

# The Spectrum Of Childhood Meningitis In Barbados: A Population Based Study

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## Citation

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## Abstract

**Objectives:** To describe the epidemiologic characteristics of meningitis in children during a 12 year period, from 1994 to 2005, in Barbados, with particular emphasis on the trends in incidence and age distribution.

**Methods:** This is a retrospective population based study of all childhood meningitis over a 12 years period. A chart review was conducted of all patients outside of the neonatal age group hospitalized at the Queen Elizabeth Hospital of Barbados with a diagnosis of meningitis from January 1994 to November 2005.

**Results:** There were 327 cases of meningitis, 235 (71%) cases were categorized as aseptic meningitis and 92 (29%) were categorized as bacterial meningitis. The median age of children with aseptic meningitis was 3 years (Range 2 months - 15 years) and the median age for patients with bacterial meningitis was 18.0 months and ranged in age from 1 months to 15 years ( $P < 0.05$ ). Fifty nine percent of the cases of aseptic meningitis and 50% of the cases of bacterial meningitis occurred in boys. The annual incidence of pyogenic meningitis has varied narrowly in between 10 to 20 per 100, 000 under 16 populations, with a decline to less than 5 in 2005. The annual incidence rate of aseptic meningitis showed two epidemics with the rate peaking above 40 cases per 100, 000 under 16 population in 1997 and 2001. Through out the study period, a little over half of all meningitis in  $< 5$  years children was pyogenic without any significant trend.

**Conclusions:** The incidence of pyogenic meningitis in Barbados has shown a modest decline since early 2000. Aseptic meningitis is as common as pyogenic meningitis and shows seasonality during the year with epidemics every few years.

## INTRODUCTION

The epidemiology of childhood meningitis has been constantly changing over the past two decades (1). With the advent of conjugate hemophilus influenza vaccine both the incidence of over all bacterial meningitis and the incidence of meningitis due to hemophilus influenza have declined (1, 2). Also there have been changes in the etiology and incidence of aseptic meningitis (3). Several studies have characterized the epidemiology of the Bacterial meningitis in the English speaking Caribbean including Barbados in the eighties and early nineties (4,5,6). Since early two thousand many Caribbean countries including Barbados have been using conjugated hemophilus influenza vaccine to routinely immunize all the children. However, there is no recent published report on the pattern of meningitis from the English speaking Caribbean. In this study, we describe the epidemiology of the meningitis in children during a 12 year period, from 1994 to 2005, in Barbados, with particular

emphasis on the trends in incidence, age distribution and etiology of pyogenic meningitis in this country.

## METHODS

This is a retrospective population based study of all childhood (all children outside the neonatal period and aged  $< 16$  years) meningitis over a 12 years period in Barbados. A retrospective chart review was conducted of all patients outside of the neonatal age group hospitalized at the Queen Elizabeth Hospital (QEH) of Barbados with a diagnosis of meningitis from January 1994 to December 2005. The QEH is the only hospital in Barbados providing inpatient care for children with meningitis. Therefore all children with suspected meningitis in Barbados are admitted to this hospital.

Cases of aseptic meningitis were defined as patients with a pleocytosis in the CSF of at least 20 WBC/mm<sup>3</sup> and the absence of any bacterial growth on culture of the CSF. Cases

were excluded for the following reasons: age <30 days, receipt of antibiotics within 5 days before the lumbar puncture was performed, concurrent bacterial infection (including a parameningeal focus), neurosurgical procedure before the onset of meningitis, presence of a shunt within the central nervous system, or presence of a known immunodeficiency. Cases of bacterial meningitis were defined by either a positive culture from the CSF or a pleocytosis in the CSF in with a positive blood culture for a bacterial pathogen.

Data collected on each patient included, demographic information, date and year of presentation to the hospital, and CSF parameters. Data from the laboratory was supplemented by the data from the patient's case record notes.

