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Neonatal Mortality: Experience of Pediatric Emergency Department

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Abstract **Original Research Article**

***Introduction*:** Neonatal mortality is a global health problem that has been at the heart of World Health Organization (WHO) programs for more than 30 years. In Morocco, it represents a real scourge and remains high despite the efforts made by the Ministry of Health. We conducted this study to assess the prevalence of neonatal mortality, determine its causes and risk factors, and propose preventive measures to reduce this rate. ***Methods*:** This was a retrospective descriptive and analytical study conducted over a period of four and a half years, from January 2016 to June 2020, in the Pediatric Emergency Department of the Centre Hospitalier Universitaire Mohamed VI in Marrakech. ***Results*:** We recorded 268 deaths, representing a neonatal mortality rate of 18.3%, with a preponderance of early neonatal deaths (73.9%). The sex ratio was 1.45 in favor of males. Mean age at death was 6.5 days. 70% of pregnancies were poorly attended, medical deliveries accounted for 86% in our serie, and 90.5% of deliveries were vaginal. The majority of deaths occurred in parturients aged between 20 and 29 years (57.3%), and 28.5% of deaths occurred in primiparous women. The prematurity rate was 49.2%, and 58% of the newborns who died had a low birth weight. Prematurity was the leading cause of neonatal mortality (49.2%), followed by neonatal infection (38.5%) and perinatal asphyxia (12.3%). ***Conclusion*:** Effective management of pregnancy and the newborn in the first week of life should improve neonatal prognosis.

Keywords: Neonatal Mortality, Risk Factors, Pediatric Emergencies, Causes.

INTRODUCTION

Neonatal mortality continues to be a major concern for healthcare professionals worldwide. It represents a reliable and sensitive indicator of health status, availability, use and effectiveness of care [1], while also reflecting socioeconomic development [2]. According to the WHO, 2.5 million children worldwide died in 2017 during their first months of life. This represents around 7000 newborn deaths per day. More than two-thirds of neonatal deaths occur in the first week of life, and around one million newborns die within the first 24 hours [2]. In Morocco, on May 14, 2018, the Ministry of Health presented the preliminary results of the 2018 National Population and Family Health Survey [3]. The results show a 38% drop in neonatal mortality compared with 2011 rates, from 21.7 to 14 deaths per 1000 live births. According to the Ministry of Health, this success can be explained by improved pregnancy monitoring, supervised delivery and improved quality of care [3]. It is therefore important to identify the causes of death and the risk factors that are closely linked to newborn health, maternal health or the practices of healthcare professionals, so that effective action can be taken to reduce this rate, which is becoming a global concern [4, 5].

PATIENTS AND METHODS

Our study is a retrospective analytical and descriptive study of neonatal mortality in the Pediatric Emergency Department of the CHU Mohammed VI of Marrakech over a period of 4 and half years from 01/01/2016 to 30/06/2020.

This study was based on consultation and analysis of the medical records of newborns who died in the Pediatric Emergency Department, or of maternity ward referral forms if the newborn was referred directly after birth or from a peripheral pediatric department if he or she was previously hospitalized before transfer.

Data were entered using Microsoft Office Excel 2016. Statistical analyses were performed using SPSS (Statistical Package for Social Science) version 21. We

used the chi2 test with a significance level of P less than 0.05.

RESULTS

From January 1, 2016 to June 30, 2020, 1463 newborns were hospitalized in the Pediatric Emergency Department of the CHU Mohammed VI of Marrakech. During this period, 268 cases of death were recorded, representing an overall frequency of 18.3%. Table 1 shows the evolution of neonatal mortality over the study period.

Table 1: Breakdown of deaths by year of death

Year of death	Number of deaths	Number of hospitalizations	%
2016	11	123	8,9
2017	24	181	13,2
2018	31	165	18,7
2019	116	608	19
Du 01/01/2020 au 30/06/2020	86	386	22,2
Total	268	1463	18,3

Neonatal Descriptive Characteristics

A study of the epidemiological characteristics of the deceased neonates (Table 2) revealed that 59.3% were male. The mean age at death was 6.5 days, with a minimum of one day and a maximum of 28 days. Birth weight averaged 2.369 kg, with extremes ranging from 700 g to 5.5 kg. We noted 58% of newborns with a low birth weight (PN<2500g). In terms of gestational age, 49.2% were premature (132), and 48.8% were at term (131), while we noted 5 cases of over-term. Respiratory distress was the main reason for hospitalization in 71.6% of cases. As for the time of death, 73.9% occurred during the early neonatal period, from 0 to 7 days inclusive. Analysis of the causes of death remains difficult, as several causes may be associated (Table 3). Prematurity was the main cause of neonatal death (49.2%).

