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Research Article

Measles-Associated Pneumonia in Children: A Report from Pediatrics Department of Gabriel Toure University Teaching Hospital

Traoré F[1*], Maiga B[1], Sacko K[1], Traoré K[1], Ba AA[1], Diarra M[2], Coulibaly S[3] Konaté D[1], Sidibé LN[1], Diall H[1], Coulibaly O[1], Togo P[1], Cissé ME[1], Doumbia AK[1], Simaga T[1], Diakité AA[1], Dicko-Traoré F[1], Togo B[1], Sylla M[1]

[1]Pediatric department, CHU Gabriel Toure, Bamako, Mali

[2]Secondary hospital, pediatric unit, CSREF kalabancoro Bamako, Mali

[3]Secondary hospital, pediatric unit, CSREF Com IV Bamako, Mali

***Corresponding author:** Traore Fousseyni, Pediatric department, CHU Gabriel Toure, Bamako, Mali

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Introduction

Measles is a highly contagious viral disease caused by a Morbillivirus and for which humans are the only reservoir. It remains an important public health problem in many countries despite the existence of an efficient vaccine. **Patients and methods:** The aim of this work is to evaluate the epidemiological, clinical and therapeutic profile of measles complicated by pneumonia in the department of pediatrics of the CHU Gabriel Touré. It was a retroprospective, descriptive and analytical study, conducted from 01 January 2018 to 31 December 2021. Were included children aged 0-15 years, hospitalized for measles complicated by pneumonia. **Results:** Ninety-four (n=94) patients were included. The hospital frequency was 0.33%. Children aged 1 to 5 years were the most represented (n= 56; 59.6%). The sex-ratio was 1.2. In 81% of the cases, there was a history of measles in the neighbourhood. Sixty-seven percent (67%) of the patients were not immunized and ignorance was the reason for non-immunization in 37% of the cases (P=0.0000). The most common reasons for consultation were the following: respiratory distress (42.6%), fever (21.2%) and rash (19.1%). Koplick's sign was present in 7.4% of patients. The pulmonary condensation syndrome and radiological opacities accounted for 95% and 93% respectively. The most widely used antibiotic was the combination of amoxicillin and clavulanic acid. The average length of hospitalization was 7.46 days with extremes between 2 and 23 days. The mortality rate was 9%. The relationship between the patient's nutritional status and outcome was statistically significant (p=0.047). **Conclusion**: Pneumonia remains the most common complication of measles. The major challenge is to reach the WHO target of 95% immunization coverage.

Keywords: Measles; Child; Pneumonia; Mali.

Introduction

Measles is an acute, highly contagious viral infection caused by the paramyxovirus virus, which occurs mainly in children. It is characterized by oculo-nasopharyngeal inflammation and a morbilliform febrile cutaneous eruption [1]. Complicated forms are more common in patients younger than 1 year and older than 20 years. Bronchopulmonary complications are among the leading causes of death [2]. According to WHO data, 9769600 cases of measles were reported in 2018 worldwide. Among these cases, the number of deaths was 142,200 deaths. Most of the deaths occurred in children under the age of five [3]. In Africa, 1759,000 cases of measles were reported, out of which 52600 died. The countries with the highest incidence rates included Liberia, Madagascar, Democratic Republic of Congo (DRC) and Somalia . In 2001, Mali faced an epidemic of measles with 4464 cases. The eradication of a contagious disease requires achieving and maintaining a high level of immunization coverage (>95%). When coverage decreases, outbreaks may re-emerge, even in countries where the disease seemed to have been controlled for several years

[4]. In 2012, the United Nations Assembly approved the Global Vaccine Action Plan, which aimed to eliminate measles in 5 of 6 WHO Regions by 2020 [5]. At the onset of 2018, there has been an increase in the occurrence of complicated measles cases in the pediatric department of Gabriel Touré Hospital.

Patients and methods

The study was conducted in the Department of Pediatrics of the Gabriel Touré University Hospital. It was a retro-prospective, descriptive, exhaustive and analytical study conducted from 01/01/2018 to 12/31/2021. The aim of this study was to assess the epidemiological, clinical and therapeutic features of measles-related pneumonia cases. Were included children aged from 1 month to 15 years hospitalized for measles complicated by pneumonia. Data from medical records were exploited. The diagnosis was based on clinical, biological and radiological description for pneumonia. For measles, the WHO clinical description was adopted [6,7]. The data were analyzed on SPSS version 20 software. The information collected from the medical records was kept confidential.