All data was stored in a specially designed Microsoft database and Microsoft excel was used for generating tables and graphs. Incidence rates were calculated by dividing the number of cases by the age specific mid year population and expressed as number of cases/100, 000 populations. Because the data were not normally distributed, statistical comparisons between groups were performed using the nonparametric Mann-Whitney U test. For categorical variables, the Pearson  $\chi^2$  test was used to assess between group differences.

## RESULTS

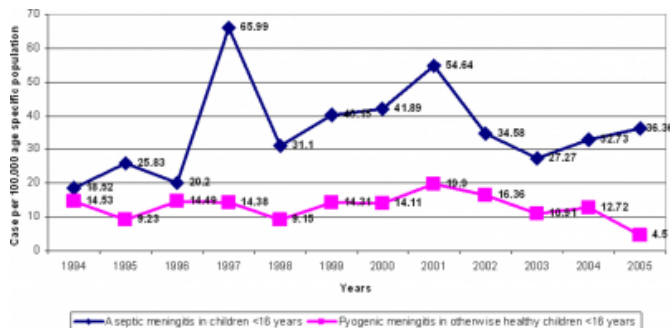
There were 327 cases of meningitis during the twelve years study period from 1994 through 2005, in children less the 16 years of age. Two hundred thirty-five cases were categorized as aseptic meningitis and 92 were categorized as bacterial meningitis. These patients with the diagnosis of meningitis including both the pyogenic meningitis and the aseptic meningitis ranged in age from 1 month to 15 years; the median age for patients was 3 years. Over all 56% of all the cases of meningitis occurred among boys and 44% among girls. The median age of children with aseptic meningitis was 3 years (Range 2 months – 15 years) and the median age for patients with bacterial meningitis was 18.0 months and ranged in age from 1 months to 15 years ( $P < 0.05$ ). Fifty nine percent of all the cases of aseptic meningitis and 50% of the cases of bacterial meningitis occurred in boys ( $P = NS$ ). All but one cases occurred among children of Afro-Caribbean decent. A single case of meningococcus meningitis occurred in a Caucasian child from UK AND who was resident in Barbados.

Trends in the annual incidence rate of the pyogenic

meningitis and the aseptic meningitis in Barbados is shown in Figure 1.

**Figure 1**

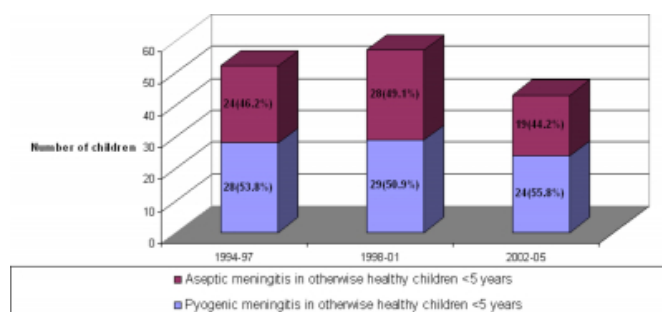
Figure 1: Annual incidence of pyogenic and aseptic meningitis.



The annual incidence of pyogenic meningitis have varied narrowly in between 10 to 20 per 100, 000 under 16 years of age population, with a decline to less than 5 per thousand under 16 years of age population in 2005. The annual incidence rate of aseptic meningitis showed two epidemics with the rate peaking above 40 cases per 100, 000 under 16 population in 1997 and 2001. During both these years the incidence rate was significantly higher than the previous base line year ( $P = 0.02$  and  $0.03$ ). Majority (95.7%) of the pyogenic meningitis occurred in children younger than 5 years. Figure 2 show the trends in the occurrence of pyogenic and aseptic meningitis in children less than 5 years of age. Through out the study period, a little over half of all meningitis was pyogenic in this age group without any significant trend.

**Figure 2**

Figure 2: Trends in the occurrence of pyogenic and aseptic meningitis in children less than 5 years in Barbados.



Over all, Hemophilus influenza type b (50%) was commonest cause of pyogenic meningitis followed by Streptococcus pneumoniae in 42.4% of cases. In children younger than 2 years, Hemophilus influenza type b was responsible for two thirds of all cases of pyogenic meningitis.