Table 2: Description of neonatal characteristics of deceased newborns

Neonatal characteristics	Number	%
Weight		
<2500g	155	58
2500-4000g	107	40
>4000g	6	2
Gender		
Male	159	59.3
Female	109	40.7
Gestational age		
< 37 SA	132	49.2
37-42 SA	131	48.8
>42 SA	5	2
Death delay		
Early delay: < 7 d	198	73.9
Late delay : 7 j-28 j	70	26.1
Reason for hospitalization		
Respiratory distress	192	71.6
Neurological signs	65	24.2
Jaundice	25	9.3
Cyanosis	44	16.4
Prematurity	132	49.2
Perinatal asphyxia	33	12.3
Fever	9	3.4
Malformative syndrome	11	4.1
Bleeding signs	10	3.7

Table 3: Etiologies of neonatal mortality

Cause of death	Number	%
Prematurity	132	49.2
Neonatal infection	103	38.5
Perinatal asphyxia	33	12.3

Cause of death	Number	%
Hyaline membrane disease	23	8.6
Jaundice	24	9
Polymalformative syndrome	15	5.6
Hemorragic disease	10	3.7
Ferraga intoxication	10	3.7

Descriptive Maternal Characteristics

The mean age was 27 years, with extremes ranging from 17 to 45 years. Statistical results revealed that neonatal mortality was highest in the 20-29 age group with a frequency (57.3%) followed by that in the 30-39 age group with 30.6%. Only 30% of parturients had received regular follow-up care during pregnancy.

For these women, vaginal delivery was the most common mode of delivery for 90.5% versus 9.5% by Caesarean section. Delivery was medicalized in 86% of cases, while 14% of deceased newborns were delivered at home. Of these patients, 71.5% were multiparous, and 84% suffered from urogenital infection, 8% from gravid hypertension and 8% from gestational diabetes. Twenty-two cases had an obstetrical history, dominated by miscarriage (63.6%), followed by neonatal death (31.8%) and in utero fetal death (4.6%) (Table 4).

Table 4: Description of maternal characteristics

Maternal characteristics	Number	%
Age		
< 20 years	22	8.1
20-29 years	153	57.3
30-39 years	82	30.6
>39 years	11	4
Parity		
1	76	28.5
2-3	126	47
>3	66	24.5
Pregnancy-related diseases		
Gestational diabetes	4	8
Pregnancy-induced hypertension	4	8
Genital infection	42	84
Obstetrical history		
Miscarriage	14	63.6
in utero fetal death	1	4.6
Neonatal deaths	7	31.8

Impact of Certain Factors on Time to Death

For the following factors, we did not find a statistically significant difference in time to death: gender, birth weight, gestational age, pregnancy follow-up, mode of delivery and cause of death. However, among the reasons for hospitalization, we did find a statistically significant difference ($p<0.05$) for neonatal respiratory distress, refusal to feed and jaundice (Table 5).

Table 5: Risk factors associated with neonatal mortality

Reason for hospitalization	Early death	Late death	(p)
neonatal respiratory distress	78,2%	54,3%	< 0,001
Refusal to feed	12,7%	41,3%	< 0,001
Jaundice	6,1%	18,6%	0,002

DISCUSSION

Newborn deaths represent a larger and growing proportion of all deaths in children under 5 years of age [6]. We count around 6700 newborn deaths per day, representing 46% of all deaths in children under 5, based on our results, the neonatal mortality rate in the pediatric emergency department during the study period from January 2016 to June 2020 was 18.3%. This rate is relatively low compared with 27.8% [7], 27.4% [8], and 25.4% [9], from studies conducted in Burkina Faso, Senegal and Algeria respectively.

As for maternal factors, Portal B and al [10], found that at an age greater than or equal to 35, the risk

of fetal and neonatal mortality was multiplied by 3. This concords with the study by Jacobsson *et al*., in Sweden, who reported that the risk of neonatal mortality is multiplied by 3.8 and 2.1 respectively for mothers aged over 45 and between 40 and 45 [11]. Indeed, advanced maternal age has been shown to be associated with pre-eclampsia, other hypertensive diseases, gestational diabetes, low birth weight and prematurity [12, 13]. In our study, neonatal morality concerned 57.3% of parturients aged between 20 and 29 years. This is in line with the study done in Eritrea, where 56.4% of mothers were aged between 20 and 29 [14].

