International Journal of Infectious Diseases 16 (2012) e491–e497

Contents lists available at SciVerse ScienceDirect

International Journal of Infectious Diseases

journal homepage: www.elsevier.com/locate/ijid

Emerging clinico-epidemiological trends in melioidosis: analysis of 95 cases from western coastal India

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ARTICLE INFO

Article history:
Received 25 October 2011
Accepted 14 February 2012

Corresponding Editor: William Cameron, Ottawa, Canada

Keywords:
Melioidosis
Burkholderia pseudomallei
Rainfall
Epidemiology
Musculoskeletal melioidosis
Dental abscess

SUMMARY

Objectives: To study the clinico-epidemiological trends in melioidosis, an emerging disease in the western coastal region of India.

Methods: Data of 95 patients with melioidosis in the western coastal region of India were retrospectively analyzed with respect to monthly rainfall, risk factors, clinical presentations, and outcome.

Results: A strong linear correlation was seen between average monthly rainfall and the occurrence of cases ($p = 0.002$). Mortality was seen only in patients with bacteremia ($p < 0.001$). Nine (40.9%) patients with septic shock died ($p < 0.001$). Age ≥40 years and diabetes mellitus were seen in 75.8% of cases, each. Pneumonia was the most common clinical presentation (32.6%), followed by musculoskeletal disease (20%), melioidotic lymphadenopathy (7.4%), and dental abscess (6.3%). Only 36.8% of patients had exposure to wet soil/surface water.

Conclusions: Melioidosis is quite prevalent in the western coastal region of India, and is strongly associated with rainfall, age, and diabetes mellitus. Higher proportions of musculoskeletal, dental, and lymph node melioidosis were seen in this region as compared to endemic areas. Bacteremic melioidosis has a poorer prognosis than non-bacteremic melioidosis. The presence of septic shock is a strong predictor of mortality. Percutaneous inoculation may not be the main portal of entry for *Burkholderia pseudomallei* in this region.

1. Introduction

Melioidosis, which is endemic in Southeast Asia and northern Australia, is an emerging infection in other Asian regions, including India, China, and Sri Lanka, and also in Brazil, South America.[1,2] With increasing awareness of melioidosis, more cases have now been reported from various regions of India, including Maharashtra, Kerala, Karnataka, Tamil Nadu, and Pondicherry.[3–6] Recently, clusters of cases have been reported from the western coastal region of India.[7,8]

The epidemiology and risk factors of melioidosis have been extensively studied in endemic areas, from where high mortality rates have been reported, i.e., up to 50% in northeast Thailand and 14% in northern Australia.[1,2] However, detailed studies on the epidemiology of melioidosis in India are lacking. The western coastal region of India seems to be an ideal setting for endemicity of this disease, with an annual rainfall of about 300 cm (tropical monsoon climate), a high population of diabetics,[9,10] and agriculture as the predominant occupation. In this study we retrospectively analyzed the data of cases of melioidosis presenting at our hospital to study the epidemiology, risk factors, and clinical presentations of this disease in the western coastal region of India.

2. Materials and methods

2.1. Study population

All patients with culture-confirmed melioidosis whose clinical specimens (blood, exudates, and urine) were received at the Microbiology Laboratory, Kasturba Medical College Hospital, Mangalore, during the period January 2005 to December 2010 were included in the study. Blood cultures were performed using the BacT-Alert automated blood culture system (bioMérieux, Marcy l'Etoile, France). All other specimens were cultured on sheep blood agar, chocolate agar, and MacConkey agar. Isolates were identified by standard microbiological techniques.[11] Salient features of identification included: oxidase-positive, Gram-negative bacilli with bipolar staining; rough, wrinkled, pink colonies on

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1201-9712/$36.00 – see front matter
http://dx.doi.org/10.1016/j.ijid.2012.02.012

MacConkey agar; oxidative utilization of glucose, lactose, and maltose; lysine decarboxylase-negative; arginine dihydrolase-positive; reduced nitrates; positive gelatin liquefaction; growth at 42 °C positive; resistance to gentamicin (10 μg/disk) and polymyxin B (300 U/disk); and growth on Ashdown's medium[12] positive, with formation of rugose colonies resembling cornflower heads, which take up neutral red dye from the medium. Identification was confirmed by the Mini API System (bioMérieux) for the initial isolates, and the later isolates were confirmed by the Vitek 2 Compact System (bioMérieux).

Case records of culture-positive patients were retrospectively analyzed. The month of the year in which the patient presented with illness was noted in order to determine if there was a correlation with the monsoon season. The monthly rainfall statistics for the past 6 years were obtained for two districts, namely Dakshina Kannada (DK) and Kasaragod, situated in the western coastal region of India.[13]

Primary clinical presentations and secondary clinical foci of infection were noted. Melioidosis was classified as bacteremic melioidosis (a positive blood culture with a single focus or no identifiable focus of infection), or localized melioidosis (one or more foci of infection and a negative blood culture). Clinical presentation was considered acute and from a recent infection if symptoms had been present for less than 2 months, and presentation was considered chronic when symptoms had been present for more than 2 months.[14]

The presence of risk factors and underlying comorbidities were recorded, including diabetes mellitus, alcohol intake, chronic renal disease, chronic lung disease, occupation (whether it involved contact with wet soil and water), age, and sex of the patient. The outcome of treatment was noted.

