Neonatal tetanus in Casablanca

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Summary
Neonatal tetanus (NT) remains common in developing countries. Its poor prognosis is characterized by a high mortality rate.

Patients and methods – Our retrospective review concerned 50 cases of NT admitted to the intensive care and neonatology units in the Casablanca Children’s Hospital between 1990 and 1999. The diagnosis was made on clinical signs and gravity was evaluated with the Dakar score.

Results – NT accounts for 0.5% of cases admitted in our service. A low socio-economical level, and home delivery without asepsis were found in 90%. 80% of patients were of rural origin. A Dakar score $\geq 4/6$ was noted in 76%. Since 1994 therapeutic management has improved but with heavier costs and longer hospitalization. Nevertheless, the mortality rate reached 66%.

Conclusion – Prevention based on vaccination, easier access to healthcare, or education of the population will help to solve this problem.

epidemiology / mortality / neonatal tetanus / prevention

Résumé – Tétanos néonatal à Casablanca.
Le tétanos néonatal (TNN) reste un problème de santé publique dans les pays en voie de développement. Son pronostic redoutable est marqué par une mortalité élevée.

Patients et méthodes – Notre étude rétrospective a concerné 50 cas de TNN colligés au service de soins intensifs et de néonatologie de l’Hôpital d’Enfants de Casablanca durant une période de 10 ans allant de 1990 à 1999. Le diagnostic du TNN est clinique et la gravité est évaluée selon le score de Dakar.

Résultats – Cette affection représente 0,5 % de l’ensemble des admissions du service. Le niveau socio-économique défavorisé avec des accouchements sans conditions d’hygiène sont retrouvés dans 90 % des cas. La population rurale représente 80 % de nos malades. Un score de Dakar $\geq 4/6$ est noté chez 76 % de malades. La prise en charge thérapeutique s’est améliorée depuis 1994 au prix d’une hospitalisation prolongée et d’un coût élevé. L’évolution est marquée par une mortalité globale de 66 %.

Conclusion – L’amélioration de la prévention basée sur la vaccination, l’accès aux soins, l’éducation et la sensibilisation de la population permettra de résoudre ce problème.

epidémiologie / mortalité / prévention / tétanos néonatal

1. INTRODUCTION
Neonatal tetanus (NT) is a public health problem for developing countries [1, 2]. Thanks to an enlarged vaccination program (EVP) set up since 1974 by the (WHO) and the UNICEF, the incidence and mortality rates of NT have significantly decreased. Nevertheless prevention efforts should be maintained to eradicate NT by 1995 [3]. During the 1980s, around a million cases of tetanus were observed in developing countries every year with a mortality rate ranging close to 80% [4]. In 1991, the number of deaths due to NT reached 433,000 according to a WHO estimation [4]. In Morocco, the EVP set up in 1981 then reviewed in 1987 and renamed national immuniza-
tion program (NIP) has lead to satisfactory results concerning vaccination rate and a reduced incidence of the target diseases [5].

The aim of this retrospective study is to report our NT experience while stressing the difficulty of management and the high cost without forgetting the role of prevention.

2. PATIENTS AND METHODS

This retrospective study was made from January 1, 1990 to December 31, 1999 in the Intensive Care and Neonatal units of the Casablanca Children’s Hospital. Our service is the only public hospital structure managing NT cases in the greater Casablanca grouping close to 5 million inhabitants (17% of the Moroccan population) according to the 1992 census.

NT diagnostic was made on strictly clinical criteria. Severity was assessed according to the Dakar score (Table I). Hospital incidence of NT, maternal parameters, severity of clinical signs, difficulty and cost of therapeutic management as well as evolution were analyzed thanks to a preprinted processing file.

