



Long-term fate of a newborn cohort with perinatal asphyxia Medicine and neonatal resuscitation, children's hospital in Rabat, IBN Sina Chis

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Abstract

The objective of this work: Highlight the table of morbidity and mortality caused by the degrees of perinatal asphyxia.

Materials and Methods: Through exhaustive sampling, this study targeted all neonates admitted with a diagnosis of perinatal asphyxia during 2015 and 2016, at the national reference center in neonatology and nutrition at the children's hospital of the university hospital of Rabat, whatever their origin. The mixed questionnaire was chosen as an investigative tool. Thus, based on a sample of 568 newborns and with a response rate of 84.51%, the speculations conducted in this study showed the following results.

Results: SNNIII accounted for 41.45 of the cases investigated, followed by SNNII, which accounted for 38.75% of cases. While, SNNI ranks last with a

percentage of 19.8%. Almost 43% of these perinatal sufferings required a hospital stay that exceeds 7 days.

Of the 480 cases investigated, 58 deaths, as a result of perinatal asphyxia complications, were recorded, and 60.43% of cases that are alive suffer from abnormal evolution. Reported health complications, among the surveyed infants and children, are mainly cerebral palsy with a percentage of 32.15%, overall retardation of motor development with a percentage of 29.80%, seizures in 16.86%, hemiplegia in 9.02%, deafness in 5.10% and blindness in 7.04% of cases. 75.69% of complicated cases did re-education sessions. With a frequency of once a week in 44.56%, two sessions per week in 49.22%, and 3 times per week in 6.22% of cases. The public health establishments provide the re-education sessions with a percentage of 56.48%. While 34.71% benefit from re-

education sessions at the association level and only 8.81% who use private practices.

Of the 60.43% of cases with complications of perinatal suffering, 30.2% are not monitored by a pediatrician following a parental decision. The reasons fueling this decision are essentially, the non completion of the requested examinations in 46.75%, the lack of financial resources in 35.06%, the repeated postponement of appointments by the care structure in 11.69%, and the use of traditional medication in 3.9%.

Conclusion: The prognosis of newborns with perinatal asphyxia is evidenced by alarming figures showing that the prevention of perinatal asphyxia requires urgent action, in order to face this public health problem. And as a result participated in the reduction of neonatal morbidity and mortality. In addition, this research has highlighted shortcomings in the subsequent care of infants and children who have suffered from perinatal asphyxia. Illustrating, therefore, the importance of taking action in the application is likely to ensure a proper charge that meets the specificities of these infants and children.

Keywords: Perinatal suffering, overall retardation of motor development, convulsion, hemiplegia, cerebral palsy blindness, deafness, re-education.

Introduction

The World Health Organization has consistently emphasized the widening gap between developed and developing countries in terms of neonatal mortality [1]. In addition, based on data collected in recent decades, the "Levels and Trends in Child Mortality" report confirmed that about half of the 69 million deaths of children under five expected between 2016 and 2030 will take place during the neonatal period. It is therefore important for developing countries to strengthen and accelerate progress in order to reduce morbidity and corollary neonatal mortality at the rate set for 2030 [2]. With the death of one million newborns on the day of birth, and two million

during the first week of life, African and Asian countries have attracted the attention of international organizations. [2] In 2008, UNICEF, the World Health Organization, the United Nations Population Fund and the World Bank agreed to work collaboratively to accelerate progress on neonatal health in all settings countries with alarmingly high rates of mortality and morbidity [3]. In this case, fighting against the causes of 86% of neonatal deaths, namely; prematurity ; serious infections ; and perinatal asphyxia [4]. Nevertheless, the results reported in 2015 show that, notwithstanding all the efforts made, the situation remains problematic in these countries [2]. Like other African countries, Morocco, by subscribing to the Millennium Development Goals, has pledged to reduce infant mortality by two-thirds by 2015, and therefore an arsenal of action was conducted. However, neonatal mortality is still a real public health problem in Morocco. It appears with very high rates [5] of 18 deaths per 1,000 live births in 2015 [6], and it continues to kill thousands of newborns each year. More precisely, in 2011, it ravaged 11500 newborns before 28 days of life [5]. With these alarming rate, Morocco is very remote class ranks compared to other Arab countries. If in 2015, the neonatal mortality rate is still 18 deaths per 1000 live births, Tunisia has reached 8 deaths per 1000 live births, Libya has recorded this year only 7 deaths per 1000 live births, and Oman was able to arrive at only 5 deaths per 1000 live births [2].