2.2. Definitions

Diabetes mellitus was defined as a fasting blood glucose level ≥126 mg/dl (7.0 mmol/l) or postprandial blood glucose level ≥200 mg/dl (11.1 mmol/l).[15] Excessive alcohol consumption was defined as more than 14 drinks per week or four drinks per occasion for men, and as more than seven drinks per week or three drinks per occasion for women, in accordance with the criteria established by the US National Institute on Alcohol Abuse and Alcoholism.[16] Chronic kidney disease was defined as kidney damage or a glomerular filtration rate (GFR) <60 ml/min/1.73 m^2 for ≥3 months, irrespective of cause.[17] Chronic lung disease was defined as a documented diagnosis of chronic obstructive airways disease.[14]

2.3. Statistical analyses

The correlation coefficient was calculated for assessing the linear relationship between average monthly rainfall and the number of cases of melioidosis for those months. Correlation was assessed by non-parametric method to obtain the corresponding Spearman's correlation coefficient. Associations between categorical variables were analyzed by Fisher's exact test. A p-value of <0.05 was considered significant. Institutional ethics committee clearance for the study was obtained. Informed patient consent was not required as this was a retrospective analysis of case records.

3. Results

During the 6-year study period, 95 cases of melioidosis were confirmed by culture in our laboratory (Table 1). Of these, 37 (38.9%) were bacteremic melioidosis. Twenty-two (59.5%) of the bacteremic patients had septic shock. Nine of the 22 patients with septic shock died (40.9%), as compared to none of the patients without septic shock, who all (100%) survived (Fisher's exact test, $p < 0.001$). All nine patients who died were bacteremic; there was no mortality among non-bacteremic patients (Fisher's exact test, $p < 0.001$).

Table 1
Clinical presentations and outcomes of 95 cases of melioidosis

Clinical presentations	Total cases *n* (%)	Septic shock cases *n* (%)	Deaths *n* (%)
Bacteremic melioidosis (*n* = 37)			
Pneumonia	19 (20)	11 (50)	7 (77.8)
Septic arthritis	5 (5.3)	2 (9.1)	0
Splenic abscess	2 (2.1)	0	0
Lymphadenopathy	1 (1.1)	1 (4.5)	0
Prostatic abscess	1 (1.1)	0	0
No focus identified	9 (9.5)	8 (36.4)	2 (22.2)
Non bacteremic melioidosis (localized melioidosis) (*n* = 58)			
Pneumonia	12 (12.6)	0	0
Septic arthritis	10 (10.5)	0	0
Lymphadenopathy	6 (6.3)	0	0
Dental abscess	6 (6.3)	0	0
Psoas abscess	4 (4.2)	0	0
Skin nodules	3 (3.2)	0	0
Parotid abscess	2 (2.1)	0	0
Pericardial effusion	2 (2.1)	0	0
Gluteal abscess	2 (2.1)	0	0
Breast abscess	2 (2.1)	0	0
Splenic abscess	2 (2.1)	0	0
Liver abscess	2 (2.1)	0	0
Prostatic abscess	1 (1.1)	0	0
Pyopneumothorax	1 (1.1)	0	0
Lung abscess	1 (1.1)	0	0
Pyelonephritis	1 (1.1)	0	0
Meningitis	1 (1.1)	0	0
Total	95	22 (23.2)	9 (9.5)

All our patients came from DK and Kasaragod districts, which are situated in the western coastal region of India. Sixty-eight patients (71.6%) presented during the heavy monsoon months (June to September, southwest monsoon). Figure 1 shows the relationship between the average monthly rainfall in DK and Kasaragod districts, and the occurrence of melioidosis cases, as well as bacteremia, septic shock, and deaths due to melioidosis. The number of melioidosis cases in a month was linearly correlated with the average monthly rainfall, and this correlation was found to be highly statistically significant (Spearman's correlation coefficient = 0.803; $p = 0.002$). Twenty-eight (75.7%) of the bacteremic cases, 18 (81.8%) septic shock cases, and six (66.7%) deaths occurred during the monsoon months.

Patients ranged in age from 20 days to 74 years (median 50 years, interquartile range 16 years). Seventy-two (75.8%) patients were aged ≥40 years. The maximum number of cases occurred in those between the ages of 40 and 70 years (69 patients, 72.6%); seven patients were children (age ≤12 years). Sixty-three (66.3%) patients were male, and the male-to-female ratio was 2.0:1.

3.1. Clinical presentations

The primary clinical presentations and outcomes of the 95 patients with culture-confirmed melioidosis are shown in Table 1.

Fever was the most consistent presenting complaint and was present in 92 (96.8%) patients. Of the three patients without fever, one was a 29-year-old pregnant woman with no defined risk factors who presented with cervical lymphadenopathy, the second was a 61-year-old male with impaired glucose tolerance who presented with a dental abscess from which *Burkholderia pseudomallei* was isolated, and the third was a 34-year-old diabetic woman with *B. pseudomallei* pneumonia.

The duration of presenting complaints ranged from 2 days to as long as a year (median duration 4 weeks, interquartile range 7 weeks). Sixty-eight (71.6%) patients had acute presentations (25 pneumonia, 11 septic arthritis, seven septicemia, five dental