Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

A Prospective Study on Clinical Characteristics, Antibiotic Susceptibility Patterns, and Factors Predicting Mortality Associated with E. Meningoseptica Infections in Critically Ill Patients Admitted to A Tertiary Care Hospital in Eastern India

[1]Cherian Roy, [2]Abhilash Dash, [3]Satyajit Choudhury, [4]Sagarika Panda, [5]Rupali Patnaik, [6]Biswajit Nayak

[1]Senior Resident, Department of Critical Care Medicine, IMS and SUM Hospital, Bhubaneswar, Odisha, India,
[2]Associate Professor, Department of Critical Care Medicine, IMS and SUM Hospital, Bhubaneswar, Odisha, India,
[3]Assistant Professor, Department of Critical Care Medicine, IMS and SUM Hospital, Bhubaneswar, Odisha, India
[4]Associate Professor, Department of Critical Care Medicine, IMS and SUM Hospital, Bhubaneswar, Odisha,
[5]Associate Professor, Department of Critical Care Medicine, IMS and SUM Hospital, Bhubaneswar, Odisha,
[6]Associate Professor, Department of Critical Care Medicine, IMS and SUM Hospital, Bhubaneswar, Odisha,

Corresponding Author: Samir Samal, Associate Professor, Department of Critical Care Medicine, IMS and SUM Hospital, Bhubaneswar, Odisha

(Received: 04 February 2024 Revised: 11 March 2024 Accepted: 08 April 2024)

KEYWORDS
Case series, Elizabethkingiameningoseptica; ICU; Multidrug resistant; ICU; Levofloxacin; Minocycline, Fluoroquinolone

ABSTRACT:

Background: Elizabethkingiameningoseptica is an emerging multidrug-resistant pathogen associated with high mortality in critically ill patients. Data on clinical characteristics, antibiotic susceptibility, and outcomes in the Indian ICU setting is limited.

Methods: This prospective study was conducted in the medical ICU of a IMS & SUM tertiary care hospital in Eastern India from May 2019 to August 2022. Critically ill patients with E. meningoseptica isolated from sterile specimens were included. Demographic details, comorbidities, microbiological data, treatment details, and outcome were noted.

Results: Of 3700 ICU admissions, 35 patients developed E. meningoseptica infection. Mean age was 60.2 years and 63% were males. Majority had pneumonia (71%) or urosepsis (14%). Key comorbidities were hypertension (49%), diabetes (43%), chronic kidney disease (40%), and chronic dialysis (23%). All isolates were sensitive to Minocycline while 43% were sensitive to Levofloxacin and ciprofloxacin each. Empiric minocycline-levofloxacin combination was used in 49% patients. Crude mortality was 54%. Mortality was significantly associated with higher severity scores, coronary artery disease, acute/chronic kidney injury, respiratory co-infection, and prolonged ICU stay. Mortality was found to be lower in case of Minocycline and Levofloxacin combination therapy (35%) compared to Minocycline and Levofloxacin monotherapy (75%).

Conclusion: E. meningoseptica caused high mortality in critically ill patients despite treatment. There is increasing incidence of resistance to fluroquinolones among the E. meingoseptica isolates found in the ICU and all were susceptible to Minocycline. Combination regimens with Minocycline may be studied in future randomized trials to study the efficacy in treating E. meningoseptica infections. Infection control and antimicrobial stewardship are keys to prevent further resistance.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Highlights: Elizabethkingiameningoseptica infection in ICU is an upcoming infection and no guidelines are currently available. Mortality in such patients is very high and is mostly seen in immunocompromised patients. Minocycline and Levofloxacin combination therapy may improve outcome and prevent further antibiotic resistance.

