Retrospective Study of *Aeromonas* Infection in a Malaysian Urban Area: A 10-year Experience

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ABSTRACT

Aims: To describe the patterns of isolation of Aeromonas spp. and the resulting spectrum of infection, intestinal and extra-intestinal, from infants and children in an urban area in a hot and humid country from Southeast Asia.

Materials and methods: Retrospective review of all bacterial culture records from children below 16 years of age, from the Department of Medical Microbiology, University of Malaya Medical Centre, Kuala Lumpur, from January 1988 to December 1997. Review of all stool samples and rectal swabs obtained from children during the same period were carried out to ascertain the isolation rate of Aeromonas sp. from stools and rectal swabs. The case records of those with a positive Aeromonas culture were retrieved and reviewed.

Results: During the study period, 84 culture samples were positive of Aeromonas spp. (stools 48, rectal swabs 36). During the same period, 1352 stool samples were positive for at least one enteropathogen. Aeromonas spp. constituted 0.62% of all stool samples. Of the 61 cases reviewed, four patterns of colonization were observed: (a) 17 cases of mostly asymptomatic nursery newborns with a positive rectal swab; (b) 9 children with no diarrhoea; (c) 23 cases, of who seven were immunocompromised, had acute, brief watery diarrhoea without severe dehydration or disturbances of serum electrolytes. No chronic diarrhoea or bacteraemia was noted. (d) 12 cases had a mixed infection with a second enteropathogen isolated from stool samples. Three had chronic diarrhoea. No extra-intestinal infection attributed to Aeromonas spp. was identified in this study.

Conclusion: Aeromonas was a rare cause of gastroenteritis in urban Malaysian children. It was isolated almost exclusively from gastro-intestinal tract, caused mostly by mild gastroenteritis with no serious complications. Asymptomatic stool carriage among newborns admitted to special care nursery and older children with no diarrhoea were observed.

Keywords: Aeromonas, gastroenteritis, childhood

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INTRODUCTION

A variety of human infections, including gastroenteritis, cellulitis, wound infections, hepatobiliary infections and septicaemia have been reported to be associated with Aeromonas spp.[1,2]. At least three distinctive gastro-intestinal syndromes following gastroenteritis caused by of Aeromonas sp. have been described: (a) acute, watery diarrhoea; (b) dysentery; and (c) subacute or chronic diarrhoea[3]. Acute watery diarrhoea was self-limiting[4,5]. Dysentery-like illness with bloody and mucousy diarrhoea, mimicking childhood inflammatory bowel disease was seen occasionally[3]. The highest attack rate for Aeromonas-associated gastroenteritis appears to be in young children[4]. A wide difference in the frequency of isolation of Aeromonas spp. from stool has been observed[6-8]. It appeared to be more common in tropical countries like Peru and tropical Australia[1,7]. There are few published reports of Aeromonas infection in children from Southeast Asia region[9,10]. Koe et al noted that among children from Kuala Lumpur with acute diarrhoea attending outpatient clinic, the isolation rate of Aeromonas was 5.2%[9]. However, the number of the patients in that study was small and it was conducted over a brief duration of time.

The aims of the present study were to describe the pattern of isolation of Aeromonas spp. from infants and children admitted to a large urban hospital in Malaysia over a period of ten years, and the pattern of infection, intestinal or extra-intestinal, in this group of population caused by Aeromonas spp.

MATERIALS AND METHODS

The University of Malaya Medical Center, Kuala Lumpur is a large urban hospital. The paediatric department both serves the local community as well as functions as a national tertiary referral center. Each year, approximately 400 children with acute gastroenteritis are admitted to the department. Stool samples were routinely obtained from these children

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for bacteriological and virological examinations. Microscopic examinations for parasitic infections were carried out in selective cases if clinically indicated. Rectal swabs for certain high-risk groups, i.e. childhood malignancies and newborns admitted to the special care nursery were obtained.

