**Listeria monocytogenes** infection in a 56-year-old female cancer patient: a case report

Md Ausrafgaman Nahid,¹ Tuhin Sadique,¹ Razib Mazumder,¹ Ahmed Abdullah,¹ Abdullah Bashar Sami,¹ Mír Atíqur Rahaman,² Anowar Hossain¹ and Dilruba Ahmed¹

**Correspondence**
Dilruba Ahmed
dahmed@icddrb.org

¹International Centre for Diarrheal Diseases Research, Bangladesh, Dhaka-1212, Bangladesh
²United Hospital Limited, Bangladesh

**Introduction:** *Listeria monocytogenes*, the aetiological agent of foodborne listeriosis, can cause a severe and potentially fatal foodborne infection. Listeriosis is associated with acquired immunodeficiency or the underlying immunosuppression found in pregnant women, cancer patients and the elderly. Listeriosis emerged in developed countries in the early 1980s with the emergence of human immunodeficiency virus/AIDS and the popularity of minimally processed foods; however, few cases have been reported from developing countries. Here, we present a successfully treated case of listeriosis in a patient undergoing chemotherapy.

**Case presentation:** An elderly female patient with thyroid carcinoma metastasized to the lungs became seriously ill following the initiation of chemotherapy. The patient was admitted with symptoms of generalized convulsion and an altered level of consciousness and was treated empirically with meropenem, amikacin and linezolid injection. Cultures of blood and cerebrospinal fluid revealed *Listeria monocytogenes* on day 5 post-admission. The patient was treated with ampicillin (2 g intravenously every 4 h), which resolved the bacterial infection by day 9. To the best of our knowledge, this is the first diagnosed and successfully treated case of listeriosis in a cancer patient to be reported from Bangladesh.

**Conclusion:** Early diagnosis is critical for successful treatment of listeriosis. We recommend raising awareness among healthcare professionals about the diagnosis and treatment of this potentially fatal disease. Patients undergoing immunosuppressive treatments that elevate the risk of listeriosis should be monitored, and the medical histories of patients presenting with possible listeriosis should be carefully reviewed for immunosuppression. The incidence of listeriosis should be established to identify susceptible populations and to implement food safety procedures in this rapidly developing country.

**Keywords:** Altered level of consciousness; antibiotics; Bangladesh; carcinoma; convulsion; elderly patient; ESBL; *Listeria monocytogenes*; listeriosis; meningitis.

---

**Abbreviations:** CSF, cerebrospinal fluid; ICU, intensive care unit; i.v., intravenous.

---

Most sporadic cases of human listeriosis have been attributed to serogroups 1/2 (Cossart, 2002). Pathogenic *L. monocytogenes* induces entry into host intestinal cells and evades neutralization by translocating directly from cell to cell (Freitag *et al.*, 2009). Severe listeriosis is characterized by sepsis, bacterial tropism to the central nervous system, meningitis and a case fatality rate of up to 30% (Gellin & Broome, 1989). *L. monocytogenes* micro-organisms are occasionally isolated from immunocompetent persons presenting with self-limiting febrile gastroenteritis, but pregnant women and immunocompromised persons are particularly vulnerable. Persons with diabetes, liver and kidney disease, organ transplants, untreated human immunodeficiency virus infection, drug dependencies, and corticosteroid and chemotherapy recipients have also
been reported to demonstrate heightened susceptibility to this disease (Dieterich et al., 2006; Goulet et al., 2012; Louria et al., 1967; Mook et al., 2011; Schlech, 2000).

Antimicrobial therapy is the mainstay of treatment for listeriosis. However, the unusual growth characteristics of the organism and incorrect diagnoses often result in inappropriate and failed treatment with severe and potentially fatal consequences. It is important for healthcare professionals to be aware of the clinical features of this pathogen to be able to provide appropriate and timely treatment and to minimize the high risk of death from listeriosis. In this study, we present a case of infection by \textit{L. monocytogenes} in an elderly female patient undergoing chemotherapy for thyroid carcinoma. To the best of our knowledge, epidemiological data for \textit{L. monocytogenes} infection are not available from Bangladesh and here we present the first reported case and successful treatment of \textit{L. monocytogenes} infection in a cancer patient in Bangladesh.