Introduction

Elizabethkingiameningoseptica has emerged as a formidable multidrug-resistant nosocomial pathogen causing serious infections associated with high morbidity and mortality rates in critically ill patients worldwide. [1-3] Initially isolated in 1959 from the cerebrospinal fluid of a neonate with meningitis in Chicago, USA, it was originally known as Flavobacteriummeningosepticum before being renamed as Chryseobacteriummeningosepticum based on rRNA (ribosomal ribonucleic acid) homology studies.[4] The genus Elizabethkingia was proposed in 2005 to accommodate this species along with closely related species like E. anophelisand E. miricola.[5]

E. meningoseptica is a gram-negative, non-motile, catalase-positive, indole-positive, oxidase-positive bacillus that is an obligate aerobe and does not ferment glucose or reduce nitrates.[6] It possesses an extensive antimicrobial resistance profile intrinsic to its genus, mediated by a combination of efflux pumps, antibiotic-inactivating enzymes, and modifications in target sites.[1,7] This includes resistance to most β-lactams like cephalosporins and carbapenems, aminoglycosides, tetracyclines, chloramphenicol, folate pathway inhibitors, vancomycin, and polymyxin B.[8,9]

E. meningoseptica is ubiquitously present in soil, freshwater, saltwater, and municipal water supplies as part of its natural habitat.[4, 5, 10] It forms robust biofilms and readily colonizes medical devices like ventilators, Foley catheters, nebulizers, central venous catheters, and saline flush solutions in the hospital environment, leading to nosocomial transmission.[11, 12] Outbreaks linked to contaminated water sources have been frequently reported in intensive care units across Asia, Europe, and the United States.[1,2,13,14]

Prolonged ICU (Intensive care unit) stay, exposure to broad-spectrum antibiotics, invasive procedures, mechanical ventilation, vascular devices, and underlying comorbidities like diabetes, chronic kidney disease, malignancy, transplantation, and immunocompromised states are established risk factors for E. meningoseptica infection.[6, 15] The spectrum of clinical disease is broad, including meningitis, pneumonia, bacteremia, endocarditis, intra-abdominal abscess, septic arthritis, osteomyelitis, cellulitis, and ophthalmitis.[6, 11] In the ICU milieu, lower respiratory tract infections and central line-associated bloodstream infections predominate.[2]

Optimal antibiotic therapy guided by susceptibility patterns and combination treatment is recommended to improve outcomes associated with invasive E. meningoseptica infections which have mortality rates up to 65%.[1, 14] Though initially sensitive, increasing resistance to cotrimoxazole, rifampin, and vancomycin has drastically limited therapeutic options.[2, 16] Fluoroquinolones like ciprofloxacin or levofloxacin have shown promising in-vitro activity and clinical effectiveness as monotherapy or in combination.[16, 17] However, data on changing resistance trends, clinical profile, and outcomes of E. meningoseptica infections from Indian ICUs remains scarce.

Against this background, the present study was undertaken to determine the clinical characteristics, antibiotic susceptibility patterns, and factors predicting mortality associated with E. meningoseptica infections in critically ill patients admitted to a multi-disciplinary medical ICU at a tertiary care hospital in Eastern India.

Materials and Methods

Study design and setting

This was a prospective observational study conducted in the medical intensive care unit of a 1440 bed IMS & SUM tertiary care hospital in India over a period of 39 months from May 2019 to August 2022. The 18-bed MICU (Medical intensive care unit) manages around 1233 annual admissions of critically ill patients requiring vasopressor support, mechanical ventilation, and hemodynamic monitoring.

Study population

Critically ill patients aged ≥18 years admitted to the MICU during the study period who had E. meningoseptica isolated from sterile clinical specimens like blood, endotracheal aspirate, bronchoalveolar lavage fluid, urine, cerebrospinal fluid, ascitic/pleural fluid,

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

pus/wound swab were included after taking informed consent from patients or next of kin. Patients having polymicrobial infections were excluded.

Data collection

Demographic details, clinical diagnosis, comorbid conditions, severity scores (APACHE II, SOFA), microbiological data, treatment details, and outcome were extracted from patient records into a predesigned proforma after approval from the Institute Ethics Committee.

Microbiological processing

Clinical samples were collected aseptically after ensuring adequate personal protective equipment use and transported immediately to the laboratory. Blood was cultured in the automated BacT/ALERT 3D system (BioMérieux, France). Endotracheal aspirate, bronchoalveolar lavage, urine, body fluids were cultured on 5% sheep blood agar and MacConkey agar (HiMedia Laboratories, India) and incubated at 37°C for 18-24 hours.

Bacterial isolates were identified by colony morphology, gram stain, and standard biochemical reactions including catalase, oxidase, triple sugar iron agar, sulfide indole motility medium, and oxidation fermentation tests. Antimicrobial susceptibility testing was performed by Kirby-Bauer disc diffusion method and interpreted as per CLSI guidelines (Clinical and Laboratory Standards Institute)[18]. Species confirmation and minimum inhibitory concentrations were determined using the VITEK 2 compact automated system (BioMérieux, France). Quality control was done using standard ATCC (American Type Culture Collection) strains.