Findings justifying the need to conduct research around the perinatal period, in a vision to participate in reducing the risks of neonatal morbidity and mortality in Morocco. Moreover, aware of the importance of this momentum, the 2012-2016 action plan, to accelerate the reduction of maternal and neonatal mortality, has outlined a specific line of intervention for neonatal health research.

According to health figure of 2014, the causes of neonatal mortality in Morocco are mainly preterm birth, perinatal

asphyxia, and infection [7]. Perinatal asphyxia is the third leading cause of neonatal mortality worldwide, with the exception of Morocco where it is the second leading cause of neonatal mortality. Since this pathology generates the main morbid risk of the perinatal period, namely; Hypoxic-ischemic encephalopathy (HIE) [8]. The realization of studies on the asphyxia of newborns is justified. In the light of these findings, this study aims to highlight a table of morbidity and mortality caused by perinatal asphyxia at the National Reference Center for Neonatology and Nutrition at the Children's Hospital.

1. Material and methods

Over a 24-month period from January 2015 to December 2016, this retrospective study was conducted at the National Reference Center for Neonatology and Nutrition in Rabat. According to the statistics register of this center, its average occupancy rate is 92.05, it recorded during the period 2015-2016 a number of hospitalization of 7265 newborns, of which about 8% due to the perinatal asphyxia [9].

1.1 Inclusion criteria

In this study were included all newborns admitted to the National Reference Center in Neonatology and Nutrition with a diagnosis of perinatal asphyxia, regardless of their gender and their origins.

1.2 Exclusion criteria

This study excludes asphyxia neonates with an associated pathology, newborns whose families refuse to participate in the study, and neonates whose parents participated in the data collection tools test used in the study.

1.3 Data collection

The study was conducted through a questionnaire on the medical information of asphyxiated newborns. Such as, parity, the term of pregnancy, the mode of delivery, the birth weight, the resuscitation at birth, the degree of perinatal asphyxia, the prognosis of the newborns, the pathologies developed following the perinatal asphyxia,

duration of hospitalization, re-education, and monitoring of infants. The socio-demographic information section introduced in the questionnaire revealed data such as, the sex of the newborn, its origin, the age of the mother,

1.4 Ethical considerations

The Ethics Committee of the Faculty of Medicine and Pharmacy of Rabat and the administration of the National Reference Center for Neonatology and Nutrition gave their authorizations for the realization of this study. Informed consent was obtained from each parent at the time of entry into the study. Participation in the study was for free, confidentiality and anonymity were respected.

1.5 Some definitions

1.5.1 Degrees of perinatal asphyxia

According to the classification of SARNAT and SARNAT, perinatal asphyxia is classified in three degrees, normal state, moderate encephalopathy and severe encephalopathy.

1.5.2 Resuscitation at birth

Referring to hospitalization records at the National Reference Center for Neonatology and Nutrition at the Children's Hospital, this study raised the realization or not of resuscitation at birth for newborns with perinatal asphyxia.

1.5.3 Prognosis of newborns

Based on the decisions of physicians treating asphyxial newborns included in this study, the normal or abnormal prognosis of these cases is analyzed.

1.5.4 Re-education

The use or not of the sessions of the re-education is studied in this research, by checking the number of the sessions realized by case, and the place of the realization of these sessions.

1.5.5 Monitoring of infants

Through the household survey and by studying the medical records of the different newborns included in this study, we checked the monitoring or not of these

newborns, in case of discontinuation of monitoring, the nature of the decision; medical or parental, and the reasons for the decision in the event of a parental decision.

1.6 Statistical Analysis

The data were imported into an Excel file and then transferred to the SPSS V20 software. The qualitative variables were compared by the Pearson Chi2 test and the comparison of the means of the quantitative variables was done by the Student's test. The results are reported as numbers with the corresponding percentages or on average ± standard deviation. P values below 0.05 were considered statistically significant.

2. Results

The study highlighted a table of morbidity and mortality caused by perinatal asphyxia at the National Reference Center for Neonatology and Nutrition at Children's Hospital.

