



# Profile of Childhood Meningitis at the Yaounde Gynaeco-Obstetric and Pediatric Hospital, Cameroon

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## Abstract

**Background:** Bacterial meningitis remains a serious global health problem, with over 1.2 million of cases worldwide each year. It still affects mostly children with significant morbidity and mortality despite the presence of vaccines. The aim of this study was to assess the incidence, clinical presentation, etiologies and outcome of bacterial meningitis in hospitalized children.

**Methods:** This was a retrospective cross sectional descriptive study done at the pediatric unit of the Yaounde Gynaeco-Obstetric and Pediatric Hospital. Included in the study were children admitted for meningitis from 1<sup>st</sup> of January 2014 to 31<sup>st</sup> of December 2018 and aged between 1 month and 15 years. The data were recorded using CSPro 7.2 software and analyzed using IBM SPSS 23.

**Results:** The incidence of bacterial meningitis was 0.3% and the female sex was predominant with sex ration of 0.8. *Streptococcus pneumoniae* was the most frequent pathogen isolated in 63% of the patients. Children within the age group of 3 to 12 months were the most affected in 32.6% of the patients. Fever and seizures were the most frequent clinical presentations on admission in 95.3% and 60.5% respectively, while neck stiffness and signs of meningeal irritation, were the most frequent clinical signs in 20.9% and 16.3% respectively. The most frequent complication during hospitalization was respiratory distress in 20.9% of the patients and the most frequent sequelae at discharge were hydrocephalus in 9.6% of the patients. A mortality rate of 2.4% was noted.

**Conclusion:** Routine vaccinations according to the national guidelines should be pursued and reinforced to avert morbidity and mortality from meningitis in children in the setting.



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## Introduction

Bacterial meningitis is an infectious disease characterized by an inflammation of the meninges due to the penetration and multiplication of the bacterium in the cerebrospinal fluid. It results in significant morbidity and mortality globally [1,2] and is estimated to be fatal in 50% of cases and affects approximately 1.2 million people each year with two thirds under 5 years of age [2].

In USA, bacterial meningitis was responsible for an estimated 4100 cases and 500 deaths annually between 2003 and 2007, while in 2012, the World Health Organization reported 22 000 meningitis cases in 14 countries in Africa, along in the meningitis belt [1,3].

Meningitis can be difficult to diagnose clinically particularly in young infants who do not seem to present the classic features of the disease [4], where symptoms observed vary from the bulging fontanel in neonates to frank meningeal signs in older children, thus a high index of suspicion is needed [5].

The different etiologies of bacterial meningitis in children were observed in various studies. In North America, in 2018, *Streptococcus pneumoniae* was the most common pathogen with a weighted mean of 43.1% [1]. Meanwhile in some studies in Africa, *Streptococcus pneumoniae* and *Neisseria meningitidis* were the commonest incriminated pathogens [6]. In Cameroon in a study in 2014, it was observed that the incidence of bacterial meningitis still remained high despite the introduction of vaccines against the three most incriminated bacteria, notably *Haemophilus influenzae* that was the most common pathogen constituting 39.2%, followed by *Streptococcus pneumoniae* with 31.6% and *Neisseria meningitidis* 10.5% [3]. We thus undertook this study to see if the pattern of pathogens responsible for bacterial meningitis in children has changed so far.

## Methods

This was a retrospective cross sectional descriptive study at the Yaounde Gynaeco-Obstetric and Pediatric Hospital (YGOPH). This is a mother-child tertiary hospital in Yaounde, the capital city of Cameroon. Data was retrieved from patient files, who were hospitalized and treated for meningitis from 1<sup>st</sup> of January 2014 to 31<sup>st</sup> of December 2018. Included in our study were children aged 1 month to 15 years. The following information was noted:

- For the child: age, gender, residence, class level in school (for those at school age), rank among the siblings, immunization status, underlying disease, contact or not with someone with meningitis, manifestations and physical findings on admission,
- For the mother /caretaker: age, profession, level of education, matrimonial status.
- Laboratory findings on CSF: cytology (with white cells  $>10/\text{mm}^3$ ), cultures results, soluble antigens if done,
- Treatment received and outcome

The data were recorded using CSPro 7.2 software and analyzed using IBM SPSS 23.

Authorization for the study was obtained from the hospital administration and ethical clearance from the Ethical Committee (N°881/CIERSH/DM/2019) of the same hospital.

## Results

A total number of 14868 were admitted in the general pediatric unit of Yaounde Gynaeco-Obstetric and Pediatric Hospital within the studied period, among which 43 cases were bacterial meningitis giving an incidence of 0.3%.

The age range of 3 months-1 year had the highest percentage of 32.6 % of the total number of patients admitted for bacterial meningitis. The mean age of patients admitted was 22.4 months (ranging from 1-60 months) (Figure 1). There were 19 males and 24 females giving a sex ratio of 0.8; 26 (60.5%) consulted directly and 17 (39.5%) were referred.

