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Bacterial Meningitis in Children Aged from 0 to 15 Years Hospitalized in Paediatrics at the Gabriel Touré University Hospital Centre

Niaré Fanta[1*], Cissé dioumé[4], Sidibé Yacouba[1], Traoré Fatoumata Binta[1], Keita Youssouf[3], Keita Mahamadou Minamba[3], Daou Adama[1], Diaby Bani[2], Traoré Aboubacar[2]

[1]Hôpital de Dermatologie de Bamako Ex CNAM, Bamako, Mali
[2]Centre National d'immunisation (CNI), Bamako, Mali
[3]Centre pour le développement des vaccins CVD-Mali Bamako, Mali
[4]Institut National de Santé Publique INSP Bamako, Mali

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***Corresponding author:** Niaré Fanta
Hôpital de Dermatologie de Bamako Ex CNAM, Bamako, Mali

Abstract **Original Research Article**

Meningitis is an inflammatory process, generally of infectious origin, affecting the meninges. Bacterial meningitis is due to the invasion of the cerebrospinal fluid by a bacteria which develops there. The objective was to determine the extent of bacterial meningitis in children aged 0 to 15 years. This was a cross-sectional descriptive study of an epidemio-clinical nature over a period of 12 months from January to December 2008 in the paediatrics department of the Gabriel Touré University Hospital Centre in Bamako, Mali. The most affected age group was 0 to 11 months with 43.3% and a male predominance at 51.9%. The peak was observed during the month of March with 25.7%. The Bambara were in the majority with 39.6%, commune I was the most represented (25.7%). Meningitis was the main diagnosis at entry (93.6%); the most encountered germs were: Neisseria meningitidis (44.4%), Streptococcus pneumoniae (32.1%) and Haemophilus influenzae type b (14.4%). Neisseria meningitidis was sensitive to Ciprofloxacin, Ceftriaxone and Cefotaxime; Streptococcus pneumoniae, sensitive to Ampicillin and Ceftriaxone; Haemophilus influenzae type b reacted to Ciprofloxacin. The evolution was favourable without sequelae in 64.7% and death occurred in 22.5% of cases. Streptococcus pneumoniae was the most lethal germ with 57.1%. The role of the laboratory is essential in helping the doctor make the diagnosis of meningitis, specifying its bacterial, viral, mycotic and parasitic aetiology for effective treatment.

Keywords: Meningitis, infectious diseases, Bamako-Mali.

INTRODUCTION

Meningitis is an inflammatory process, generally of infectious origin, affecting the meninges. Bacterial meningitis is due to the invasion of the cerebrospinal fluid by a bacteria which develops there. In 70-80% of cases, meningitis is of viral origin. They are generally benign, recovery being most often spontaneous. In 20-25% of cases, infectious meningitis is caused by bacteria. They are serious because the spontaneous evolution is practically fatal. Less than 5% of cases are due to non-pyogenic bacteria, parasites or neoplastic processes. The incidence of bacterial meningitis in industrialized countries is 2.5 to 10 per 100,000 inhabitants while it is 10 times higher in developing countries. 2/3 of these meningitis occur in children under 5 years of age [1].

Bacterial meningitis is an infection of the membranes (meninges) and cerebrospinal fluid that surrounds the brain and spinal cord. After the perinatal period, three bacteria, which are transmitted from person to person through respiratory secretions, are responsible for most bacterial meningitis: Neisseria meningitidis, Streptococcus pneumoniae and Haemophilus influenzae. Every year, an estimated one million cases of meningitis occur worldwide, 200,000 of which are fatal. The fatality rate depends on age and the bacteria involved, typically ranging from 3% to 19% in developed countries. Higher case fatality (37% – 60%) has been reported in developing countries [2].

In Sahelian Africa, there are more than 10,000 annual cases of cerebrospinal meningitis, with more than 10% deaths. The region called the Lapeyssonnie "meningitic belt" extends from the Red Sea to the

Atlantic. The objective was to determine the extent of bacterial meningitis in children aged 0 to 15 years hospitalized in the pediatric department of the Gabriel Touré University Hospital Center for bacterial meningitis or who developed bacterial meningitis during hospitalization. January to December 2008.

MATERIALS AND METHOD

This was a cross-sectional descriptive study of an epidemio-clinical nature over a period of 12 months from January to December 2008 in the pediatrics department of the Gabriel Touré University Hospital Center in Bamako, Mali.

Any child hospitalized in the pediatric department of the said hospital aged 0 to 15 years for meningitis or in whom meningitis was discovered during hospitalization was included; having a temperature ≥ 39°C on admission and/or a suspicion of invasive bacterial infection, the presence of a germ in the cerebrospinal fluid and after having had the informed consent of the parents.