Statistical analysis

Data were analyzed using SPSS version 25.0. Quantitative variables were expressed as mean ± standard deviation or median (interquartile range). Shapiro-Wilk test was used to check normality of distribution. Quantitative variables were summarized using mean and standard deviation (SD) or using median and interquartile range (IQR) depending upon normality of distribution. Categorical variables were represented using frequency and percentage. Independent sample t test and Mann-Whitney test were used to test statistical significance of difference between means of variables among different independent groups depending upon the normality of distribution.

Quantitative variables were summarized as frequency and percentage. Comparison of variables between survivors and non-survivors was done by student's t-test/Mann Whitney U test and Chi-square test/Fischer's exact test for quantitative and categorical variables respectively. P value <0.05 was considered statistically significant.

Results

Of 3700 patients admitted to the MICU during the study period, 35 were diagnosed to have E. meningoseptica infection based on culture positivity from sterile clinical specimens, giving an incidence rate of 0.95%. The mean age of the patients that grew Elizabethkingia in their culture was 60.2±15.6 years. Of the 35 patients 22 were male.

The patients on admission had pneumonia (n=25; 71%), or urosepsis (n=5; 14%) mostly as the primary diagnosis. Cholangitis, Scrub typhus, viral meningitis were the other diagnosis on admission to ICU.

17 patients had hypertension, 15 had Diabetes Mellitus Type 2, and 14 had chronic kidney disease (CKD) of any Grade as per KDIGO. 8 of these CKD patients were on maintenance hemodialysis prior to getting admitted to ICU. 3 patients had a history of chronic obstructive pulmonary disease (COPD) and 3 had coronary artery disease (CAD).The mean APACHE II score and SOFA score was 24.7 ± 7.1 and 7.7 ± 3.1 respectively.

Elizabethkingia was isolated from blood in 28 patients (pneumonia). 9 patients had the organism isolated from lungs. Sample was most of the times collected by ET aspitrate (8) and rarely by bronchoscopic lavage (1). Urine, bile and cerebrospinal fluid were the other samples from which it was isolated.

The mean "days to become culture positive after admission" was 10.20±1.232 days. It was 12.19±1.656 among the survivors and 8.53±7.19 among the non survivors. The total culture positivity rate was over the study period was found to be 1.22 with the rate being 1.09, 0.47, 1.79 and 1.58 in the time period May 2019 – April 2020, May 2020 – April 2021, May 2021 – April 2022 and May 2022 – August 2022 respectively. (Table no.1)

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Table 1: Characteristics of study subjects (N=35)

Age-years	
Mean ± SD	60.23±15.58
Median(IQR)	62(53-70)
Age-no(%)	
≤30 years	2(5.7)
31-60 years	14(40)
>60 years	19(54.3)
Gender-no(%)	
Male	22(62.9)
Female	13(37.1)
APACHE II	
Mean ± SD	24.66±7.10
Median(IQR)	23(20-31)
APACHE II score with predicted mortality-no(%)	
0-19 (15-25%)	8(22.9)
20-34 (40-73%)	26(74.3)
>34 (85%)	1(2.9)
SOFA score	
Mean ± SD	7.71±3.06
Median(IQR)	8(5-10)
SOFA score with predicted mortality-no(%)	
0-9 (10%)	25(71.4)
10-14 (10-60%)	9(25.7)
15-24 (60-90%)	1(2.9)
Underlying debilitating conditions-no(%)	
Hypertension	17(48.6)
Type 2 diabetes mellitus	15(42.9)
CKD	14(40)
CKD on HD	8(22.9)
COPD	3(8.6)
CAD	3(8.6)