The bacteriological records (blood, cerebrospinal fluid, stools, sputum, nasopharyngeal and tracheal secretions, rectal swabs, wound swabs, and aspirates of various body secretions) obtained from children below 16 years of age, of the Department of Medical Microbiology over a period of ten years, from January 1988 to December 1997, were reviewed. During the study period, stool samples and rectal swabs were routinely processed for *Salmonella, Shigella, Campylobacter, Aeromonas, Vibrio parahaemolyticus* and other *enteropathogens*. Standard bacteriological methods[11] were used to identify Aeromonas and these were then confirmed by using the API 20E system during the earlier years and later by the API 20 NE system (bioMerieux).

The records of all cases with a positive Aeromonas culture were retrieved. Demographic data, clinical features, laboratory investigations and clinical outcome of these cases were obtained. Acute gastroenteritis was defined as the presence of loose stools of three or more episodes per day of less than 14 days' duration. Chronic diarrhoea was defined as diarrhoea of more than 14 days' duration. The presence of other enteropathogens was noted to ascertain the frequency of co-infection.

All stool cultures positive for bacterial enteropathogen during the same period were noted to compute the isolation rate of Aeromonas during the study period.

RESULTS

During the 10-year study period, a total of 84 positive Aeromonas cultures were isolated from children below 16 years of age. Forty-eight isolates were from stool samples while the remaining 36 were from rectal swabs. No other positive Aeromonas cultures were noted. During the same period, a total of 12 758 stool specimens or rectal swabs obtained from children were processed. A total of 1352 specimens (10.6%) were positive for at least one bacterial enteropathogen. Thus, isolation rate of Aeromonas species was 0.62%. The case notes of 61 patients (70%) were available for review. There were 41 males and 20 females.

Four patterns of isolation were identified (Table I)

(a) Seventeen positive isolates were obtained from rectal swabs taken from newborn infants admitted to the special care nursery. Fourteen of these swabs were taken within a few hours after delivery, three within the second day and one on the third day. Three had prolonged rupture of membrane, four had signs of neonatal sepsis, while two had fresh blood per rectum. The remaining eight infants were admitted for reasons other than sepsis (i.e. prematurity, respiratory distress syndrome, positive serology for syphilis). Blood cultures were obtained from 11 infants. One had a positive culture (group B Streptococcus). One premature infant with no risk factors for sepsis had a positive umbilical swab for Aeromonas. The two infants who had fresh blood per rectum improved spontaneously within three days. No diarrhoea, fever or abdominal distension was noted. One of them also had a positive stool culture of enteropathogenic *E. coli*. None of the remaining 14 infants developed any diarrhoea subsequently. None required treatment for the positive rectal swab of Aeromonas.

(b) Nine Aeromonas isolates were from rectal swabs or stool samples from children who did not have diarrhoea. The age ranged from five months to 14 years (median: 4 years, mean: 6.6 years). Of these: two were children with a haematological malignancy before undergoing chemotherapy; four had viral fever; one had an abdominal wall abscess; one had intussusception; and another had acute glomerulonephritis. Blood cultures were obtained from eight cases, none were positive. None developed gastro-intestinal symptoms subsequently.

(c) Twenty-three isolates were from children admitted for acute gastroenteritis (see next page).

(d) Twelve cases had a positive second enteropathogen besides Aeromonas spp. Seven had non-typhoidal *Salmonella*, three had rotavirus and two had Shigella species. Three cases in this group had prolonged diarrhoea: two had secondary lactose intolerance, while one had cow's milk protein intolerance. All had non-typhoid *Salmonella* in the stools besides Aeromonas.

Table 1. Spectrum of clinical conditions where Aeromonas was isolated from rectal swabs and stool cultures

Group	n	Source	Median age (y) (range)	Clinical features
a	17	rectal swabs	newborn	2 had bleeding per rectum
b	9	rectal swabs	4 (5m - 14y)	asymptomatic
c	23	stools	2 (1m - 8y)	acute gastroenteritis
d*	12	stools	1 (3m - 8y)	acute gastroenteritis, two had prolonged diarrhoea

m - months, y - years, * co-infection with a second enteropathogen.