The sample was exhaustive and included 187 children, hospitalized and included in the study of hospitalized patients at the Center for Vaccine Development - Mali (CVD-Mali).

Patients who did not have germs in the cerebrospinal fluid and whose parents did not give consent for the study were excluded.

The data collected was entered and analyzed using the following software: SPSS version 12.0, Word and Excel. The value of $p < 0.05$ was considered statistically significant. The results were presented in tables and graphs for better understanding.

RESULTS

During the study there were 30,196 children consulted in the pediatric department of the Gabriel Touré University Hospital Center, among them 4,875 were included in the CVD-Mali protocols, including 2,366 hospitalized and 2,509 external. We identified 187 cases of bacterial meningitis out of the 2366 hospitalized patients, representing a frequency of 7.9%.

The most affected age group was 0 to 11 months with 43.3% of cases.

Among the 187 cases of meningitis, one germ was isolated in the cerebrospinal fluid of all participants (100%); and both in the cerebrospinal fluid and in the blood in 106 patients (56.7%).

Some months of the year are more favorable to the disease than others, as we can see in Figure 1.

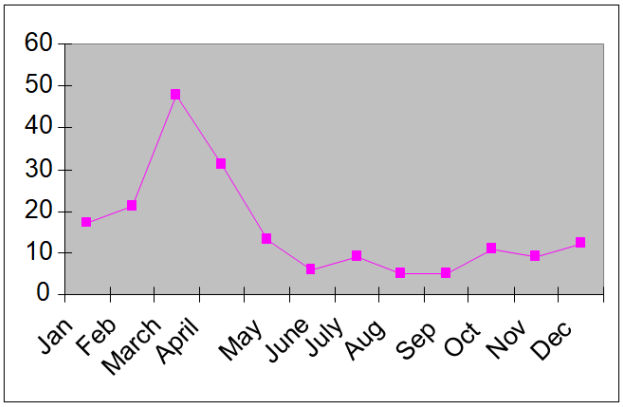

Figure 1: Distribution of patients according to period of admission

The majority of cases were recorded during the dry season with a peak in March.

The vaccine occupies a preponderant place in the prevention of diseases and meningitis is not left out of this state of affairs. Table 1 shows the distribution of patients according to vaccination status with the pentavalent vaccine.

Table 1: Patients and vaccination status with pentavalent vaccine

Vaccine	Pentavalent 1		Pentavalent 2		Pentavalent 3	
	Effective	%	Effective	%	Effective	%
Received	77	41,2	61	32,6	51	27,3
Not Received	110	58,8	126	67,4	136	72,7
Total	187	100	187	100	187	100

There was a low rate of vaccine receipt with only a quarter of patients having received all three doses of the pentavalent vaccine.

In 106 cases of positive blood culture, the germs isolated were identical to those in the CSF.

Among the germs found Neisseria meningitidis A occupied first place followed by Streptococcus pneumoniae and Haemophilus influenzae b.

Before two years, pneumococcus was the most common germ and beyond that, meningococcus came in first position.

More than half of our patients only spent seven days in hospital.

In total 22.5% of deaths and more than half were observed in 0 – 11 month olds (23/42) or 54.8%.

Some age groups seem more affected than others. This is what Table 2 shows us at least with a greater lethality in patients aged 0-11 months.

Table 2: Outcome of patients and age group

Devenir	**Age range**										**Total**	
	0–11 month		**12–23 month**		**24–35 month**		**3–5 years**		**6–15 years**			
	Eff	**%**	**Eff**	**%**	**Eff**	**%**	**Eff**	**%**	**Eff**	**%**	**Eff**	**%**
Improved without after-effects	44	54,3	15	68,2	5	55,6	15	75	42	76,4	121	64,7
Improved with after-effects	8	9,9	2	9,1	1	11,1	0	0	0	0	11	5,9
Non améliorés	3	3,7	1	4,5	1	11,1	1	5	3	5,4	9	4,8
Lost	3	3,7	0	0	0	0	1	5	0	0	4	2,1
Deceased	23	28,4	4	18,2	2	22,2	3	15	10	18,2	42	22,5
Total	81	100	22	100	9	100	20	100	55	100	187	100

We observed 22.5% deaths among all patients. This figure more than doubled among children aged 0 – 11 months, more than half (23/42) with 54.8%.

The identification of germs is fundamental to have bacterial mapping allowing better care, prevention of complications and avoiding deaths or at least considerably reducing them. Table 3 shows us the relationship of deceased patients and the type of germ isolated.