\section*{Case report}

A 56-year-old female patient with diabetes and thyroid carcinoma with metastasis to the lungs was admitted to hospital after suffering a sudden altered level of consciousness. Her past medical history included a laparotomy followed by a left adrenalectomy with sample spleenectomy in 2013. The patient also had a history of total thyroidectomy in 2008 and cholecystectomy with appendectomy in 1989. She received radiotherapy between July and September 2013 and a thyroxine tablet (15 \textmu{}g, orally disintegrating), calcium plus vitamin D3 tablet, prednisolone tablet (20 mg, orally disintegrating) and intravenous (i.v.) insulin injection. On the last week of August 2014, her condition was stable and she went to Bangkok for surgery (excision of a metastatic lesion at the upper end of the left tibia). After surgery, she developed an intermittent high-grade temperature, whilst parenteral thiopental sodium was stopped after 24 h in the ICU, convulsion occurred only very occasionally. On her fifth day in the ICU, parenteral levetiracetam was started instead of the sodium valproate injection, whilst parenteral thiopental sodium was stopped after 3 days. She developed hypotension, and a noradrenaline infusion was started. On the fifth day of her hospital stay, her respiratory effort became poorer and her overall condition deteriorated. She was shifted to the intensive care unit (ICU), where she was intubated and put on a mechanical ventilator. Parenteral thiopental sodium was started instead of the phenobarbitone injection. After 24 h in the ICU, convulsion occurred only very occasionally. On her fifth day in the ICU, parenteral levetiracetam was started instead of the sodium valproate injection, whilst parenteral thiopental sodium was stopped after 3 days. She developed hypotension, and a noradrenaline i.v. infusion was started.

On the fifth day of her hospital stay, her tracheal aspirate culture and sensitivity showed no growth and she was negative for \textit{Mycobacterium tuberculosis}. However, her blood and CSF culture and sensitivity showed growth for a Gram-positive bacillus, which was later identified as \textit{Listeria monocytogenes}. Antimicrobial susceptibility testing by disc diffusion showed that the strain was susceptible to amikacin (30 \textmu{}g), ampicillin (10 \textmu{}g), erythromycin (30 \textmu{}g), gentamicin (10 \textmu{}g), imipenem (10 \textmu{}g), linezolid (30 \textmu{}g), meropenem (10 \textmu{}g), netilmicin (30 \textmu{}g), penicillin G (10 \textmu{}g), piperacillin + tazobactam (110 \textmu{}g) and vancomycin (30 \textmu{}g). However, it was resistant to ceftriaxone (5 \textmu{}g), cefazidime (30 \textmu{}g), ceftriaxone (30 \textmu{}g), colistin (10 \textmu{}g) and polymyxin B (300 U). MICs were measured for amikacin (0.38 mg ml\textsuperscript{-1}), ampicillin (0.064 mg ml\textsuperscript{-1}), ceftriaxone (32 mg ml\textsuperscript{-1}), gentamicin (4 mg ml\textsuperscript{-1}), imipenem (0.064 mg ml\textsuperscript{-1}) and vancomycin (0.75 mg ml\textsuperscript{-1}). She was treated with ampicillin (2 g i.v. every 4 h) and after 24 h she became afebrile. Ampicillin was continued for the next 3 weeks, and 4 days after ampicillin treatment, an Indian Ink preparation of her CSF was negative.

Cerebrospinal fluid (CSF), obtained by lumbar puncture, appeared on examination to be slightly turbid with a white blood cell count of 250 \mu{}l\textsuperscript{-1} with 80% neutrophils and 20% lymphocytes, protein of 219 mg dl\textsuperscript{-1}, glucose of 10.7 mmol l\textsuperscript{-1}, adenosine deaminase of 4.19 U l\textsuperscript{-1} and a negative fungal stain. Initial treatment was empirical injection with meropenem (1 g i.v. every 8 h), amikacin (500 mg i.v. every 12 h) and linezolid (600 mg i.v. every 12 h), which continued for 9, 16 and 7 days, respectively. Ceftriaxone injection (2 g i.v. every 12 h) started on the next day and continued for 5 days. Injection of acyclovir and fluconazole started 1 week later and continued for 10 and 14 days, respectively. Two days after hospital admission, the patient’s white blood cell count was found to be $0.3 \times 10^3$ \mu{}l\textsuperscript{-1} and she received a transfusion of 1 U packed red blood cells, and filgrastim (Neupogen\textsuperscript{a}) (5 \mu{}g kg\textsuperscript{-1} day\textsuperscript{-1}) injection was started and continued for 2 weeks. For her convulsion, the patient was initially treated with midazolam and phenytoin injection plus sodium valproate and carbamazepine tablets. However, the convulsion was not controlled, so the drugs were rescheduled to parenteral phenytoin, phenobarbitone and sodium valproate. She also received parenteral dexamethasone (Oraledon\textsuperscript{a}) and mannitol (Osmirol\textsuperscript{a}) for 14 and 3 days, respectively. On the fourth day of her hospital stay, her respiratory effort became worse and her overall condition deteriorated. She was shifted to the intensive care unit (ICU), where she was intubated and put on a mechanical ventilator. Parenteral thiopental sodium was started instead of the phenobarbitone injection.
rubidaea, Klebsiella pneumoniae, and Candida and Proteus spp., respectively. Her infection resolved after specific treatment. She was released in the first week of January 2015 whilst she was haemodynamically stable, afebrile and conscious but still disoriented from the side effects of her cancer treatment.

