

The Management of Neonatal Peritonitis in the Paediatric Surgery Department of the Donka National Hospital

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Abstract

Introduction: Neonatal peritonitis is a rare but serious condition requiring early diagnosis and management. The lack of antenatal diagnosis, the precariousness of neonatal intensive care, and the delay in diagnosis and treatment are the factors of poor prognosis. The objective of this study was to study the epidemiological, diagnostic and therapeutic aspects of neonatal peritonitis in order to improve its management in the pediatric surgery department of the CHU-Donka. **Materials and Methods:** This is a retrospective descriptive study of the records of patients treated for neonatal peritonitis from January 1, 2017 to December 31, 2022. **Results:** Results: We compiled 17 records of patients operated on for neonatal peritonitis, representing a frequency of 3.85% and an incidence of 2.83 cases/year. The mean age of our patients was 8.29 days, with extremes of D0 and D25. Males were more dominant, with a frequency of 71% and a sex ratio of 2.4. The average consultation time was 72 h, with extremes of 12 h and 144 h. Abdominal bloating was the main reason for consultation (100%). Fever and vomiting were frequent, at 70.59% and 82.35% respectively. PSA revealed pneumoperitoneum in 12 patients (70.59%). The colon was the most frequent site of perforation at 29.41%. ECUN was the main etiology with 35.29%. Ostomy was the main surgical procedure in 58.82% of cases, followed by suture excision in 29.41%. Postoperative follow-up was simple in 3 patients (17.65%) and complicated in 14 (82.35%). Sepsis was the main cause of death (47.59%). The mortality rate was 76.47%. **Conclusion:** Mortality from neonatal peritonitis remains

high in developing countries. Early diagnosis, early surgical management, and the presence of well-equipped neonatal intensive care units with qualified staff are essential for an improvement in the prognosis of neonatal peritonitis.

Keywords

Etiology, Newborns, Gastrointestinal Perforation

1. Introduction

Neonatal peritonitis is an acute localized or generalized inflammation of the peritoneal serosa of newborns aged 0 to 28 days. It is most often secondary to a hollow organ perforation or to the spread of an intra-abdominal septic focus [1] [2]. It accounts for 20% to 40% of gastrointestinal surgical pathologies in the neonatal period [3]. Perforation can occur either antenatally and persist until birth, or postnatally. These causes can be iatrogenic, idiopathic, due to ulcerative necrotizing enterocolitis, secondary to mechanical or functional occlusion [4]. It is a serious condition requiring early diagnosis and management to avoid the risk of irreversible multi-organ failure. Diagnosis can be made either antenatally in the case of intrauterine perforation by the ultrasound discovery of: fetal ascites, hydramnios, intestinal dilation, pseudocyst or intra-abdominal calcifications, or postnatally by clinical signs of peritonitis and pneumoperitoneum on X-ray [5] [6]. The care is medical-surgical and requires the speed of the surgical intervention coupled with adequate resuscitation measures in order to have better results, all in a well-equipped hospital center [2]. Neonatal peritonitis is characterized by its poor prognosis with a mortality varying from 40% - 70% [7]. Enormous progress has been made in developed countries in recent decades, resulting in a significant decrease in mortality. However, in developing countries, mortality remains high [8].

The aim of this study was to study the epidemiological, diagnostic and therapeutic aspects in the Department of Pediatric Surgery of the Donka National Hospital.