2.1 Flow Chart of the study

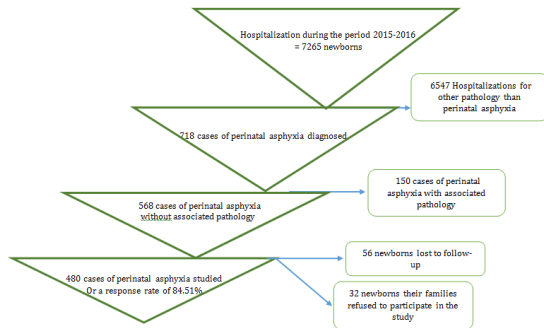


Figure 1: Summary of the flow of newborns participating in the study.

2.2 Sociodemographic characteristics of the studied cases

As shown in Table 1, the average age of infants at the time of the survey was 14,88± 6,85. 1.42% were newborns, 37.2% their age varies between] 18 months, 24 months], 26.07% their ages vary between] 6 months, 12 months], and 17.3% were aged more than 24 months. The average age of the mothers, of asphyxial cases included in this study, is 32,91± 9,22. Mothers under the age of 20 represented by a percentage of 15.21%, mothers aged between [20 years, 30 years [evoked in 11.67%, mothers between [30 years, 40 years] accounted by percentage of 43.33%, and mothers over the age of 40 accounted by 29.79% of cases. The sex of newborns was female in 54.8%. The sex of respondents who responded to the questionnaire was male in 67.1% of cases. The condition of the newborn at the time of the survey was alive in 87.9% of cases. The origin of the studied cases was urban in 41.9%, periurban in 34.8% and rural in 23.3% of the cases. The majority of cases included in this study were from the Rabat-Salé-Kenitra region (96.04%).

Table 1. Sociodemographic characteristics of the cases studied

Variables	Asphyxial neonates N = 480	
	Effective	Percentage (%)
The age of the infant / child at the time of the survey (mean ± SD)	14,88 ± 6,85	
The age of the infant / child at the time of the survey		
[0 month, 1month]	6	1,42
[2 month, 6month]	10	2,37
[6 month, 12month]	110	26,07
[12 month, 18 month]	66	15,64
[18 month, 24month]	157	37,2

>24 month	73	17,3
Mother's age (mean ± SD)	32,91± 9,22	
Mother's age		
< 20 years	73	15,21
[20 years, 30 years [56	11,67
[30 years, 40 years]	208	43,33
> 40 years	143	29,79
Sex of the newborn		
Female	263	54,8
Male	217	45,2
Sex of the respondent		
Female	158	32,9
Male	322	67,1
State of the newborn at the time of the survey		
alive	422	87,9
dead	58	12,1
Provenance of the studied cases (zone)		
urban	201	41,9
suburban	167	34,8
rural	112	23,3
Provenance of the cases studied (region)		
Rabat-Salé-Kenitra	461	96,04
Casablanca-Settat	7	1,46
Tanger-Tétouan-Al Hoceima	6	1,25
Drâa-Tafilalet	3	0,63
Fès-Meknès	3	0,63

2.3 The medical information of asphyxial newborns included in this study

According to the results in Table 2, 98.5% of the mothers of asphyxia neonates did not have a medical or surgical history. The parity of the mothers of the cases included in this study was primiparity in 44.2%, and more than fifth part in 1.9% of cases. These mothers had a history of perinatal asphyxia in 14.2% of cases. Their terms of pregnancy was between 37 and 40 weeks of amenorrhea in 88.3%. Their mode of delivery was vaginal birth in 69,4%, and cesarean in 30,6%. The birth weight of the asphyxial neonates studied was eutrophic in 75.6%, hypotrophic in 16.7% and hypertrophic in 7.7%. 99.2% of these newborns were resuscitated in the birth room. The average duration of hospitalization of the cases studied, at the level of the neonatology center, was 9,88± 5,12, this duration was in 41.5% of cases between [7d, 30d [. The condition of the newborns with perinatal asphyxia was three degrees Normal, (Perinatal asphyxia I (SNNI), 19.8%), moderate encephalopathy, (SNN II, 38.75%), and encephalopathy severe (SNNIII, 41.45%).