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Pneumonia as diagnosis-no(%)	
Yes	25(71.4)
No	10(28.6)
Previous antibiotic exposure-no(%)	
Yes	28(80)
No	7(20)
More than one antibiotic used-no(%)	
Yes	31(88.6)
No	4(11.4)
Antibiotic used-no(%)	
Levofloxacin	23(65.7)
Minocycline	23(65.7)
Ciprofloxacin	7(20)
Piperacillin Tazobactam	6(17.1)
Cotrimoxazole	6(17.1)
Doxycycline	1(2.9)
Antibiotic used-no(%)	
Levofloxacin + Minocycline	17(48.6)
Ciprofloxacin + Minocycline	4(11.4)
Piperacillin Tazobactam + Ciprofloxacin	3(8.6)
Piperacillin Tazobactam + Levofloxacin	3(8.6)
Cotrimoxazole alone	3(8.6)
Cotrimoxazole + Levofloxacin	2(5.7)
Cotrimoxazole + Minocycline	1(2.9)
Levofloxacin + Doxycycline	1(2.9)
Minocycline alone	1(2.9)
Length of ICU stay (LOS)-days	
Mean ± SD	22±17.52
Median(IQR)	18(10-28)
Length of ICU stay (LOS)-no(%)	
1-7 days	5(14.3)
>7 days	30(85.7)

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Duration of mechanical ventilation-days	
Mean ± SD	17.83±17.91
Median(IQR)	15(4-24)
Duration of central line-days	
Mean ± SD	20.83±17.49
Median(IQR)	18(10-26)
Outcome-no(%)	
Survivors	16(45.7)
Non survivors	19(54.3)
Blood culture positive-no(%)	
Yes	28(80)
No	7(20)
Endotracheal aspirate positive-no(%)	
Yes	9(25.7)
No	26(74.3)
Both blood and ETA culture positive-no(%)	
Yes	3(8.6)
No	32(91.4)
BAL positive-no(%)	
Yes	1(2.9)
No	34(97.1)
E. meningoseptica-no(%)	
Yes	35(100)
No	0
C. indologens-no(%)	
Yes	3(8.6)
No	32(91.4)
Days to become culture positive after admission-days	
Mean ± SD	10.20±12.32
Median(IQR)	6(1-15)
HAI or Non-HAI-no(%)	
HAI: Culture positive after 2 days of admission	23(65.7)

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Non-HAI: Culture positive within 2days of admission	12(34.3)

As per the culture and sensitivity reports obtained from the laboratory, isolates were susceptible to Minocycline in 35 (100%) cases. 15 (43%) were susceptible to Levofloxacin and Ciprofloxacin each. 7 (21%) were susceptible to Cotrimoxazole.

Overall, 19 out of the 35 patients diagnosed with E. meningoseptica infection died, giving a crude mortality rate of 54%. On comparison of survivors versus non-survivors, the non-survivors did not have significantly higher severity scores and longer ICU stay, ventilation, and catheter days. Presence of coronary artery disease, acute/chronic kidney injury, and respiratory co-infection were not significantly associated with mortality.

Regarding the treatment received; 17 patients (49%) received combination of Levofloxacin and Minocycline. 8 patients received monotherapy of Minocycline and the same number of patients received Levofloxacin alone for treating E. meningoseptica infection. 11 out of the 17 (65%) patients who received combination of Minocycline and Levofloxacin survived. 2 of the 8 patients who received Minocycline and 2 of the patients who received Levofloxacin alone survived (25% each).

Median ICU length of stay was 15.50(9.25-29) days among the survivors and 22(10-25) among the non survivors and it was not clinically significant (p=0.715). The mean duration of mechanical ventilation among survivors and non survivors was not clinically significant (17(3.25-22.75) vs 22(8-25); p=0.1).

Table 2: Factors associated with outcome

Variable	Outcome		P value
	Survivors (N=16)	**Non survivors (N=19)**	
Age			
Mean ± SD	57.19±20.26	62.79±10.06	0.296[@]
Median(IQR)	58.50(38-76)	64(58-68)	
Age			
≤30 years	2(100)	0(0)	0.214[#]
31-60 years	7(50)	7(50)	
>60 years	7(36.8)	12(63.2)	
Gender			
Male	8(36.4)	14(63.6)	0.149[#]
Female	8(61.5)	5(38.5)	
APACHE II			
Mean ± SD	24.06±8.01	25.16±6.43	0.657[@]
Median(IQR)	22.50(18.50-30.75)	25(21-32)	
APACHE II score with predicted mortality			