3. RESULTS

Fifty NT cases were collected over ten years, that is five cases per year and close to 0.5% of all patients hospitalized in the service during the same period. The yearly distribution shows a significant decrease since 1993. Indeed, 70% of patients had been hospitalized during the first three years of the study (Fig. 1). Assessment of maternal factors reveal: non-monitored pregnancy (n = 46), home delivery (n = 45), rural origin (n = 40), and the absence of any antitetanus vaccination whether during or before pregnancy (n = 39). In 11 cases the mother had been given antitetanus vaccination, before pregnancy (n = 9) and during pregnancy (n = 2). The number and date of the vaccines were not specified. The umbilical cord was cut with a non-sterile instrument in 45 cases: with a razor blade (n = 34), a pair of scissors (n = 10), and a knife (n = 1). A toplica was applied to the umbilical cord as a bandage in 28 cases. This toplica was “khool” (n = 21), “henne” (n = 4), and talcum powder (n = 3). No neonate had been given antitetanus serum (ATS) before admission in our service. The portal of entry was umbilical in 94% of the cases. Distribution according to gender showed predominance in males with a sex ratio at 1.38. Age on admission was inferior to 7 days in 25 cases (50%), between 7 and 14 days in 22 cases (44%), and superior to 14 days in 3 cases (6%). Hospitalization was due to: refused breast-feeding (n = 23), a suspected materno-fetal infection (n = 14), fever above 38.5°C (n = 10), neonatal jaundice (n = 8), atony (n = 5), cyanosis (n = 1), and hematemesis (n = 1). According to the Dakar classification issued by the fourth international congress in 1975, our patients were distributed in class III (scores 4 and 5) in 76% of the cases, and in II (score 3) in 24% of the cases. Therapeutic management consisted in umbilical disinfection with hydrogen peroxide (n = 37) and aqueous eosin at 2% (n = 13). Antitetanus serum (ATS) was administered with doses of 250 to 400 international units (IU) intra muscular (n = 45), sub-cutaneous (n = 4), and intrathecal (n = 1). Penicillin G at 100,000 IU/kg/j (slow infusion) was prescribed alone in 15 cases (30%). It was combined to a 3rd generation cephalosporin (3GC) and an aminoside in 21 cases (42%). When an associated materno-fetal infection was suspected, bitherapy (3GC + aminoside) was immediately used (28%).

Sedation was achieved by administration of Diazepam IV at 0.5 to 1 mg/kg/hour in 48 cases (96%). Midazolam at 100 to 300 µg/kg/hour was used in 3 cases (6%). Curare was used in 5 cases (10%). They were pancuronium Bromure (Norcuron) at 60 µg/kg/hour combined with Fentanyl at 1 to 2 µg/kg/h. Pentotal (Nesdonal) in loading doses at 3 mg/kg then at 3 mg/kg/hour was used in 3 cases. 20 patients (40%) had been under respiratory assistance for a mean length of 5.82 days (3 hours to 35 days). Neonates under respiratory assistance had a mean length of 5.82 days (3 hours to 14 days). Neonates under respiratory assistance had a mean length of 5.82 days (3 hours to 14 days).

<table>
<thead>
<tr>
<th>Table I. Dakar prognostic Score</th>
<th>Tableau I. Score pronostic de Dakar</th>
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</thead>
<tbody>
<tr>
<td>Éléments pronostic</td>
<td>0</td>
</tr>
<tr>
<td>Incubation</td>
<td>&gt;7 days</td>
</tr>
<tr>
<td>Invasion</td>
<td>&gt;2 days</td>
</tr>
<tr>
<td>Température</td>
<td>&lt;38.5</td>
</tr>
<tr>
<td>Porte d’entrée ombilicale</td>
<td>absente</td>
</tr>
<tr>
<td>Fréquence cardiaque</td>
<td>&lt;150</td>
</tr>
<tr>
<td>Paroxysmes</td>
<td>absents</td>
</tr>
</tbody>
</table>

Figure 1. Répartition annuelle des cas de TNN.
for NT management was estimated at 750 French francs (FF). This cost took into account only used products. Evolution was favorable in 17 cases (34%) with a mean hospitalization stay of 19.4 days (6 to 45 days). 33 patients died (66%) after a mean hospitalization stay of 3.6 days (16 hours to 17 days). Late deaths (J17) were not directly linked to NT but to iatrogenic complications and especially nosocomial infections. Survivors followed-up in consultation (n = 11) were healthy except for three presenting with retarded psychomotoric. These three children had been under respiratory assistance and had presented with repeated episodes of hypoxia.

4. DISCUSSION

Intensive and recurrent vaccination campaigns supported by the WHO and the UNICEF have lead to the decrease of NT incidence in many countries. Nevertheless, the real incidence of NT is under-estimated because of a difficult or impossible access to healthcare of the rural population (80% in our series), and because of NT deaths at an early age [2, 4, 6]. The global incidence in our series is 5 cases/year. This incidence has decreased to 1.8 cases/year since 1994. On the national level, the number of reported NT has clearly decreased, especially since the setting up of a NIP (Fig. 2) [7]. In North-African countries, the same conditions are noted, with a more favorable in Tunisia for several health indicators [8]. In Africa, the Sahel region is the most affected by this disease. In 1996, out of 48 countries of the WHO-Afro region, 9 have not reported any case of NT [9]. Nevertheless, official declarations are often incomplete and cannot be the only parameter used to assess vaccination programs [10]. Analyzing maternal risk factors can be summed up as the consequences of a low socio-economical status: difficult access to healthcare, non-followed pregnancy, delivery in difficult and unsanitary conditions, section of the umbilical cord with a non sterile tool, and application of various substances as umbilical bandage [4, 11, 12]. All these risk factors are found in our study.