Table 2. The medical information of asphyxial newborns included in this study

Variables	Asphyxial neonates N = 480	
	Effective	Percentage (%)
Maternal antecedents		
No	473	98,5
Yes	7	1,5
Parity		
Primipare	212	44,2
2nd P	134	27,9
3rd P	72	15,0
4th	40	8,3
5th	13	2,7
> 5	9	1,9
History of cases of perinatal asphyxia		
No	412	85,8
Yes	68	14,2
Term of Pregnancy		
Exceeding term	56	11,6
A term	424	88,3
Mode of delivery		
Vaginal birth	333	69,4
Cesarean.	147	30,6
Weight at birth		
Eutrophie	363	75,6
Hypertrophy	37	7,7
hypotrophy	80	16,7
Resuscitation at birth		
Yes	476	99,2
No	4	0,8
Duration of hospitalization (mean ± SD)		
	9,88 ± 5,12	
Duration of hospitalization		
1d	15	3,1
2d	62	12,9
3d	83	17,3
] 3d, 7d [116	24,2
[7d, 30d [199	41,5

30 days	5	1,0
Degrees of perinatal asphyxia		
SNNI	95	19,8
SNNII	186	38,75
SNNIII	199	41,45

2.4 The evolution of the state of health of the cases included in this study

Table 3 reports results showing that in 60.43% the evolution of asphyxial newborns included in this study was abnormal. The pathologies diagnosed were cerebral palsy in 32.15%, overall retardation of motor development

in 29.80%, hemiplegia in 9.02%, blindness in 7.04%, and deafness in 5.10%. 30.02% of these cases stopped medical monitoring following a decision by their parents.

Table 3. The evolution of the health status of the cases included in this study

Variables	Asphyxial neonates N = 480	
	Effective	Percentage (%)
Prognosis declared		
Abnormal evolution	255	60,43
Normal evolution	167	39,57
Reported health problems		
Cerebral palsy	82	32,15
Overall retardation of motor development	76	29,80
Convulsion	43	16,86
Deafness	13	5,10
Hemiplegia	23	9,02
Blindness	18	7,04
monitoring of infants / children with asphyxia		
Yes	178	69,80
No	77	30,2

2.5 Delivery of re-education sessions

According to Table 4, among the 255 cases with a bad prognosis, 24.31% did not benefit from the re-education sessions. For the cases having done re-education sessions, 49.22% had two sessions per week

and 44.56% one session per week. These sessions were held at the regional or provincial hospital in 52.33% and at associations in 34.71%.

Table 4. Delivery of re-education sessions

Variables	Asphyxial neonates N = 480	
	Effective	Percentage (%)

Benefit from re-education sessions

Yes	193	75,69
No	62	24,31

Number of sessions per week

1 time / W	86	44,56
2 times / W	95	49,22
3 times / W	12	6,22

Structures providing re-education sessions

Association	67	34,71
Hospital	101	52,33
Health center	8	4,15
Private cabinet	17	8,81

2.6 The reasons why the parents decided to stop the medical monitoring

Table 5 lists the reasons given by families to justify their decision to discontinue their infants / children monitoring. According to this table, the non-achievement of the radiological or biological examinations requested by the

doctor was advanced in 46.75%. The lack of financial resources in 35.06%, the postponement of appointments by the care structure in 11.69%, the choice of traditional medicine in 3,90%, the problem of geographical accessibility in 1.30 % and non-acceptance of the health status of their infants / children in, also, 1.30%.

Table 5. Justifications provided by parents of asphyxia cases not monitored

Variables	Asphyxial neonates N = 480	
	Effective	Percentage (%)
The reasons why parents decided to stop monitoring their infants / children		
Lack of financial resources	27	35,06
Geographic accessibility	1	1,30
Examinations requested not done	36	46,75
Postponement of appointments by the care structure	9	11,69
Parents do not accept the health status of their newborn	1	1,30
Use of traditional medication	3	3,90

2.7 Association between the socio-demographic conditions of the cases studied and the stages of the severity of perinatal asphyxia

Table 6 reports associations between three sociodemographic conditions included in this study and the severity of perinatal asphyxia: maternal age (<0.001),

sex of the newborn (0.003), and household provenance. (0.003).