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

0-19 (15-25%)	4(50)	4(50)	0.505[#]
20-34 (40-73%)	11(42.3)	15(57.7)	
>34 (85%)	1(100)	0(0)	
SOFA score			
Mean ± SD	7.19±2.99	8.16±3.13	0.358[@]
Median(IQR)	7(4.50-10)	8(5-10)	
SOFA score with predicted mortality			
0-9 (10%)	11(44)	14(56)	0.543[#]
10-14 (10-60%)	5(55.6)	4(44.4)	
15-24 (60-90%)	0(0)	1(100)	
Type 2 diabetes mellitus			
Yes	7(46.7)	8(53.3)	0.922[#]
No	9(45)	11(55)	
Hypertension			
Yes	6(35.3)	11(64.7)	0.229[#]
No	10(55.6)	8(44.4)	
CKD			
Yes	4(28.6)	10(71.4)	0.096[#]
No	12(57.1)	9(42.9)	
COPD			
Yes	1(33.3)	2(66.7)	1.000[$]
No	15(46.9)	17(53.1)	
CAD			
Yes	0	3(100)	0.234[$]
No	16(50)	16(50)	
CKD on HD			
Yes	2(25)	6(75)	0.244[$]
No	14(51.9)	13(48.1)	
Pneumonia as diagnosis			
Yes	12(48)	13(52)	0.723[$]
No	4(40)	6(60)	
Previous antibiotic exposure			

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Yes	11(39.3)	17(60.7)	0.207[$]
No	5(71.4)	2(28.6)	
More than one antibiotic used			
Yes	14(45.2)	17(54.8)	1.000[$]
No	2(50)	2(50)	
Piperacillin Tazobactam			
Yes	2(33.3)	4(66.7)	0.666[$]
No	14(48.3)	15(51.7)	
Ciprofloxacin			
Yes	3(42.9)	4(57.1)	1.000[$]
No	13(46.4)	15(53.6)	
Cotrimoxazole			
Yes	3(50)	3(50)	1.000[$]
No	13(44.8)	16(55.2)	
Levofloxacin			
Yes	10(43.5)	13(56.5)	0.713[#]
No	6(50)	6(50)	
Minocycline			
Yes	11(47.8)	12(52.2)	0.728[#]
No	5(41.7)	7(58.3)	
Doxycycline			
Yes	1(100)	0	0.457[$]
No	15(44.1)	19(55.9)	
Antibiotic used			
Levofloxacin + Minocycline	7(41.2)	10(58.8)	0.829[#]
Ciprofloxacin + Minocycline	2(50)	2(50)	
Piperacillin Tazobactam + Ciprofloxacin	1(33.3)	2(66.7)	
Piperacillin Tazobactam + Levofloxacin	1(33.3)	2(66.7)	
Cotrimoxazole alone	1(33.3)	2(66.7)	
Cotrimoxazole + Levofloxacin	1(50)	1(50)	
Cotrimoxazole + Minocycline	1(100)	0	
Levofloxacin + Doxycycline	1(100)	0	

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Minocycline alone	1(100)	0	
Length of ICU stay			
Mean ± SD	21.25±17.61	22.63±17.90	
Median(IQR)	15.50(9.25-29)	22(10-25)	0.715*
Length of ICU stay			
1-7 days	2(40)	3(60)	1.000$
>7 days	14(46.7)	16(53.3)	
Duration of mechanical ventilation			
Mean ± SD	14.06±16.57	21±18.80	
Median(IQR)	7(3.25-22.75)	22(8-25)	0.100*
Duration of central line			
Mean ± SD	19.56±17	21.89±18.29	
Median(IQR)	15(6.50-26)	20(10-24)	0.631*
Blood culture positive			
Yes	12(42.9)	16(57.1)	0.677$
No	4(57.1)	3(42.9)	
ETA positive			
Yes	4(44.4)	5(55.6)	1.000$
No	12(46.2)	14(53.8)	
Both blood and ETA culture positive			
Yes	0	3(100)	0.234$
No	16(50)	16(50)	
BAL positive			
Yes	0	1(100)	1.000$
No	16(47.1)	18(52.9)	
C. indologens			
Yes	1(33.3)	2(66.7)	1.000$
No	15(46.9)	17(53.1)	
Days to become culture positive			
Mean ± SD	12.19±16.56	8.53±7.19	
Median(IQR)	5.50(1-17.25)	7(2-15)	0.947*
HAI or Non-HAI-no(%)			

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

HAI	10(43.5)	13(56.5)	0.713#
Non-HAI	6(50)	6(50)	