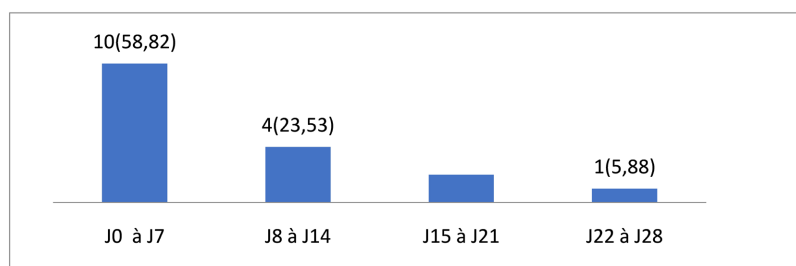
2. Patients and Methods

Our work was a retrospective observational descriptive study with a duration of 06 years from January 1, 2017 to December 31, 2022. We targeted all cases of newborns aged 0 to 28 days hospitalized and operated on in the ward for neonatal surgical emergencies during the study period. This study included all records of newborns aged 0 to 28 days in which the diagnosis of neonatal peritonitis was retained and/or confirmed intraoperatively. We pooled our data according to epidemiological, clinical, paraclinical, therapeutic and evolutionary variables. Data were collected on KoBo collect and analysed using statistical SPSS 21 software (Tables 1-11, Figures 1-3).

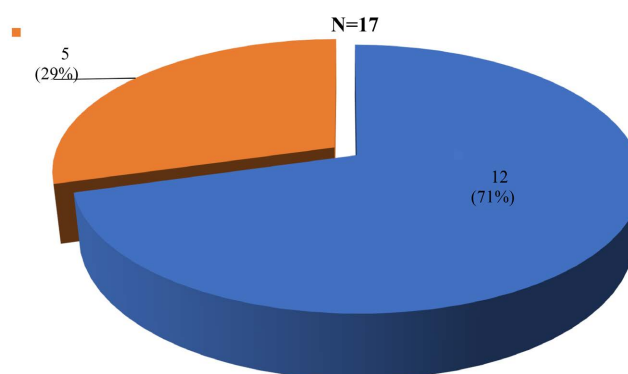
Table 1. Frequency of neonatal peritonitis.

Year	Number of neonatal surgical emergencies	Number of cases of PN	Proportion
2017	78	02	2.56
2018	94	03	3.19
2019	94	02	2.13
2020	76	05	6.58
2021	99	04	4.40
2022	74	01	1.35
Total	441	17	3.85

The annual incidence is 2.83 cases/year.



Mean age = 8.29 days. Extremes = [J0 and J25]. Standard deviation: 2.36.

Figure 1. Distribution of neonatal peritonitis cases by age group (N = 17).

Sex ratio (G/F) = 2.4.

Figure 2. Distribution of neonatal peritonitis cases by gender.**Table 2.** Distribution by birth weight.

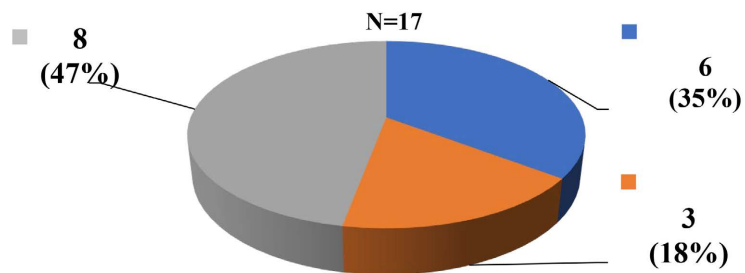
Birth weight	Number	Proportion
<2500 g	5	29.41
2500 - 3500 g	11	64.71
>3500 g	1	5.88

Average weight: 2740 g. Extreme = [1702 g - 3900 g]. Standard deviation: 603 g.

Table 3. Reasons for consultation.

Reasons for consultation			Number (N = 17)	Proportion
Abdominal bloating			17	100
Vomiting	Bilious	7	14	82.35
	Greenish	5		
	Fecaloïd	2		
Absence of meconium			2	11.76
Fever			12	70.59
Absence of anal orifice			1	5.88
Transit stopped			8	47.06
Irreducible inguino-scrotal swelling			1	5.88

Average time = 72 h. Extremes = [12 Hour and 144 Hour]. Standard deviation: 42 h.

**Figure 3.** Distribution of patients by time to diagnosis.

Text 1 : 14/17 of the patients' mothers performed antenatal ultrasound.