Table 6. Association between the socio-demographic conditions of the cases studied and the stages of the severity of perinatal asphyxia

	SNNI (n=95)	SNNII (n=186)	SNNIII (n=199)	P-value
Mother's age				
<20 years	15 (15,78%)	32 (17,2%)	26 (13,07%)	< 0,001
[20 years, 30 years old [37 (38,95%)	14 (7,53%)	5 (2,51%)	
[30 years, 40 years]	23 (24,21%)	80 (43,01%)	105 (52,76%)	
> 40 years	20 (21,05%)	60 (32,26%)	63 (31,66%)	
Sex of the newborn				
Female	37(38,95%)	68 (36,56%)	53 (26,63%)	0,003
Male	58 (61,05%)	118 (63,44%)	146 (73,37%)	
Provenance of the cases studied				
Urban	46 (48,42%)	74 (39,79%)	81 (40,7%)	0,003
Periurban + Rural	49 (51,58%)	112 (60,21%)	118 (59,3%)	

2.8 Association between the medical characteristics of the cases studied and the severity of perinatal asphyxia

Medical characteristics of the cases included in this study have influences on the severity of perinatal asphyxia.

Table 7 shows that the following aspects are associated with the severity of perinatal asphyxia: history of perinatal asphyxia (<0.001), parity (0.033), term of pregnancy (0.047), and mode of delivery (<0.001).

Table 7. Association between the medical characteristics of the cases studied and the severity of perinatal asphyxia.

	SNNI (n=95)	SNNII (n=186)	SNNIII (n=199)	P-value
History of neonatal asphyxia				
No	88 (92, 63%)	156 (83, 87%)	168 (84, 42%)	< 0,001
Yes	7(7, 37%)	30 (16, 13%)	31 (15, 58%)	
Parity				
Primipare	61(64,21%)	93 (50%)	58 (29,14%)	0,033
Second party	19 (20%)	43 (23,11%)	72 (36,18%)	
Third party	7 (7,37%)	33 (17,74%)	32 (16,08%)	
Fourth party	5 (5,26%)	10 (5,38%)	25 (12,56%)	
Fifth parity	3 (3,16%)	3 (1,61%)	7 (3,52%)	
More than a fifth party	0	4(2,15%)	5 (2,51%)	
Term of pregnancy				
Exceeding term	13 (13,68%)	23 (12,37%)	20 (10,05%)	0,047
A term	82 (86,32%)	163 (87,63%)	179 (89,95%)	

Mode of delivery

Vaginal birth	70 (73,68%)	138 (74,19%)	125 (62,81%)	< 0,001
Cesarean.	25 (26,32%)	48 (25,81%)	74 (37,18%)	

Weight at birth

Eutrophique	71(74,74%)	150 (80,65%)	142 (71,36%)	0,095
Hypertrophique	0	16 (8,6%)	21 (10,55%)	
Hypotrophique	24 (25,26%)	20 (10,75%)	36 (18,09%)	

Resuscitation at birth

Yes	95 (100%)	186 (100 %)	195 (97,99%)	0,053
No	0	0	4 (%)	

2.9 Mortality and morbidity table for perinatal asphyxia cases included in this study

The table of mortality and morbidity of cases of perinatal asphyxia included in this study reported in Table 8, illustrates that 43 deaths were among the third degree of perinatal asphyxia, 15 among the second degree of perinatal asphyxia and no deaths in the first degree of perinatal asphyxia. In the same way, the abnormal evolutions are more numerous in the cases of the third degree of perinatal asphyxia (142 cases) than the cases of the second degree of this pathology (113 cases). While, all the cases of the first degree had a normal evolution. Cerebral palsy accounts for 35.21% of cases of the third degree of perinatal asphyxia; that's 50 cases. Exceeding this fact, the cases recorded under the second degree of perinatal asphyxia (32 cases). The overall retardation of motor development is found in 35.40% of the second

degree of perinatal asphyxia; 40 cases. Advancing in this way, cases recorded in the context of the third degree of perinatal asphyxia. This last degree records a greater number of cases of convulsion, deafness and hemiplegia, comparing with the second degree of perinatal asphyxia. Either respectively 24, 9 and 14 cases, against 19.4 and 9 cases in the second degree of perinatal asphyxia. The number of cases of blindness is the same in the second and third degree. The time when cases of the first degree of perinatal asphyxia did not register any health complications. Infants and children who did not receive the re-education sessions were 37 cases of the third degree of perinatal asphyxia, and 25 cases of the second degree of perinatal asphyxia. In 29,20% of the second degree and in 30,99% of the third degree of perinatal asphyxia the parents decided to stop the medical monitoring of their infants / children.