Therapeutic management of NT is well codified. It consists in isolating the patient, trying to stop all nociceptive stimulations, giving local care to the umbilicus, and giving an efficient antibiotherapy for clostridium tetani (Penicillin G) [4, 6]. Sedation may be acquired with strong doses of Diazepam, up to 40 mg/kg/d, or Midazolam (60 to 120 µg/kg/h). Curare such as Bromure de pancuronium (100 µg/kg IV then continuous infusion at 30 to 60 µg/kg/h) combined with Fentanyl (3 µg/kg/IVL) then continuous infusion (1 to 2 µg/kg/h) is seldom used. In these cases, respiratory assistance is mandatory. This respiratory assistance along with an optimal sedation, allows using enteral feeding, avoiding as much as possible risk of tracheal food instillation [13–15]. In our settings, management is difficult for many reasons:

Medical hardware is insufficient, especially for respiratory assistance: the latter is not always possible for patients needing strong doses of diazepam or curare to be sedated.

High risk of nosocomial infections in case of prolonged respiratory assistance.

Feeding problem when parenteral nutrition is not available.

A prolonged stay in a small and over-crowded unit poses a real problem of room.

The administration mode of ATS is not consensual. The superiority of the intrathecal way has been demonstrated by many studies of the Dakar school [2, 16]. A meta-analysis including 9 very heterogeneous therapeutic trials did not prove the efficacy of intrathecal serotherapy, the indication of which remains very controversial [17].

The prognostic of NT is poor. Indeed, the authors report a high death rate, whatever the therapeutic protocols used, the sanitary state, the period of study, and the number of cases studied (Table II).

The global incidence of NT related deaths is 29.3% in Africa, 48.8% in South-East Asia, 8.4% in oriental Mediterranean countries, and only 0.3% in Europe [1].

In our study, the global death rate is 66%, but 2 different periods must be detailed. The 1st period (before 1994) featured frequent cases of NT and no means of resuscitation. In this 1st period, the death rate was 74.35% compared to 36.36% for the 2nd period (after 1994) with a decreased number of NT cases and improved medical hardware.

This improved management of NT, due to respiratory assistance, requires a prolonged hospitalization from 16 to 35 days [14], an excessive cost estimated at FF 3,300 per patient [18], from FF 250 [2] to FF 750 per hospitalization day in our study. This cost estimation did not include: non-medical cost in ICU, respiratory assistance, medical and paramedical staff workload costs, but it would have allowed us to deal with around ten cases of suspected materno-fetal infection. This underlines the
Table II. NNT Mortality rate in literature

<table>
<thead>
<tr>
<th>Auteurs</th>
<th>Origine</th>
<th>Période d’étude</th>
<th>Nombre de cas</th>
<th>Mortalité %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renaudin</td>
<td>Sénégal</td>
<td>1986–1990</td>
<td>103</td>
<td>51.45</td>
</tr>
<tr>
<td>Badiane</td>
<td>Sénégal</td>
<td>1979–1989</td>
<td>1159</td>
<td>62.55</td>
</tr>
<tr>
<td>Mayanda</td>
<td>Brazzaville</td>
<td>1987–1996</td>
<td>12</td>
<td>91.6</td>
</tr>
<tr>
<td>Série personnelle</td>
<td>Casablanca</td>
<td>1990–1999</td>
<td>50</td>
<td>66</td>
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</tbody>
</table>

The efficient protection of children born to mothers vaccinated against tetanus is well established [19]. In our series, we noted 11 cases of NT even though the mother had been given antitetanus vaccine (ATV). This could be explained by a possibly incomplete vaccination, the number and date of anatoxin injections having not been specified. The problem of limited transplacental transfer of antibodies in African women reported by Gendrel et al. [21] could also account for these cases of NT. If the 5 ATV injections recommended by the WHO seem difficult to carry out, at least 2 ATV must be given, the first 3 months and the second 20 days before delivery [20].

In Morocco, the target population is 6 million women of childbearing age (15 to 44 years of age). In 1998, close to 500,000 women had been given 5 ATV [7]. On a world scale, vaccinal protection against tetanus is still insufficient (only 40% of women of childbearing age are vaccinated) [1, 21]. This vaccination which should be generalized and accessible is not always sufficient. Improving delivery conditions, adequate care of the umbilical cord, and setting-up sensitization and sanitary education would probably reduce the incidence of NT in developing countries to zero case per year, goal which should have been reached in 1995 according to the WHO [6, 10].

5. CONCLUSION

The high cost of NT, both human and financial, forces developing countries and international organizations to make great efforts in prevention based on vaccination, easy access to healthcare, and sanitary education of target populations. This is the only way we hope to eradicate this disease.

REFERENCES