From 2014, the incidence was 0.37% (8 cases) and it increased to 0.46% in 2015 with a total number of 12 confirmed cases. It dropped to 0.07% in 2016 with 2 cases, then increased to 0.3% in 2017 with 11 cases; then there was slight drop in 2018 to 0.26 % with 10 confirmed cases. (Figure 2).

The most frequent manifestations were neurological with convulsions in 60.5% of the patients (Table 1). The most frequent clinical signs were neck stiffness in 9 (20.9 %), other meningeal signs (Kernig and Brudzinski) in 7 (16, 3%) and a bulging fontanel in 4 (9.3%).

Of the 43 patients admitted for meningitis, CSF cultures were positive in 6 patients and soluble antigens in 10 patients but with sterile cultures and cytology showed more than 10 white blood cells/ $\text{mm}^3$  though with sterile cultures in 27 cases. The mean white cells in the CSF was  $1181.2 \pm 6379.0$  cells/ $\text{mm}^3$  (extremes: 11-42000); the mean protein level was 1.30 g/l (extremes: 0.1 - 5.1) and the mean glucose level was 0.49 g/l (extremes: 0.16 to 1.10).

*Streptococcus pneumoniae* was the most predominant bacterium isolated with 10 (63%), followed by *Neisseria meningitidis* in 4 (25%). Other bacteria found were *Salmonella* and *Group B streptococcus* each at a lower percentage of 6% (Figure 3).

From the 16 cases, *Streptococcus pneumoniae* was most frequent with 23.3% in the age range of 3 months to 12 months (Table 2).

Of the 43 patients, included in this study, 41 (97.6%) were discharged cured, 1 died (2.4%) and 1 discharged against medical advice.

Most of the patients (25) developed complications during hospitalization, among which respiratory distress was the most frequent in 9 patients (20.9 %). (Table 3), upon discharge, 9 (21.4%) patients out of the 42 patients that were discharged had sequelae with hydrocephalus occurring in 4 (9.5%) (Table 4).

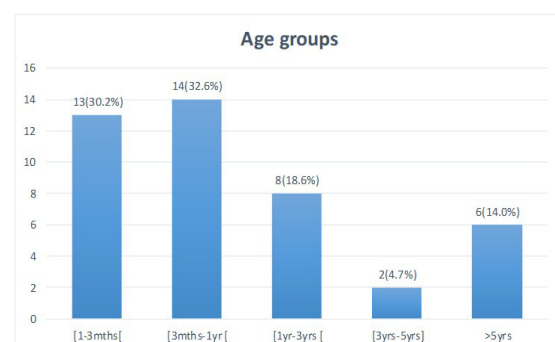


Figure 1: Distribution of patients according to age groups.

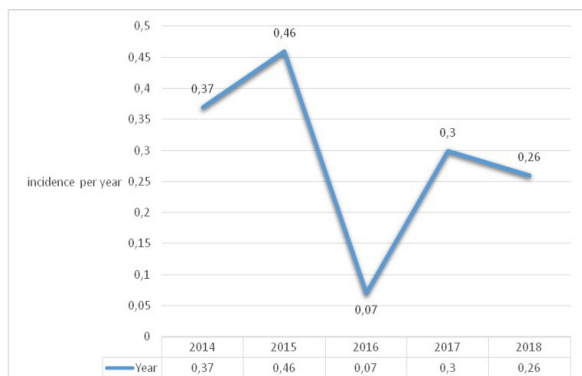


Figure 2: Yearly incidence of meningitis.

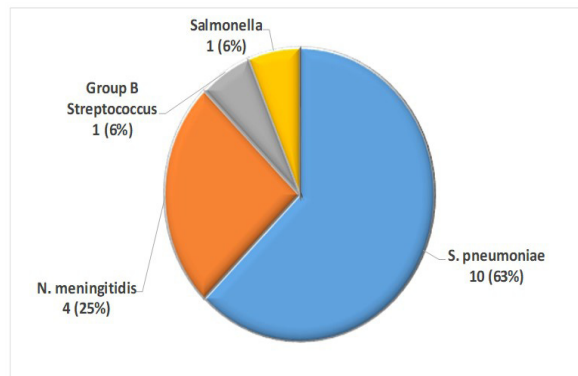


Figure 3: Distribution of the different etiologies.

Table 1: Clinical presentation on admission.

Symptoms	Number	Percentage(%)
Fever	41	95.3
Convulsions	26	60.5
Irritability	10	23.3
Diarrhea	10	23.3
Respiratory distress	8	18.6
Feeding difficulties	7	16.3
Vomiting	6	14
Cervical pain	2	4.7
Loss of consciousness	2	4.7
Headache	1	2.3

Table 2: Distribution of pathogens according to age.

GERM	[1 – 3] months Z (%)	[3 – 12] months N (%)	[12 -36] months N (%)	[36-60] months N (%)	≥60 months N (%)	Total
<i>S. pneumoniae</i>	2	5	2	0	1	10
	-15.4	-35.7	-25	0	-16.7	-23.3
<i>GBS*</i>	0	1	0	0	0	1
	0	-7.1	0	0	0	-2.3
<i>N. meningitidis</i>	1	1	0	1	1	4
	-7.7	7(.1)	0	-50	-16.7	-9.3
<i>Salmonella</i>	0	1	0	0	0	1
	0	-7.1	0	0	0	-2.3
TOTAL	3	8	2	1	2	16
	-100	-100	-100	-100	-100	-100

Table 3: Distribution of complications during hospitalization.