Trend in the age distribution of children with aseptic meningitis is shown in Figure 3. Through out the study period, over two-thirds of all cases of aseptic meningitis, occurred in children less than 5 years of age.

**Figure 3**

Figure 3: Trends in the age distribution of aseptic meningitis.

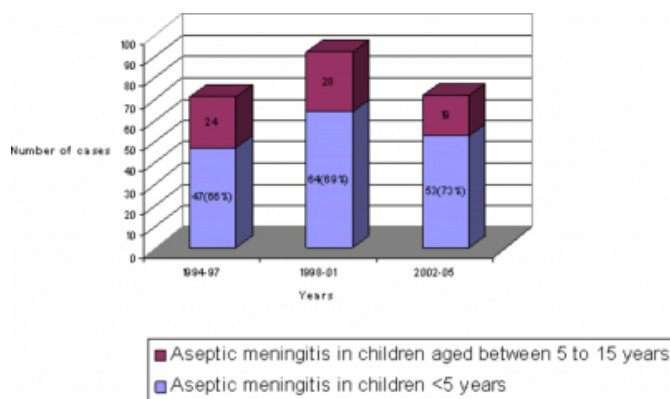
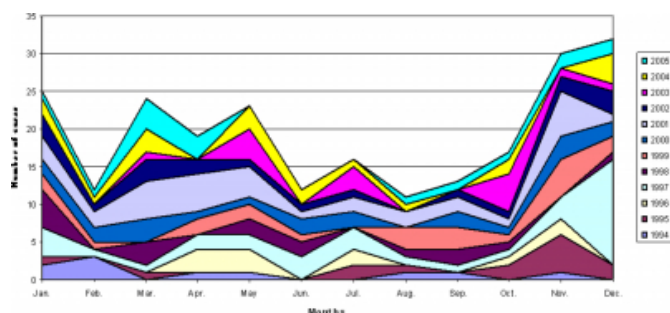


Figure 4 shows seasonal variation the frequency of the cases of aseptic meningitis in this population. There were two distinct peaking of the occurrence of aseptic meningitis one peaking during March and April while the other peak occurred during November and December.

**Figure 4**

Figure 4: Seasonality and aseptic meningitis



## DISCUSSIONS

Over all, nearly three-fourths of all cases of childhood meningitis are aseptic meningitis with remaining being pyogenic meningitis. This finding is similar to those reported from the United States (7). Our mean annual incidence of pyogenic meningitis among children <5 years of age was similar to those reported from several developing and developed countries prior to the use of hemophilus influenza vaccine, (8, 9). Globally the age distribution during epidemics of aseptic meningitis varies, possibly due to different causative agents and specific herd immunity that results from varying socio-economic environments and other

factors. For example, in the United States, the peak age for children with aseptic meningitis is reported to be < 1 year old (10), whereas in five South African epidemics in the 1980s, the mean age of children with echovirus meningitis was 4–5 years of age, whereas those with coxsackie B meningitis were most commonly <1 year old (11). It is interesting to note that the median age of children with aseptic meningitis in this predominant Afro-Caribbean population (3 years) was similar to those reported from the echo virus epidemics in African countries (11). Aseptic meningitis is generally commoner in males with a male-to-female ratio of 1.2–2.3 to 1 (3, 12), as observed in the current study.

Epidemics of aseptic meningitis are known to occur every two to three years (3). We observed a single epidemic of aseptic meningitis during the twelve years study period, and it occurred in 1997. Epidemic years were defined as those with more than 100 patients per year and at least a two-fold increase in cases compared to the previous year. We also observed an increase in the incidence of aseptic meningitis during the 2000 through 2002, although it was not of epidemic proportion and to a lesser extent there after. Changes in herd immunity may contribute to an increased population susceptibility to epidemics of virus transmitted by the fecal-oral route.

There was a seasonal pattern in the occurrence of aseptic meningitis, with almost three quarters of cases occurring during the six months (March to May and November to January), however it was not as striking as described in other reports (3) especially those from the regions in the temperate climates zone (Fig.4).

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