One case of meconium peritonitis was diagnosed at 39SA by antenatal ultrasound.

Table 4. Distribution of radiological signs.

Abdomen without preparation	Effectif (N = 17)	Proportion
Gas crescents	12	70.59
Hydro-aeric images	6	35.29
Diffuse grayscale	10	58.82
Pneumatosis intestinal	6	35.29
Calcification	1	5.88

Table 5. Breakdown by time to surgery.

Time to surgery	Effectif	Proportion
Less than 24 H	6	35.29
24 - 48 H	7	41.18
More than 48 H	4	23.53
Total	17	100

Average delay: 42 hrs. Extreme = [12 hrs - 74 hrs]. Standard deviation: 21 Hour.

Table 6. Distribution according to intraoperative lesion assessment.

Siège de la perforation	Effectif (N = 17)	Proportion
Stomach	4	23.53
Colon	5	29.41
Coecum: 4		
Sigmoid: 1		
Multiples		
Ileum	3	17.61
Sigmoid		
Stomach + Sigmoid		
Ileum	4	23.53

Table 7. Distribution according to perforation etiology.

Etiology	Number (N = 17)	Proportion
Iatrogenic	2	23.53
Stomach		
Enterocolitis Ultero-necrotizing	6	29.41
Coecum		
Ileon		
Secondary		
Hirschsprung's disease	1	17.61
Anorectal malformation	1	
Strangulated hernia	1	
Idiopathic		
Stomach	2	23.53

Table 8. Breakdown by surgical procedure.

Procedure	Number (N = 17)	Proportion
Stoma	10	58.82
Colostomy :9		
Ileostomy : 1		
Excision-Suture	5	29.41
Resection-Anastomosis	2	11.76
Appendicectomy	1	5.88

Text 2: We observed 2 immediate postoperative deaths and 11 late postoperative deaths.

Table 9. Breakdown by type of postoperative complication.

Operating sequences	Number (N = 17)	Proportion
Simple	3	17.63
Complicated	Parietal suppuration	29.41
	Evisceration	23.53
	Suture loosening	17.63
	Stercoral fistula	17.63
Death	13	76.47

Table 10. Distribution by cause of death.

Cause of death	Number (N = 17)	Proportion
Septic shock	8	47.59
Hypovolemic shock	1	5.88
Respiratory distress	2	11.76
Multivisceral failure	2	11.76

Table 11. Breakdown by length of hospital stay.

Length of hospital stay	Effectif	Proportion
< à 4 days	7	41.18
5 to 10 days	5	29.41
> 10 days	5	29.41
Total	17	100

Average duration: 8.29 days. Extrême = [1 jour - 25 jours]. Standard deviation: 5.71 days.

3. Discussion

Neonatal peritonitis is an acute localized or generalized inflammation of the peritoneal serosa in neonates aged 0 to 28 days. We collected 17 cases of neonatal peritonitis over a period of 6 years, which represents an annual incidence of 2.83 cases/year. This incidence is significantly lower than that reported by Nezar *et al.* [9] (11.3 cases/year) and Keremu *et al.* [10] (9 cases/year). This incidence in our study suggests that neonatal peritonitis is uncommon in Guinea. Although the paediatric surgery department of Donka National Hospital is the only referral hospital for paediatric surgery in the country, this incidence seems to underestimate in reality, as it does not take into account those who are not referred for economic reasons and those who died early before being referred. Multicenter studies would be necessary, through the creation of pediatric surgery services in the different regions of the country, to obtain the real situation of this pathology in Guinea. The average age of onset of neonatal peritonitis varies between studies. In our study, it was 8.29 days, with extremes ranging from 0 to 25 days. The most affected age group was 0 to 7 days. Our result was higher than that of Hassan *et al.* [11],