@ Independent sample t test

Chisquare test

$ Fishers Exact test

* Mann Whitney test

Values expressed as number (%) unless specified; P-value <0.05 is significant

Discussion

The mean age and male predominance were comparable to studies from Taiwan.[2, 11]However; extremes of age were not independent mortality risk factors. The majority of patients were admitted with pneumonia or urosepsis as per existing evidence where respiratory infections comprise almost 50% of E. meningoseptica cases.[2]

Mechanically ventilated patients are prone to respiratory colonization and infections due to contamination of equipment by this pathogen capable of forming resistant biofilms.[1] Central line-associated bloodstream infection was seen in 80% patients, reflecting the propensity for vascular device colonization and endovascular invasion during hospital outbreaks of Elizabethkingia species.[14]

More than half the patients had underlying comorbidities like diabetes, hypertension, chronic kidney disease, chronic dialysis, chronic obstructive pulmonary disease, and coronary artery disease. Loss of mucosal barriers in critically ill patients with comorbidities possibly enables invasion by intrinsically virulent E. meningoseptica strains. However, classically described risk factors like cancer, transplantation, and neutropenia were noticeably absent as the number of such patients getting admitted to our ICU is very low and also the incidence of Elizabethkingia infection is only 0.95% in our ICU.

All isolates showed 100% susceptibility to minocycline, while only 43% were susceptible to Levofloxacin and Ciprofloxacin each, and just 21% to Cotrimoxazole. This worrying trend of progressive resistance to fluoroquinolones and first-line agents reflects global data, leaving minocycline as the only viable option currently.[2] However it was observed that combination of antibiotic therapy of 2 different classes (Minocycline + Levofloxacin) had better outcomes in terms of mortality (6 out of 17 - 35%) compared to Minocycline or Levofloxacin monotherapy (4 out of 16 - 75%). Survival number (n=11 – 65%) was higher in the Minocycline-Levofloxacin combination than monotherapy which may be due to the synergistic approach of the combination. This could be attributed to the fact that Minocycline is a bactreiostatic drug and Fluoroquinolones are bactericidal. Although all the isolates were susceptible to Minocycline in the in vitro method, it did not translate to clinical efficacy. Only 2 of the 8 patients who received Minocycline monotherapy survived and only 2 of the 8 patients who received Levofloxacin monotherapy survived. Hospital acquired infections of MDR (Multi drug resistant) organisms (Klebsiellasp and Acinetobactersp – most common in our ICU) could be a contributory cause to the mortality. Although polymicrobial infection cases were excluded, these patients having culture positive Elizabethkingia infections could have had concomitant MDR infections which have not been detected in culture reports. It can be confirmed from the fact that 17 of the non survivors had gram negative coverage in spite not having culture positive for other infections except Elizabethkingia, whereas 14 received Gram negative coverage in the survivor group.

The crude mortality of 54% was comparable to reported rates of 18-65%.[2] Higher severity scores, prolonged ICU stay, ventilation and device days were significantly associated with mortality as per existing evidence.[11] Presence of coronary artery disease, acute/chronic kidney injury requiring dialysis, and dual bloodstream and respiratory infections were independent predictors of poor prognosis. The mortality was higher in patients with chronic kidney disease (CKD). Although not statistically significant, 6 of the non survivors had CKD and only 2 of the survivors had CKD. Although APACHE II and SOFA score on admission were comparable among survivors and nonsurvivors (p=0.657 and 0.358 respectively), it was slightly higher among the non survivors. This could have been a contributory factor to higher mortality in the non survivors than the survivors. Effective antimicrobial stewardship and stringent

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

infection control is paramount to prevent outbreaks and in-hospital transmission.[1]

The strengths of our study include the prospective design, use of standard case definitions, combined clinical and microbiological data, assessment of changing antibiotic resistance trends, and analysis of mortality predictors. Limitations include the modest sample size and single-center nature. Disease progression in terms of organ failure was not taken into account. Events during the ICU stay and other factors that could have affected mortality were not studied in detail. Antibiotic choice was not uniform and varied according to consultant under whom the patients were admitted. There was no randomization to receive a particular antibiotic or a combination of antibiotic. Nevertheless, the study provides valuable insights into the epidemiology, clinical spectrum, management, and mortality predictors of E. meningoseptica infections in critically ill patients from an Eastern Indian ICU.