Table 8. Mortality and morbidity table for neonatal asphyxia cases included in this study.

	SNNI (n=95)	SNNII (n=186)	SNNIII (n=199)
State of the child at the time of the survey			
Alive	95 (100%)	171 (91,94%)	156 (78,39%)
dead	0	15 (8,06%)	43 (21,61%)

The evolution of children's health

status

Abnormal evolution	0	113 (66,08%)	142 (91,03%)
Normal evolution	95 (100%)	58 (33,92%)	14 (8,97%)

Reported health problems

Cerebral palsy	0	32 (28,32%)	50(35,21%)
Overall retardation of motor development	0	40 (35,40%)	36 (25,35%)
Convulsion	0	19 (16,81%)	24 (16,9%)
Deafness	0	4 (3,54%)	9 (6,34%)
Hemiplegia	0	9 (7,96%)	14 (9,86%)
Blindness	0	9 (7,96%)	9 (6,34%)

Benefit from re-education sessions

Yes	0	88 (77,88%)	105 (73,94%)
No	0	25 (22,12%)	37 (26,06%)

Infant / child monitoring

Yes	0	80 (70,80%)	98 (69,01%)
No	0	33 (29,20%)	44 (30,99%)

3. Discussion

The results of this study allowed to relate a table of the morbidity and mortality caused by perinatal asphyxia at the national reference center for neonatology and nutrition at the children's hospital. The age of the mother influences the severity of perinatal asphyxia. The P-value of this association is statistically significant less than 0.001. Confirming the results of the Luhete et al study on the association between low birth weight and maternal age in a population followed in Lubumbashi. This study has shown that the prevalence of low birth weight is higher among women <20 years of age. These women have a risk multiplied by 2.47 times to have a newborn of low weight by appearing with those whose age is > 20 years [10].

The sex of newborns included in this study is in association with the severity of perinatal asphyxia. The P-value of this association is statistically significant, it is

0.003. Corroborating the results of several studies, including; the study of Dali Yahia and Said Medjahed [11]; the study by Badawi et al [12]; the study by Thiam et al [13]; and the Rojoso study [14]. These studies found that the male sex is more exposed to developing neonatal asphyxia. The association between the origin of asphyxial neonates and the severity of perinatal asphyxia is presented in this study by a P-value of 0.003. Corroborating in this way the results of several researches attesting the influence of the origin of the individuals on their state of health. Including the results of investigations of the High Commission for Planning on neonatal mortality [15]; Abadou's work on reported deaths in different Paris districts [16]; the Lauchaud study on health vulnerability [17]; Study of Yaakoubd on inequality before death at younger ages [18]; and the Cherkaoui study on access to reproductive health for vulnerable

populations in Morocco [19]. The neonatal asphyxia history were associated with the severity of perinatal asphyxia. This association came out with a P-value of less than 0.001. According to the results of the crossover study, the percentage of mothers reporting a history of newborns with perinatal asphyxia increased from one degree of asphyxia to another. It is; 7.37% in the case of the first degree of perinatal asphyxia; 16.13% of the second degree of perinatal asphyxia; 15.58% of the third degree of perinatal asphyxia. Corroborating the results of the Harir et al [20] study on risk factors for neonatal mortality. These authors reported that of the 1,209 newborn infants included in their study, mothers had a history of neonatal death in 25.53% and a history of stillbirth in 21.27%; or 46.8% report a history of newborn death. The maternal parity of asphyxial newborns included in this study is associated with the severity of perinatal asphyxia. This relation was expressed with a statistically significant P-value of 0.033. Corroborating the advances of the study by Luhete et al. These researchers demonstrated that parity is significantly correlated with birth weight (OR adjusted = 2.61, 95% CI: 1.43-4.74) [10]. The severity of perinatal asphyxia is associated with the term of pregnancy. This association is represented with a P-value of 0.047. Thus contradicting the results of Douanla Nodem's study [21]. Indeed, he found that gestational age in its correlation with neonatal asphyxia does not represent a statistically significant difference; with a P-value of 0.18. The mode of delivery is associated with the severity of perinatal asphyxia. This relationship is reported with a P-value less than 0.001. Corroborating the results of several works, including; the study of Douanla Nodem [21]; and the study of Dali Yahia and Said Medjahed [11]. The weight of the newborn is not associated with the severity of perinatal asphyxia. The P-value of this association is 0.095. The same observation for the association between the realization of resuscitation