who reported a mean age of 4 days, and lower than that of Ahmed [12], who reported a mean age of 11.2 days. These observations suggest that in the vast majority of cases, neonatal peritonitis occurs within the first 2 weeks of life. As mentioned in the epidemiological section, neonatal peritonitis most often affects boys. Indeed, in our study, boys were more affected by neonatal peritonitis, with a ratio of 2.4. Yassegounbe *et al.* [13] and Ekwunife *et al.* [6] reported a male predominance with sex ratios of 1.57 and 1.28 respectively. Similarly, Keremu *et al.* [10] reported a male predominance with a sex ratio of 2.17. However, there is no clear explanation for this predominance.

The majority of newborns (52.94%) were referred by the neonatology department, a result due on the one hand to the proximity of the two services and on the other hand to the fact that it was the only reference service for the medical care of newborns on a national scale. Delay in diagnosis has an important prognostic value. The long course of neonatal peritonitis without adequate treatment worsens the prognosis. In our study, the mean time to diagnosis was 72 h, with extremes of 12 h and 144 h. This time was counted from the first functional signs reported by the parents and attributable to peritonitis. This long delay in admission in our study could be linked on the one hand to the systematic use of self-medication and traditional treatments by the patients' parents and on the other hand to the lack of knowledge of the pathology by front-line medical and paramedical staff. In our study, only one case of meconium peritonitis was diagnosed antenatally at 35 weeks' gestation by ultrasound in a private clinic. After the birth at the clinic, the patient was transferred to our department. However, follow-up and delivery in a mother-child centre with a paediatric medical-surgical unit would improve the survival rate of children. Yi *et al.* [14] reported that the survival of all patients operated on in their mother-child center with a pediatric medical-surgical unit was 95% for patients born with meconium peritonitis followed in their department, compared to 79.5% for patients transferred to their department. Hence the importance of a mother-child centre with a paediatric medical-surgical unit. Pre-term birth and low birth weight were factors in poor prognosis. In fact, in addition to the problems of prematurity, there are those of neonatal peritonitis. The average weight was 2740 g, with extremes of 1702 g - 3900 g. The mean gestational age was 36.40 weeks. All 5 preterm births had low birth weight. In most developing countries, patient transport was not medicalized, while it is vital to stabilize the condition of the newborn before and during transfer. In our study, no transport was medicalized.

The main reason for consultation found on admission was abdominal distension, with a frequency of 100%. This result is similar to those of Do *et al.* [15] and Tiwari *et al.* [16] whose studies showed that abdominal bloating was the most frequent reason for consultation in 100% of cases. This shows that abdominal bloating in newborns leads to the search for neonatal obstruction complicated by peritonitis. Pneumoperitoneum on ASP X-ray was found in 70.59% of our patients. This result is superimposed on those of Essam *et al.* [17] and Do *et al.* [15], who

in their studies had found pneumoperitoneum on ASP radiograph in 88.66% and 100% of cases respectively. These observations suggest that any pneumoperitoneum found on a neonatal PSA X-ray is neonatal peritonitis due to hollow organ perforation, until proven otherwise. However, the absence of pneumoperitoneum does not exclude the diagnosis of neonatal peritonitis. In the literature, ulceronecrotizing enterocolitis was the cause of nearly half of intestinal perforations in newborns, especially in preterm infants and newborns with perinatal asphyxia. 1 in 4 patients with perinatal asphyxia and all premature patients developed ulceronecrotizing enterocolitis, which was complicated by perforation.