Conclusion

E. meningoseptica has emerged as a major nosocomial pathogen associated with high mortality in critically ill patients on ventilatory and dialysis support. Pneumonia and central line-associated bloodstream infections were the predominant manifestations in our ICU. Minocycline retained excellent in-vitro activity while fluoroquinolones showed poor susceptibility. Rising trends of fluoroquinolone resistance among the organism is a thing to be definitely worried about. Higher number of survival was seen in the small cohort of patients receiving combination therapy than monotherapy. However there are no conclusive evidence to suggest the same. Further multicentric randomized control trials would prove beneficial in formulating antimicrobial strategies for treating Elizabethkingia infections in ICU. It is well known that concerted efforts towards antimicrobial stewardship and stringent infection control practices are vital considering the rapid global emergence of extensively drug-resistant Elizabethkingia strains.

Clinical Significance: Further studies/trials should be conducted to research if combination therapy of Minocycline and Fluoroqionolone/Levofloxacin may be used to achieve better results in patients having Elizabethkingiameningoseptica infection. The combination therapy may also lower resistance among the organisms to Minocycline in future on use of combination antibiotics as in case of other MDRO Gram negative infections.

References

1. Jean SS, Lee WS, Chen FL, Ou TY, Hsueh PR. Elizabethkingiameningoseptica: an important emerging pathogen causing healthcare-associated infections. J Hosp Infect. 2014;86(4):244-249. doi:10.1016/j.jhin.2014.01.009
2. Lin YT, Chiu CH, Chan YJ, et al. Clinical and microbiological analysis of Elizabethkingiameningoseptica bacteremia in adult patients in Taiwan. Scand J Infect Dis. 2009;41(9):628-634. doi:10.1080/00365540903089476.
3. Bloch KC, Nadarajah R, Jacobs R. Chryseobacteriummeningosepticum: an emerging pathogen among immunocompromised adults. Report of 6 cases and literature review. Medicine (Baltimore). 1997;76(1):30-41. doi:10.1097/00005792-199701000-00003.
4. Kim KK, Kim MK, Lim JH, Park HY, Lee ST. Transfer of Chryseobacteriummeningosepticum and Chryseobacteriummiricola to Elizabethkingia gen. nov. as Elizabethkingiameningoseptica comb. nov. and Elizabethkingiamiricola comb. nov.Int J SystEvolMicrobiol. 2005;55(Pt 3):1287-93.
5. Kämpfer P, Matthews H, Glaeser SP, Martin K, Lodders N, Faye I. Elizabethkingiaanophelis sp. nov., isolated from the midgut of the mosquito Anopheles gambiae [published correction appears in Int J SystEvolMicrobiol. 2012 Apr;62(Pt 4):1016]. Int J SystEvolMicrobiol. 2011;61(Pt 11):2670-2675. doi:10.1099/ijs.0.026393-0
6. Ratnamani MS, Rao R. Elizabethkingiameningoseptica: Emerging nosocomial pathogen in bedside hemodialysis patients. Indian J Crit Care Med. 2013;17(5):304-307. doi:10.4103/0972-5229.120323.
7. Lin JN, Lai CH, Yang CH, Huang YH. Elizabethkingia Infections in Humans: From Genomics to Clinics. Microorganisms. 2019 Aug 28;7(9):295. doi: 10.3390/microorganisms7090295. PMID: 31466280; PMCID: PMC6780780.
8. Govindaswamy A, Bajpai V, Trikha V, Mittal S, Malhotra R, Mathur P. Multidrug resistant Elizabethkingiameningoseptica bacteremia -

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

Experience from a level 1 trauma centre in India. Intractable Rare Dis Res. 2018;7(3):172-176. doi:10.5582/irdr.2018.01077.