Results

Ninety-four (n = 94) patients were included. The hospital frequency of occurrence was 0.33%. Children aged 1 to 5 years were the most represented (n= 56; 59.6%). The majority of patients were admitted between March and June. Admission was predominantly in 2021 (n = 46;49%). The mean age was 2.5 ± 1.95 years with extremes of 8 months to 11 years. The 1-5 year age group was the most represented (n = 56;60%). The sex ratio was 1.2. The distribution of the Z-score at admission was as follows: Z-score < -3 (22%), Z-score -2 and -3 (24%), Z-score > 1.5 (54%). The presence of a measles case in the neighborhood was found in 81% of cases. Sixty-seven percent (67%) of patients were not immunized. Ignorance and lack of knowledge of the vaccination schedule were the reasons for non-vaccination in 37% of patients (P=0.0000). The most common complaints were respiratory distress (42.6%), fever (21.2%) and skin eruption (19.1%). The median delay of consultation was 8 days (1-23 days). The clinical signs of measles were as follows: fever (n = 93; 99%), cutaneous eruption (n = 91; 97%), conjunctivitis (n=71; 75%), rhinorrhea (n=56; 60%), Koplick's sign (n =7; 7.4%). Respiratory distress, intercostal pulling and nasal flaring accounted for 92%, 89% and 84% respectively. Twenty nine percent (29%) of patients had expiratory whining. Chest inspection was normal in 26% of cases. Pulmonary condensation syndrome and radiological opacity accounted for 95% and 93% respectively. Bilateral radiological opacity represented 93%, (i.e.) 87 patients. Unilateral lobar opacity represented 7%, i.e. 7 patients. Haemocultures were not performed. The haemogram showed microcytic hypochromic anaemia associated with polynucleosis in 77 cases. All patients received antibiotics, vitamin A, eye and skin care (100%). The most commonly used antibiotic was the combination of amoxicillin and clavulanic acid. The average length of hospitalization was 7.46 days with extremes between 2 and 23 days. The death rate was 9%. There was a statistically significant relationship between the patient's nutritional status and outcome (p = 0.047).

Discussion

During the study period, 28737 children were admitted to the pediatric department. Of these, 94 were hospitalized for measles pneumonia, (i.e.,) a hospital frequency of 0.33%. Kaboré et al found a hospital frequency of 6.4% [8]. In Mauritania, the hospital frequency is lower than that found in our study [9]. The age range of 1-4 years was the most represented with 59.6% of cases (Table 1). In the study conducted by Jean Baptiste in Nigeria, the 9-11 month age group was the most affected [10]. This age group generally corresponds to the period after weaning from breastfeeding when the child is no longer protected by maternal antibodies. The predominance of boys was found in the study by Yitbarek [11,12]. To date, there are no plausible scientific explanations for the male predominance of measles. The majority of patients were admitted between March and June (Figure 1). During this period, it's extremely hot in mali. The heat is one of the factors that exacerbate the transmission of the disease. The majority of patients (47.9%) had consulted within 6 to 10 days. This delay of consultation is near to that of Ahmed in Nigeria [13]. This delay is relatively less in the study by Ossibi in Brazzaville [14]. This delayed consultation could be related to a factor specific to our socio-cultural environment, which is the use of traditional medicine as a first line of treatment, but also to unfavorable socio-economic conditions which do not facilitate the attendance of health facilities where care is more expensive. Measles occurs often in a context of malnutrition in our environment. It is an aggravating factor of malnutrition, linked to low socio-economic level and illiteracy. Measles is a breeding ground for Kwashiorkor, which is the oedematous form of malnutrition in children [15].

Features	Number	Proportion
Gender		
Male	51	54
Female	43	46
Age		
< 1 an	32	34
1-5 years	56	59
6-11 years	6	6%
Reasons for visit		
Respiratory distress	61	58
Fever	40	42
Cutaneous eruption	20	21
Cough	18	19
contamination mode		
Neighborhood	76	81
Unknown	11	12
Family	7	7
Consultation delay		
1-5 days	35	37,2
6-10 days	45	48
11-15 days	14	15
Immunization status		
Non immunized	63	67
Immunized	26	28
Unknown status	5	5
duration of hospitalization		
1-5 days	35	37
5-10 days	39	41
10-15 days	15	16
> 15 days	5	5
Outcome		
Recovered	75	80
Died	9	9
Treatment adandonment	10	11

Table 1: Patients features.

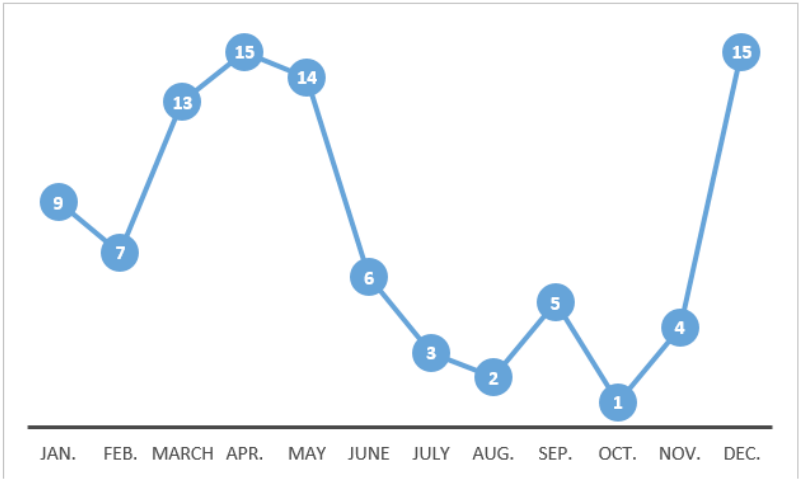

Figure 1: Evolution of admissions according to months.

