacter* has peritrichous flagella [1,2]. *A. xylosoxidans* is ubiquitous in the environment, causing infections in debilitated and immunocompromised patients with only few cases being reported in neonates [1-3]. Though *A. xylosoxidans* has been isolated from the urine, blood, respiratory tract, spinal fluid, indwelling catheters and ears, it is often isolated along with other microorganisms, making it difficult to assess the clinical significance of its isolation. *A. xylosoxidans* was found in environmental habitats such as surface water, contaminated chlorhexidine solution, incubators, humidifiers, faucets, sinks and dialysate fluid [2].

Literature search of PubMed, EMBASE, MEDLINE and Google scholar was done from 1960 till June 2022 using the MeSH words: infection, neonate, sepsis and *A. xylosoxidans*, it showed around 105 reported cases of *A. xylosoxidans* associated infections in neonates [Table/Fig-1]. Achromobacter is a rare but significant pathogen causing nosocomial and opportunistic infections in neonates [3].

Foley JF et al., reported 6 cases of infections due to *A. xylosoxidans* in neonates with fatal outcome [3]. Hearn YR and Gander RM from USA had reported early onset sepsis due to in-utero transmission with fatal outcome [4]. Kumar A et al., from India reported an

Author, Place and Year	No. of cases (No. of episodes of infection)	Age of onset of symptoms (day of life)	Isolated from	Source of infection	Outcome
Foley JF et al., Lincoln, Nebraska, USA, 1961 [3]	6	Not specified	Blood, nose, throat	Not identified	Died
Sindhu SS, Singapore, 1971 [11]	3	2, <1, 16	CSF	Not identified	Survived 2, Died 1*
Lee SL and Tan KL, Singapore, 1972 [12]	3	6, <1, 6	CSF, blood	Not identified	Survived 1, Died 2#
Namnyak SS et al., Saudi Arabia, 1985 [14]	1	2 days	CSF	Not identified	Died
Puthucheary SD and Ngeow YF, Kuala Lumpur, Malaysia, 1986 [10]	2	15, 3	Blood, umbilical catheter	Not identified	Survived 1, Died 1
Manjra AI et al., South Africa, 1989 [15]	1	6 days	CSF	Not identified	Died
Hearn YR and Gander RM, Texas, USA, 1991 [4]	1	<1 day	Blood	Chorioamnionitis, maternal UTI	Died
Boukadida et al., Tunisia, 1993 [8]	1	9 days	Blood, CSF	Eosin	Died
Shie SS et al., Taiwan, 2005 [13]	1	4 days	Blood	Not identified	Died
Kumar A et al., Chandigarh, India, 2006 [5]	8	Not specified	Blood, CSF, pleural fluid	Not identified	26.7% mortality
Molina-Cabrillana J et al., Spain, 2007 [6]	52 (58)	< 10 days: 42%	Blood, CSF	Chlorhexidine, faucet	Died 4
Ozden Turel et al., Turkey, 2012 [9]	22 (34)	21 days (6-45 days)	Blood; CSF +ve in 3 cases	Not identified	Survived 29, Died 3
Ramaswamy VV et al., Andhra Pradesh, India 2018 [7]	1	3 days	Blood, conjunctiva	Saline-soaked gauze	Survived
Present case, Telangana, India, 2022	1	25 days	Blood	Not identified	Survived

[Table/Fig-1]: Characteristics of *A. xylosoxidans* sepsis reported in neonates.
*Alive at 20 weeks, subsequently lost to follow-up; #Discharged at 6 weeks with hydrocephalus, subsequently lost to follow-up

outbreak of infections due to this organism in 8 neonates, but could not identify the source of infection [5]. Molina-Cabrillana J et al., from Spain reported an outbreak of infection in NICU due to contaminated chlorhexidine solution affecting 52 neonates [6]. *A. xylosoxidans* infection was reported from India in a 3-day-old neonate with early onset sepsis, keratoconjunctivitis and meningitis [7].

A. xylosoxidans, is reported to cause sepsis, meningitis, osteomyelitis, pneumonia, keratoconjunctivitis, endocarditis, and ventriculitis. The bacteremia is often associated with indwelling catheters, implanted devices, contaminated parenteral solutions, ventriculostomy drains, contaminated water, antiseptic solutions and vascular catheters [8,9]. *A. xylosoxidans* infection is usually associated with prematurity, total parenteral nutrition, use of broad-spectrum antibiotics, surgical procedures, irrigation of surgical wounds, implanted devices and central venous catheters, but none of these risk factors were present in the index case.

Though still uncommon in NICU, infection with *A. xylosoxidans* is worrisome because of intrinsic resistance to commonly used antibiotics including ampicillin, aminoglycosides, ciprofloxacin and first generation cephalosporins. It is usually susceptible to ticarcillin, trimethoprim-sulfamethoxazole, piperacillin and imipenem [10]. *A. xylosoxidans* infections in neonatal period is associated with high mortality [3,4,8-14]. Management includes prompt initiation of antibiotic therapy to which this organism is susceptible along with supportive care. A tertiary hospital from India reported a mortality of 26.7% in a nosocomial outbreak due to *A. xylosoxidans* [5].

This baby presented at 3 weeks of life with respiratory distress and infection was presumed to be acquired either from community or in the referral hospital from humidified oxygen. Blood culture and environmental sampling were not done in referral hospital and the source of infection was not identified. After isolation of the index case, periodic surveillance of environmental samples and hands of healthcare personnel was done and there was no episode of any nosocomial infection due to this organism over the next 12 months.

CONCLUSION(S)

This case report highlights that *A. xylosoxidans* is an uncommon pathogen in India and there is a need for epidemiological surveillance in hospitals to identify the source of this organism which can cause nosocomial outbreaks with high mortality because of innate resistance to ampicillin, aminoglycosides and first generation cephalosporins. This organism is often confused with *Pseudomonas* and is underreported. Achromobacter causes two important reactions, an alkaline reaction in Oxidation-Fermentation (O-F) medium and oxidation of xylose which help in its identification. Use of aseptic precautions by healthcare personnel and proper sterilisation of equipment prevents nosocomial outbreaks. Awareness regarding this uncommon pathogen and initiation of appropriate antibiotic therapy improves the outcome and prevents mortality.

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