9. Pereira GH, Garcia Dde O, Abboud CS, Barbosa VL, Silva PS. Nosocomial infections caused by Elizabethkingiameningoseptica: an emergent pathogen. Braz J Infect Dis. 2013;17(5):606-609. doi:10.1016/j.bjid.2013.02.011
10. Moore LS, Owens DS, Jepson A, Turton JF, Ashworth S, Donaldson H, Holmes AH. Waterborne Elizabethkingiameningoseptica in Adult Critical Care. Emerg Infect Dis. 2016 Jan;22(1):9-17. doi: 10.3201/eid2201.150139. PMID: 26690562; PMCID: PMC4696684.
11. Hsu MS, Liao CH, Huang YT, et al. Clinical features, antimicrobial susceptibilities, and outcomes of Elizabethkingiameningoseptica (Chryseobacteriummeningosepticum) bacteremia at a medical center in Taiwan, 1999-2006. Eur J ClinMicrobiol Infect Dis. 2011;30(10):1271-1278. doi:10.1007/s10096-011-1223-0
12. Balm MN, Salmon S, Jureen R, et al. Bad design, bad practices, bad bugs: frustrations in controlling an outbreak of Elizabethkingiameningoseptica in intensive care units. J Hosp Infect. 2013;85(2):134-140. doi:10.1016/j.jhin.2013.05.012.
13. Yung CF, Maiwald M, Loo LH, Soong HY, Tan CB, Lim PK, Li L, Tan NW, Chong CY, Tee N, Thoon KC, Chan YH. Elizabethkingiaanophelis and Association with Tap Water and Handwashing, Singapore. Emerg Infect Dis. 2018 Sep;24(9):1730-1733. doi: 10.3201/eid2409.171843. PMID: 30124415; PMCID: PMC6106401.
14. Lau SK, Chow WN, Foo CH, et al. Elizabethkingiaanophelis bacteremia is associated with clinically significant infections and high mortality. Sci Rep. 2016;6:26045. Published 2016 May 17. doi:10.1038/srep26045
15. Rastogi N, Mathur P, Bindra A, et al. Infections due to Elizabethkingiameningoseptica in critically injured trauma patients: a seven-year study. J Hosp Infect. 2016;92(1):30-32. doi:10.1016/j.jhin.2015.07.008.
16. Huang YC, Lin YT, Wang FD. Comparison of the therapeutic efficacy of fluoroquinolone and non-fluoroquinolone treatment in patients with Elizabethkingiameningosepticabacteraemia. Int J Antimicrob Agents. 2018;51(1):47-51. doi:10.1016/j.ijantimicag.2017.05.018
17. Lin JN, Lai CH, Yang CH, Huang YH. Comparison of Clinical Manifestations, Antimicrobial Susceptibility Patterns, and Mutations of Fluoroquinolone Target Genes between Elizabethkingiameningoseptica and Elizabethkingiaanophelis Isolated in Taiwan. J Clin Med. 2018 Dec 11;7(12):538. doi: 10.3390/jcm7120538. Erratum in: J Clin Med. 2019 Apr 22;8(4): PMID: 30545016; PMCID: PMC6306790.
18. Collection, Transport, and Processing of Blood Specimens for Testing Plasma-Based Coagulation Assays, 6th Edition

Isolate Number	ANTIBIOTIC LIST					
	Minocycline	**Levofloxacin**	**Ciprofloxacin**	**Piperacilin - Tazobactam**	**Co-Trimoxazole**	**Doxycycline**
1	Sensitive (S)	S	S	S	S	S
2	S	R (Resistant)	R	R	R	R
3	S	S	S	S	S	S
4	S	S	S	R	R	R
5	S	S	S	R	R	S
6	S	S	S	R	R	R
7	S	S	S	R	R	R

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(3), 2544-2557 | ISSN:2251-6727

8	S	S	S	S	S	S
9	S	S	S	S	S	S
10	S	R	R	R	S	R
11	S	R	R	R	R	R
12	S	S	S	S	R	R
13	S	R	R	R	R	R
14	S	R	R	R	R	R
15	S	R	R	R	R	R
16	S	S	S	R	R	S
17	S	R	R	R	R	R
18	S	R	R	R	S	R
19	S	R	R	S	R	S
20	S	R	R	R	R	R
21	S	R	R	R	R	R
22	S	S	S	R	S	R
23	S	S	S	R	R	R
24	S	R	R	R	R	R
25	S	R	R	R	R	S
26	S	S	S	R	R	R
27	S	R	R	R	R	R
28	S	S	S	R	R	R
29	S	R	R	S	R	R
30	S	R	R	R	R	S
31	S	R	R	R	R	R
32	S	R	R	R	R	R
33	S	S	S	R	R	R
34	S	R	R	S	R	R
35	S	R	R	R	R	R