Clinical features of Aeromonas gastroenteritis

Twenty-three children have clinical features suggestive of gastroenteritis. The median age was two years (range: one month to 8 years). Seven had an underlying haematological disorder: four had acute lymphoblastic leukaemia and one child each had Langerhan cell histiocytosis, congenital agranulocytosis and Wiskott-Aldrich syndrome. They developed diarrhoea whilst in the hospital. Six cases had a second diagnosis: pneumonia in four, acute bronchiolitis and dengue haemorrhagic fever in one each. The clinical presentation of these 23 cases was similar to other causes of acute gastroenteritis. The commonest feature was acute watery diarrhoea (100%), with fever (70%) and vomiting (30%). The median duration of diarrhoea before admission was two days. Five cases (22%) had bloody stools. Mild dehydration was noted in six cases (26%). None had a positive blood culture and no disturbances of serum sodium were noted. The diarrhoea was transient in all cases and resolved spontaneously within a few days. Most required oral rehydration. No antibiotics were prescribed. No prolonged dysentery-like illness was seen.

DISCUSSIONS

This review showed that there was no extra-intestinal Aeromonas infection, such as sepsis, cellulitis and wound infection noted from an urban child population in Malaysia over a ten-year period. Aeromonas spp. accounted for 0.62% of all stool cultures and rectal swabs positive for bacterial enteropathogens over the same period. This is a relatively low figure if compared to the 5.2% of Aeromonas isolation rate from study conducted by Koe et al[9]. This latter figure were very much similar to figures from the US[5], but much lower from the figures from Peru[7] and Nigeria[8].

This study showed that Aeromonas was isolated in newborns admitted to nursery, as well as to children admitted to hospital for various medical reasons. None of these two groups of patients had gastro-intestinal symptoms such as diarrhoea. Thus it is likely that the isolation of Aeromonas sp. in them was not pathologically significant. In those cases where there were more than one enteropathogens, it was also likely that these second pathogens played a more important role than Aeromonas in causing diarrhoea.

In those presented with acute gastroenteritis, brief watery diarrhoea with variable fever and vomiting were the commonest presentation[12]. Severe gastroenteritis with profound dehydration or electrolytes disturbances or prolonged diarrhoea were not seen. Similarly, persistent diarrhoea and dysentery-like illness mimicking chronic inflammatory bowel diseases as observed by Gracey et al[1] and Agger et al[5] were not seen. Although bacteraemia may complicate immunocompromised patients who had Aeromonas gastro-enteritis[13], none of the nine immunocompromised children in this study, who either had acute gastroenteritis or a positive rectal swab had bacteraemia.

In this study, a quarter of positive isolates was from routine rectal swabs taken within a few hours after birth from newborn infants with no diarrhoea. Breast-fed infants harboured *E. coli*, lactobacilli, and various anaerobes, while in those admitted to intensive care nursery, *Klebsiella*, *Enterobacter*, and *Citrobacter* were isolated[14]. Aeromonas was not isolated in any of these studies[14,15]. In a study from tropical Australia, Aeromonas-associated diarrhoea was not seen in neonates[16]. However, in an environment with a high prevalence of Aeromonas such as Lima, Peru, 23% of normal infants delivered by Caesarean section were affected or colonized with Aeromonas spp. during the first week of life[17].

Since the natural habitat of Aeromonas is the aquatic environment, it is likely that the organisms gain entry to the digestive tract via ingestion of contaminated food or water[18]. This could explain the low isolation rate of Aeromonas in this study, as it was conducted from children mainly from an urban area. The route of entry of Aeromonas in neonates who were admitted to the special care nursery in this study was unknown, as they were admitted directly to the nursery after delivery. A study on Aeromonas bacteraemia in patients with haematologic diseases also showed no exposure to fish or water[13]. It seemed to be of low pathogenicity. Except for two infants who had bleeding per rectum, the remaining fifteen infants did not have gastro-intestinal symptoms.

In conclusion, Aeromonas spp. was a rare cause of gastroenteritis among Malaysian children admitted with diarrhoea, usually causing a brief and mild disease. In a third of positive isolates, a second enteropathogen was isolated. No bacteraemia or other extra-intestinal infections were observed, even in children who were immunocompromised. It colonized normal newborns admitted to special care nursery, where it did not appear to cause any gastro-intestinal symptoms or bacteraemia.

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