Diagnosis

The patient’s blood and CSF samples were inoculated in BACTEC blood culture bottles and incubated in a BACTEC 9240 blood culture machine. The machine gave positive signals for culture after 48 h. Positive culture media of both samples were then subcultured onto blood, MacConkey and chocolate agar medium plates. After incubation in appropriate conditions, β-haemolytic colonies was detected on the blood agar plate. The colonies were subjected to a reverse CAMP (Christie–Atkins–Munch–Petersen) test for identification and an API profile index test to confirm the organism as L. monocytogenes (API index no. 0170164). An antibiogram was done by the disk diffusion method and MIC values were determined using E-test strips.

Discussion

L. monocytogenes is ubiquitous in the environment and is a normal member of the gut flora in many mammals. Cases of infection and disease (listeriosis) in humans are rare (estimated at 4.6 per million of the population). Elderly persons with defective immunity are at high risk of contracting this disease, with a case fatality rate of 24–62% (Pigrau et al., 1993). A few cases of L. monocytogenes infection have been reported from neighbouring south Asian countries (Adhikary & Joshi, 2011; Rahman et al., 2002; Soni et al., 2015). However, no epidemiological data exists on L. monocytogenes from Bangladesh, which makes our case particularly important.

The patient in this case was found sick 4 days after receiving the first round of chemotherapy for non-Hodgkin’s lymphoma. Although the early signs and symptoms matched listerial meningitis, infection with L. monocytogenes was not suspected until the pathogen was cultured from blood and CSF samples. The source of the infection was not determined. Ingestion of contaminated foods has been reported as the main source of infection by this pathogen. Foods such as ready-to-eat meats, seafood, soft cheeses, unpasteurized milks, hot dogs and ice cream have been linked to most such as ready-to-eat meats, seafood, soft cheeses, unpasteurized milks, hot dogs and ice cream have been linked to most pathogens targeted towards normalizing blood cell counts and physiological conditions. Although the L. monocytogenes strain in our study was sensitive to amikacin, meropenem and linezolid, the empirical treatment did not lead to an improvement in her condition. This may be due to the antagonistic effects in the combined empirical therapy, as reported previously between linezolid and aminoglycosides (Jacqueline et al., 2003). For meningitis patients with defective cellular immunity, it is recommended to target the treatment towards L. monocytogenes, Gram-negative bacilli or Streptococcus pneumoniae (Quagliarello & Scheld, 1997). The first choice of treatment for severe listeriosis is currently based on the synergistic effect of an aminopenicillin (ampicillin or amoxicillin) and gentamicin. Rifampicin, vancomycin, linezolid and carbapenems are alternatives, but trimethoprim is usually used in case of any complication with β-lactams (Hof, 2004; Temple & Nahata, 2000). L. monocytogenes shows natural resistance to expanded-spectrum cephalosporins, older quinolones and fosfomycin, but they are usually widely susceptible to clinically relevant antibiotics targeting Gram-positive bacteria (Troxler et al., 2000). L. monocytogenes strains with resistance to multiple antibiotics have also been reported, and it is suggested that they are capable of acquiring foreign antibiotic resistance genes (Charpentier & Courvalin, 1999).

Accurate diagnosis and microbiological confirmation are critical for the appropriate treatment for listeriosis. However, making a diagnosis of this pathogen is not always straightforward. The key point is suspicion of the presence of this organism. Good medical records of the
patient’s clinical symptoms and relevant host factors may provide indicative information for this purpose. As this organism shares some characteristics with other Gram-positive bacteria, especially streptococci, it is also necessary to establish some differential diagnosis. Additionally, the current lack of regular surveillance for this pathogen, especially in developing countries, makes it difficult to evaluate the changing epidemiology of this pathogen. However, we believe that proper awareness among healthcare professionals about the clinical features and severe consequences of listeriosis will help to implement proper measures to minimize the casualties associated with this infection.

Acknowledgements

This study was funded by icddr,b and its donors, who provide unrestricted support to icddr,b for its operations and research. Current donors providing unrestricted support include: the Government of the People’s Republic of Bangladesh, Australian Agency for International Development (AusAID), Canadian International Development Agency (CIDA), Swedish International Development Cooperation Agency (Sida), and the Department for International Development, UK (DFID). The authors gratefully acknowledge these donors for their support and commitment to the research efforts of icddr,b. The funders had no role in the study design, data collection and analysis, decision to publish or preparation of the manuscript. The authors declare they have no conflicts of interest.

References