Table 3: Deceased patients and identified germs

Sprouts	**Deceased**	
	Effective	**Percentage**
Pneumococcus	24	57,1
Meningo A	7	16,6
Hib	5	11,9
CDC group V	1	2,4
Enterococcus spp	1	2,4
Escherichia coli	1	2,4
Ungrouped Meningo	1	2,4
Salmonella spp.	1	2,4
Non-groupable hemolytic Streptococcus beta	1	2,4
Total	**42**	**100**

Streptococcus pneumoniae (Pneumococcus) was the most lethal germ foundwith 57.1% among deceased patients.

DISCUSSION

The prevention of infectious diseases through vaccination is essential in all countries but above all remains very important for developing countries and particularly among children in these countries where this segment of the population.

All age groups were affected by the infection, the majority of our patients were aged 0 – 11 months (43.3%). This could be explained by the immaturity of the immune system but also by the virulence of the germs involved. These results are comparable to those of KONE O [3] which found 42.8% in the same pediatric department from 1998 to 1999. And according to the literature this is the age group most affected [4].

Bacterial meningitis affects both sexes, but with a predominance of the male sex (51.9%), i.e. a sex ratio of 1.1 in favor of the male sex. Our results are similar to

those of Koné, O [3] who had 56.6% in the same department, and of Fjeega TFW [5] and Kanté M [6] who had 59.6% and 65 respectively, 8%. Bougoudogo F [4] and colleagues found 64.8% in their study.

This study reveals that meningitis occurs in all seasons with an increase during the hot season (March with 25.7%) in Mali.

This seasonal distribution that we observed can be explained by the fact that at this time of year certain environmental factors favor the outbreak of the condition. Among other factors, the great heat of the harmattan (which is a hot and dry wind blowing from East to West) drying out the nasopharyngeal mucosa thus promoting microtrauma. ABDOU H [7] had 18.5% during the same period and in the same department. The first cases appear in December-January with a peak in February-March, and disappearing around April-May. Epidemics therefore appear during the coolest and driest period of the year [8], the same observation was made by GOITA D [9], KONE O [3], DOUMBIA N'TJI A [10]. The meningitic syndrome (the most constant with 97.9%) became clearer with age, making the diagnosis easier. The same remark was made by DOUMBIA N'TJI A [10]. The presence of afebrile patients can be explained by the fact that parents most often administer an antipyretic at home. However, 49.7% of patients had a fever. Other signs such as headaches, irritability, convulsions, are very important and suggest a suspicion of meningitis and therefore should lead to the practice of lumbar puncture. A quarter of the patients had received all three doses of pentavalent. Several germs were identified, 91.5% of cases were due to three germs, namely Neisseria meningitidis (44.4%), Streptococcus pneumoniae (32.1) and Haemophilus influenzae b (14.4).

These results are comparable to those of TJEEGA TFW [5] and ABDOU H [7] who found 36.1% for these germs respectively; 33%; 30.9%, but the difference is that the frequency of Hib decreased in our study. This could be explained by the fact that his study was carried out before the introduction of Hib into the EPI and ours after. Among these three germs only Neisseria meningitidis A was present at all ages, on the other hand Streptococcus pneumoniae and Haemophilus influenzae b were more frequent during the first two years of life and became rarer beyond that.

With antibiotic therapy, we see improvement in many of our patients without after-effects (64.7%) despite the considerable number of deaths. More than half of our patients only spent two weeks in hospital.

We deplored 42 deaths (22.5%). The age group from 0 to 11 months were the most vulnerable with 23 deaths out of 42 (54.8%). Elsewhere Traore M [11] found the same age group vulnerable in a study carried out in Tenenkou in 1996. There were 29 deaths before 24 hours of hospitalization which could be explained either by the behavior of the parents by dragging with the child at home, or by late referral of patients by peripheral centers. The evolution was favorable without sequelae in 121 patients or 64.7%, this result is comparable to that of Kone, O [3] which found 73.3%. Streptococcus pneumoniae was the most lethal germ with 57.1%, and according to the literature this lethality can go up to 60% [12].

The fate of four (4) of our patients remains undefined because they were lost to follow-up. 55. 1% of our patients were discharged between 8 and 15 days of hospitalization.

CONCLUSION

Strengthening surveillance of infectious diseases, particularly those preventable by vaccination, must be a priority. The role of the laboratory is essential to help the doctor make the diagnosis of meningitis, clarify its bacterial, viral, mycotic, parasitic etiology for effective treatment. Taking these considerations into account will contribute to the promotion of policies for the introduction of new vaccines into Mali's expanded routine vaccination program.

Conflict of Interest: None

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