Indeed, the main etiology in our study was perforation due to ulceronecrotizing enterocolitis (35.29%), followed by spontaneous perforation (29.41%). Our results corroborate those reported in the literature and by many authors: Sandra *et al.* [18] had reported that ulceronecrotizing enterocolitis was the predominant cause of perforation with 51.4%. Nezar *et al.* [9] had reported that ulceronecrotic enterocolitis was the main cause of perforation with 47.5%. Yassegounbe *et al.* [13] reported that ulceronecrotizing enterocolitis was the main cause of perforation with 72.2%. It is a situation close to intestinal stasis that can occur in premature newborns due to the functional immaturity of the intestine, exposing it to a bacterial proliferation that will extend from the last small loop, creating a real vicious circle that is completed by the distension of the intestinal loops, intraluminal hyperpressure, the slowing down of microcirculation and finally parietal necrosis. Other factors are involved: on the one hand, intestinal colonization by the hospital flora, altered by perinatal antibiotic therapies frequently associated, the inadequacy of the choice of exclusive breastfeeding, although protective, are environmental factors that precipitate the inflammatory cascade and on the other hand, the factor is immune. In newborns, immunoglobulins are barely detectable, especially secretory IgA [19] [20]. In our study, the colon was the main site of perforation (29.41%). Our results differ from those of Koushi *et al.* [8] and Ekwunife *et al.* [6] who reported a predominance of small intestine perforation at 70% and 75%, respectively. This difference could be explained in our study by the fact that colon perforation is more common in term newborns, which predominated in our study. However, there is no clear explanation for this predominance. The management of neonatal peritonitis requires optimal pre-, intra- and post-operative conditioning in a neonatal intensive care unit. The objective is to correct hydroelectrolyte and haematological disorders. In our study, neonatal resuscitation was performed before surgery.

In developed countries, all patients with neonatal peritonitis and poor general condition are admitted to neonatal intensive care units for resuscitation prior to surgery. The establishment of an intensive care unit in the department, the equipment of the neonatal intensive care unit and the training of qualified staff will contribute to improving the management of neonatal peritonitis. The surgical procedure should not be delayed, which would promote complications. In our study, 35.29% of our patients were operated on in less than 24 hours. In our study, this could be explained by the fact that parents delay paying for resuscitation

drugs, operating kits and preoperative check-ups, by the low socio-economic level of the population and by the lack of insurance for patients. According to the literature, patients in poor general condition should have an ostomy, so that they can be fed again as quickly as possible and their poor general condition corrected. Continuity is planned for later [2] [14] [21]. The most common surgical procedure performed in our study was stoma, with a frequency of (58.82%). Our result was similar to that of Nezar *et al.* [9], who reported a high frequency of stoma (67%), but different from that of Ekwunife *et al.* [6], who reported a high frequency of resection-anastomosis (38%).

The main complication and cause of death in our study was septic shock (47.59%). Our result was higher than that of Keïchi *et al.* [21] Who reported 6.6% of deaths secondary to sepsis. This high rate of sepsis in our study could be explained by the late presentation of patients and by the fact that the management of the infection was not based on a well-conducted antibiotic therapy adapted to the bacteriological data obtained from peritoneal fluid samples. In developed countries, the mortality rate has fallen due to advances in prenatal diagnostic techniques and appropriate management, including surgery and intensive care for patients with poor preoperative general condition. We recorded a mortality rate of 76.47%. Our result is close to that reported by Yassegoungbe *et al.* [13] who reported a mortality rate of 77.8%, but lower than that reported by Sato M *et al.* [22] and Yi *et al.* [14] who reported a mortality rate of 20.5% and 12% respectively. This high mortality rate in our study could be explained by the delay in diagnosis, the delay in surgical management, the precariousness of neonatal intensive care units and the lack of qualified staff in neonatal intensive care.

4. Conclusion

Neonatal peritonitis is mainly the complication of spontaneous digestive perforation. It remains associated with a high mortality rate in developing countries. The main etiologies are represented by ulceronecrotizing enterocolitis. Delayed diagnosis, precarious neonatal intensive care units and delayed surgical management are associated with high mortality. The prenatal care of fetuses with meconium peritonitis, the evaluation and improvement of the knowledge of medical and paramedical staff for early referral of patients, the improvement of the technical platform and the development of neonatal resuscitation make it possible to improve the survival rate of patients.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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