at birth and the severity of perinatal asphyxia. Because, the P-value is 0.053. On the one hand The results of Douanla Nodem's study [21] have recounted the same observation. Because, the P-value he found is 0.16. On the other hand, the study by Dali Yahia and Said Medjahed [11], the Chelo et al [22] study, and the Harir et al [20] study have shown that birth weight is a factor in risk to neonatal health. The percentage of asphyxial newborns died increases as they progress to grades of neonatal asphyxia. It represents; 0% of SNN I; 8.06% of SNN II; and 21.61% of the SNN III. Even finding regarding the evolution of the health status of newborn asphyxia. In fact, abnormal prognoses are reported from: 0% of SNN I; 66.08% of SNN II; and 91.03% of the SNN III. Confirming the results; of Maréchal et al [23] study; and the Lebbardi study [24]. These researchers reported in their studies that neonatal asphyxia is a cause of neonatal death. 100% of cases of SNN I have a normal prognosis. In contrast, 35.21% of SNN III cases, and 28.32% of SNN II cases, have cerebral palsy. The overall retardation of motor development is reported in; 35.40% of SNN II; and in 25.35% of the SNN III. Affirming the results; of Striijbis et al [25] study on cerebral palsy and the application of international criteria for acute intrapartum hypoxia; and the Leung et al. [26] study on the further reduction of the incidence of birth injury and birth asphyxia. Children and infants with convulsions constitute; 16.9% of the cases of the SNN III; and 16.81% of SNN II cases. Attesting the stipulations of the Lebbardi study [24] and the Pisani et al study [27]. These studies presented seizures as neurologic sequelae of perinatal asphyxia.

Deafness and hemiplegia are diagnosed only in cases of SNN II and SNN III. With respectively 3.54% and 6.34% for deafness and 7.96% and 9.86% for hemiplegia. Attesting the results of the Lindstrom et al study on the consequences of full-term birth with moderate neonatal

encephalopathy [28]. This group of researchers studied adolescents who had suffered neonatal encephalopathy at birth and found that of the 684 cases studied, 18% developed hearing loss. In addition, the Darleguy-Pili study recorded, in studying the fate of children with neonatal anoxic ischemic encephalopathy (IAE), that children who have suffered from a Grade III IBD suffer from deafness [29]. Blindness is diagnosed in; 6.34% of the SNN III cases, and 7.96% of the SNN II cases. Reaffirming the results of Marlow et al study [30]. In an aim to study neurocognitive and behavioral outcomes after neonatal encephalopathy, these researchers found cortical blindness as a consequence of this neonatal complication. And corroborating, too, the results of Darleguy-Pili study [29] having found that anoxic ischemic encephalopathy has caused cases of bilateral blindness in children who have suffered a grade III AEI. Children and infants went to re-education sessions in; 77.88% of the SNN II cases and 73.94% of the SNN III cases. The study showed that parents who decided to stop monitoring their children or infants accounted for 29.20% of SNN II cases; and 30.99% of the cases of SNN III. Among the cases of the SNN II, as cause animating this decision; 25% of parents reported lack of financial resources; 62.5% said they did not realize the requested examinations; and 12.5% decided to refer to traditional medicine. Whereas, in the case of SNN III, the parents decided accordingly; lack of financial resources in 29.26%; the non-completion of the balance sheets requested in 41.46%; repetitive postponement of appointments by the health facility in 21.96% ; the non-acceptance of the disease of their children / infants in 1.44%; and the use of traditional medicine in 4.88% of cases.

Conclusion

With 12.1% of deaths and 60.43% of abnormal evolutions, this study has shown that perinatal asphyxia is responsible for an alarming mortality and morbidity table. Urgent

action is needed to reduce the number of cases registered at the National Reference Center for Neonatology and Nutrition at the Children's Hospital of Rabat University Hospital. Moreover, the study of the socio-demographic and medical characteristics of the asphyxial newborns included in this study and their associations with the severity of perinatal asphyxia allowed to highlight a set of factors that influenced the cases of perinatal asphyxia in this study. Hence the importance of taking them into consideration when establishing actions to reduce perinatal asphyxia and these sequelae.

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Conflicts of interest

The authors stated that there are no competing interests.

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