

Short Communication

## Bacteriological Study of 53 Children with Bacterial Meningitis in our Hospital (2000–2017)

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**Key Words** : *Streptococcus pneumoniae*, *Hemophilus influenza*, Group B *Streptococcus*

### INTRODUCTION

Clinically, bacterial meningitis should be most Attentive in childhood infections. The mortality rate of bacterial meningitis in children has decreased with advancements in antibiotics. However, meningitis of children with neurological sequelae still remains. As a result, vaccination against causal bacteria of childhood meningitis was promoted worldwide mainly by World Health Organization. In Japan, *Hemophilus influenza* type B (Hib) vaccine was introduced in December 2008, 7-valent pneumococcal conjugate vaccine (PCV 7) in February 2010 was introduced by arbitrary vaccination. In 2013, Hib vaccine became regular vaccination. In addition, PCV 7 was changed to 13-valent pneumococcal conjugate vaccine (PCV 13).

In recent years, there have been several reports from domestic and foreign countries with reduced meningitis and bacteremia in children after the introduction of Hib and PCV vaccines. Therefore we report on the trends of children's meningitis in the periods before and after the introduction of these two

vaccines both Hib and PCV in our Hospital.

### MATERIAL and METHODS

In this survey, children under the age of 16 who were admitted to Dokkyo Medical University Hospital in Tochigi prefecture were examined. The research period spanned from January 2000 to March 2017 for 17 years and 3 months. For the method of research, a patient database of the bacteria laboratory of Dokkyo Medical University Hospital was used.

We retrospectively analyzed cases in which causative bacteria were detected from the result of bacterial culture from cerebral spinal fluid. In our study, we examined cases of causal bacteria from the results of cerebrospinal fluid cultures, checked pediatric inpatients list, and finally diagnosed bacterial meningitis in childhood.

Based on the results of this study, we examined 1) type and number of causal bacteria and 2) yearly trends of childhood meningitis caused by each causal bacteria.

### RESULT

#### 1) Type and number of causal bacteria

During the study period, total of 53 children were reported with cases of bacterial meningitis. Of the causal bacteria, *Streptococcus pneumoniae* was the most prominent with 20 cases, *Hemophilus influenza* in 16 cases, Group B *Streptococcus* in 16 cases, and

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**Figure 1** Annual trend of childhood bacterial meningitis by causal bacteria in our hospital. (Blue : *Streptococcus pneumoniae*, Red : *Hemophilus influenzae*, Green : Group B *Streptococcus*, Purple : *Listeria*)

*Listeria* in 1 case.

2) *Yearly trends of childhood meningitis caused by each causal bacteria*

Pediatric case of meningitis with *Streptococcus pneumoniae* was recognized from 2000 to 2015. In the trend of meningitis due to *Streptococcus pneumoniae*, the number of cases decreased since 2010. Childhood meningitis with *Hemophilus influenzae* was observed from 2000 to 2010, but there were no onset and hospitalization since 2011. Group B *Streptococcus* was recognized throughout almost the entire investigation period from 2000 to 2017.

Case of pediatric meningitis by *Streptococcus pneumoniae* and *Hemophilus influenzae* had decreased past 2009 and 2010 respectively. On the other hand, since 2011 Group B *Streptococcus* has become a major causal bacteria for pediatric meningitis (Figure 1). In our hospital, there was no hospitalization of meningitis caused by *Neisseria* and *Escherichia coli* which are common in newborns and infants.

## DISCUSSION

As I mentioned in the introduction, the results on the annual trend of childhood onset meningitis in our hospital, which we investigated, the type of bacteria causing it has changed around 2010. That is, around

2010, it is recognized that the reduction of meningitis caused by *Streptococcus pneumoniae* and the disappearance of meningitis caused by *Hemophilus influenzae*. In addition, after 2010, meningitis caused by Group B *Streptococcus* was the biggest problem for meningitis developing in children. Our results indicate that the preventive effect of the two vaccines with HiB and PCV for pediatric bacterial meningitis, which was introduced in 2008 and 2010 at our university hospital. Shinjo M *et al.* reported recent trend in pediatric bacterial meningitis in Japan after the introduction of such two vaccines<sup>1)</sup> and our results have supported the survey in spite of the number of cases being so few.

Moreover, this result can be said that the two vaccines changed to childhood meningitis as regional pediatric medical environment. Ishiwada N *et al.* reported the incidence survey of pediatric invasive meningitis in Chiba prefecture<sup>2)</sup>. We estimated the results of long periods of this research at a single university hospital at a fixed point in Tochigi prefecture brings a great interest in preventive medicine for concern with public health in pediatric onset bacterial meningitis.

One out of 4 to 5 pregnant woman has Group B *Streptococcus* in the vagina and rectum. One in 100–250 of children born from a mother carrying Group B

*Streptococcus* suffers from an infection associated with this pathogen.

As a countermeasure, by treating with penicillin or ampicillin to the mother at the time of delivery, most of the neonatal Group B *Streptococcus* infection can be prevented.

However, complete prevention for pregnant women to neonatal infection is difficult.

Edmond *et al.* has investigated meningitis due to neonatal Group B *Streptococcus*. Causative types of Group B *Streptococcus* are type III (48.9%), type Ia (22.9%), type V (9.1%), type Ib (7.0%), type II (6.2%) and insists the need to develop a new vaccine for Group B *Streptococcus* for the mothers. But in fact, it will take long time to develop a new Group B *Streptococcus* vaccine. We need to recognize the importance of Group B *Streptococcus* as an old and new causal bacterium in the childhood onset of bacterial meningitis.

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