The largest proportion of confirmed measles cases (67%) have never been vaccinated against measles (Figure 2). Several studies around the world confirm this fact [16-19]. Low vaccination coverage is closely linked to the resurgence of measles [20]. These cases represent a threat to the collective immunity, the factors associated with the non-vaccination should be identified and specific strategies should be implemented, in particular the introduction of a second dose of measles vaccine at school age. This would also allow catching up with lost to follow-up children and, above all, increasing children's immunity. Measles eradication requires achieving and maintaining high vaccination coverage (>95%) [21]. When coverage decreases, outbreaks may reappear, even in countries where the disease seemed to have been controlled for several years.

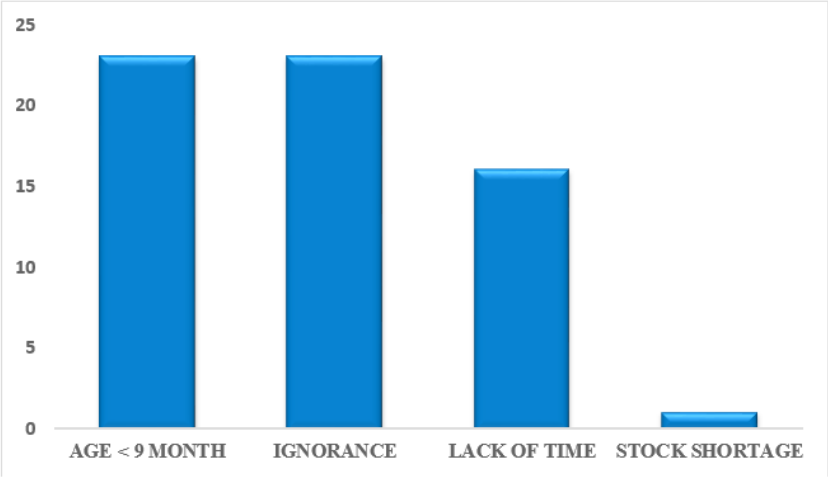

Figure 2: The reasons for non-immunization.

Despite the considerable decline in measles mortality, immunization coverage in the African region is still low. Several countries have not yet reached the levels required to prevent the outbreak of measles. The World Health Organization advises that the first and second doses of measles-containing vaccine be given at ages 9 months and 15 to 18 months, respectively, in countries with high levels of measles transmission. Clinically, measles manifests as a febrile naso-ocular discharge with skin rash [22]. In our study, fever, rash and conjunctivitis were the most frequent signs. Some authors suggest a modification of the clinical definition of cases [23]. The evidence of contact and the rash have a high specificity in the diagnosis of measles. Serological tests are scarce in developing countries. Tests can eliminate misdiagnosis of the disease. These clinical errors accounted for 23% in the Helfand study [24]. Pneumonia is one of the most

lethal complications of measles. Supportive care facilitates a rapid recovery [25]. Bronchopulmonary complication represented 0.33% of hospitalizations in our department. Bacterial superinfection of the lungs occurs most often in compromised conditions. Measles causes a transitory immunodepression, facilitating this bacterial graft to the lungs.

In Albarello's study, it represented 76% [26]. Several authors report a pulmonary infectious complication in childhood measles [27,28]. Systematic hemoculture is one of the limitations of this study. Bacteria incriminated in bronchopulmonary exacerbations could not be identified. Bacterial involvement of the lung tissue is one of the main causes of death due to respiratory failure. The radiological lesions are very variable, and may involve both lungs or a lobar involvement. The treatment of pulmonary involvement is based on a synergistic antibiotic therapy.

As for the outcome of our patients, 9% died. Camara reported 7.6% of deaths in a study done in Senegal [29]. There is a correlation between the nutritional status and the outcome of patients (p= 0.0047).

Conclusion

In the hope of reducing the incidence of measles in Mali, it is important to strengthen routine immunization and to improve the response and immunization strategies throughout the country in order to achieve a clear improvement in the fight against this disease, if not its elimination. The major challenge is to reach the WHO's 95% vaccination coverage target. A measles booster at 1 year of age may reduce the morbidity of measles.

Conflicts of interest

The authors have declared no conflicts of interest

Ethical considerations

Upon admission, parents or legal guardians of patients approved their inclusion in a clinical research study. The national ethics committee validated the research protocol.

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