Complication	Number	Percentage (%)
Respiratory distress	9	20.9
Anemia	7	16.3
Brain abscess	6	14
Status epilepticus	5	11.6
Dehydration	5	11.6
Motor deficit	4	9.3
Intracranial hypertension	4	9.3
Cerebral empyema	2	4.7

Table 4: Distribution of sequelae at discharge from hospital.

Sequelae	Number	Percentage (%)
Hydrocephalus	4	9.5
Tetraparesis	2	4.7
Hemiparesis	1	2.3
Facial paralysis	1	2.3
Psychomotor regression	1	2.3

## Discussion

We noted that from 1<sup>st</sup> of January 2014 to 31<sup>st</sup> of December 2018, 43 patients were admitted for bacterial meningitis giving an incidence of 0.3%. This incidence is similar to that of Shingoh et al., in Japan who noted an incidence of 0.37% [7]. Our incidence for bacterial meningitis is far lower than what Nguéack et al had in 2014 in the same unit where bacterial meningitis was noted in 1.54 % of admissions [3]. The difference could be due to the intensification of vaccination programs in children all over the country, which was introduced in Cameroon in 1976, became operational in all the regions in 1982 and covers children from 0-11 months of age [8]. Koko et al in Libreville, Gabon also had a higher incidence of 1.2% [9]. The mean age of our patients was 22.4 months, with most patients less than 12 months of age. Nguéack et al had similar findings in an earlier study in the same unit [3]. Similar results were also observed by Al-Ani et al, in Al-Ramadi in Iraq with more patients less than 1 year of age [10]; but our results are contradictory to those of Campagne who rather had less patients of bacterial meningitis with less than 1 year of age [11]. Fayyaz also had less patients of less than 1 year of age [12].

The sex ratio in our study was 0.8. This result is similar to that of Almuneef et al in Saudi Arabia [13]. Contradictory results from Sile et al, in Cameroon who had a sex ratio of 1.65 indicating a male sex predominance [14]; and also with Franck-Briggs in Nigeria [15] and Otero et al in Columbia [16] who all had a male predominance. No explanation could be given for this finding.

The most predominant symptom was fever at 95.3% and is similar to that of Nguéack et al who had fever as the main symptom in 98.8% of their patients in Yaounde [3]. This finding is similar to that of Almuneef et al., [13] and Heydari [17], who also noted fever as the most frequent symptom. The most frequent sign on physical examination was neck stiffness in 20.9% of the patients [17]. This finding contradicts that of Johnson who had drowsiness/coma in 50% of their study population [18].

The biochemical and cytologic analyses of cerebrospinal fluid in our study were suggestive of bacterial meningitis, with a mean white cell count of 1181/mm<sup>3</sup> in the cerebrospinal fluid, which is similar to that noted by Heydari et al., [17]. The proteins found in our study were high ( $\geq 1$  g/l) predominantly in 30.2% of the patients, confirming the presence of bacterial meningitis, in which proteins tend to increase due to the increase in permeability of the blood-brain barrier. The glucose of  $<0.4$  g/L was most present at 20.9 % in our study and is similar to that obtained by Heydari et al., who had the low glucose in 75% of his patients [17].

From our study *Streptococcus pneumoniae* was the most frequent pathogen in 63% of the patients, followed by *Neisseria meningitidis* in 25.0%. Nguéack et al., in Yaounde in 2014, noted *Haemophilus influenzae* as the predominant pathogen in 39.2%, of the patients followed by *Streptococcus pneumoniae* in 31.6% [3]. However, our results are similar to those of Fonkoua et al., in Yaounde [19], Mullan et al., in Botswana [20], Toure et al., in Ivory Coast [6] and Otero in Columbia [16], who all note predominantly *Streptococcus pneumoniae* in the various studies. Our findings could be explained by the high completeness for the anti Hemophilus vaccine noted, since its introduction into the Expanded Program on Immunization (EPI) in 2009 [8]. The age group of 3 months to 12 months had the highest percentage of bacterial meningitis caused by *Streptococcus pneu-*

*moniae* in 35.7 %.

We recorded in our study one death representing a mortality of 2.4%, whereas Nguéack et al in the same unit in 2014 noted a mortality of 18.7% [3], Koko et al in Gabon 62% [9].

We observed that respiratory distress was the most common complication during hospitalization in 20.9% of the patients. Contrarily, Franco-Paredes et and Nguéack et al., noted seizures and status epilepticus, as main complications in 37% and 54.7% of their patients respectively [3,21].

Hydrocephalus was the most, common sequelae at the time of discharge in 9.5% of the patients, whereas Nguéack et al had psychomotor regression as the most frequent sequelae in 2.9 % of the patients [3]. We thus recommend that parents should take their children for vaccination according to the schedule given by the Ministry of Public Health, in order to avert meningitis and other infectious diseases, which increase infant mortality.

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