Many studies have shown that neonatal mortality is higher in women of higher parity [5-15]. In our series, neonatal deaths occurred in 71.5% of multiparous women. This is in line with the study by Manzar and al in Pakistan, who found a frequency of 70.1% in multiparous women [16]. Thus, multiparous women tend to rely on their experience of previous pregnancies and do not feel the need for antenatal controls, believing that they already know what to expect during pregnancy or childbirth [17]. Other studies have found an association between primiparity and neonatal mortality, especially if primiparity is associated with an age below 18 years [18]. Because primiparity may be associated with ignorance of the importance of prenatal care.

Pregnancy monitoring enables us to detect high-risk pregnancies and monitor their evolution. The health of the child during the first months of life depends largely on the conditions of pregnancy [19]. Inadequate prenatal care is one of the reasons for high perinatal mortality in developing countries [20, 21]. In Africa, various studies have demonstrated the importance of prenatal consultations: mothers who had not attended a consultation had a higher probability of losing their child before the 8th day; this risk decreases when the woman comes for a consultation [22, 23]. The same findings were observed in our series, where inadequate pregnancy follow-up concerned the majority of cases, with only 30% of parturients able to have recourse to regular follow-up.

The delivery process is an important factor in the survival of the newborn. Some studies show that cesarean delivery is a protective factor in neonatal mortality [24, 25]. The vaginal delivery route appears to increase the risk of dystocia, a source of intra-uterine hypoxia and birth asphyxia, and therefore of death if adequate neonatal resuscitation care is not applied [26]. In our series, the caesarean delivery rate was 9.5%. This compares with the 10-15% recommended by the WHO [27]. This caesarean section rate is lower than that found by Harir Noria and al, which was 65.83% [5].

The majority of literature reports a higher male neonatal mortality rate [5-28]. In our study, we found that 59.3% of deceased neonates were male, as reported in the majority of studies. We found no statistically significant relationship between gender and early death (P=0.062), which is in line with the study by Bezzaoucha and al in Algeria [9].

Newborns weighing less than 2500g represented 58% of all newborns included in our study. This same finding is reported by the majority of authors [5-29]. Low birth weight was not statistically associated with early neonatal death. This is in contrast to other studies in which very low birth weight is a major risk factor for early neonatal mortality [30, 31]. Thus, birth weight appears to be one of the best predictors of a newborn's chance of survival. Low-birth-weight newborns are particularly vulnerable during the first hours and days of life, especially if they are premature.

Neonatal mortality is recognized as an alarming global scourge. Etiological investigation therefore remains crucial. There are many causes, and several factors may be involved. Thus, the discovery of one cause does not obviate the need to investigate other etiologies. The three principal direct causes of neonatal mortality in Africa are, in order of frequency: prematurity, neonatal infection and neonatal asphyxia [32]. In our series, the predominant etiologies were: Prematurity (49.2%), neonatal infection (38.5%) and perinatal asphyxia (12.3%). Worldwide, the causes of neonatal death vary from region to region. The main causes of neonatal mortality worldwide are complications of prematurity (30%) and infectious diseases (23%) [2]. Causes of death also vary according to the time of death during the neonatal period. Neonatal infections predominate at the end of the neonatal period, meaning beyond the first week. Deaths due to prematurity and perinatal asphyxia are highest in the early neonatal period [33].

Finally, although the limitations associated with the retrospective nature of the study may be significant, such as incomplete data collection due to missing information in some clinical records; this research has nevertheless helped us to identify the real morbidity and mortality problems affecting newborn health.

CONCLUSION

Neonatal mortality, a good indicator of child health, represents a major public health problem. Morocco is said to be among the African countries that have made considerable progress in reducing mortality. However, despite these efforts, neonatal deaths remain high. In our series, the neonatal mortality rate was high at 18.3%, with early neonatal mortality predominating. The main causes of death were prematurity, followed by neonatal infection and perinatal asphyxia. Reinforced monitoring before and during pregnancy, during delivery and even in the post-partum period, as well as effective management of the newborn in the first week life, should improve neonatal prognosis.

Conflicts of Interest: The authors declare no conflicts of interest.

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