Original Article

Neonatal Risk Assessment: Analysis of Obstetrical and Neonatal Data

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ABSTRACT

Background

Neonatal suffering is a major health problem in Morocco, as in other countries, and concerns the difficulties encountered by the newborn during the perinatal period. According to the WHO, the causes of this suffering are multiple, including health care, maternal health, access to health services, education and nutrition.

Aim

This study aims to clarify the epidemiological and anthropometric profile of neonatal suffering in Morocco by analysing 1,416 cases recorded over a five-year period (2019-2023) at the Idrissi Hospital in Kénitra.

Result

Analysis of Apgar scores, birth weights and foetal aspects reveals a predominance of full-term births (81.9%), with foetal weights mainly between 2,600 and 3,600 grams (50.8%). However, a significant proportion of newborns required resuscitation at birth (85.2%), indicating a high prevalence of perinatal complications. The low Apgar scores at 1 minute, with 58.6% of newborns having a score of less than 6, underline the importance of intensive neonatal monitoring. In addition, the distribution of medical interventions shows that 67.4% of deliveries required interventions such as episiotomy or caesarean section, reflecting proactive management of obstetric risks. In addition, the logistic regression model identified key factors associated with the need for neonatal resuscitation, such as maternal age, number of live babies, 1-minute Apgar score and newborn weight.

Conclusion

These results underline the importance of rigorous antenatal surveillance, particularly for pregnancies identified as being at risk, in order to prevent neonatal suffering.

Keywords

Neonatal distress; risk factor; Apgar score; neonatal resuscitation

INTRODUCTION

Neonatal distress is one of the most pressing challenges in developing countries, including Morocco, where it contributes significantly to neonatal mortality and morbidity[1]. This suffering refers to a set of complications and difficulties encountered by the newborn during the perinatal period, encompassing the moments immediately before, during and after childbirth[2]. The perinatal period is particularly critical, as it corresponds to a phase in which the newborn is extremely vulnerable, and any failure in care can have serious and lasting consequences for the infant's health.

In this context, the present study aims to gain a deeper understanding of the epidemiological and anthropometric profile of newborns suffering from perinatal complications. Based on the analysis of 1416 cases of neonatal suffering collected over a five-year period (2019-2023) in the maternity ward of the Idrissi Hospital in Kénitra, this research aims to provide critical data

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that could inform public health policies and contribute to the reduction of neonatal mortality inMorocco[3].

MATERIALS AND METHODS

This study is retrospective, descriptive and analytical, covering the period from 1 January 2019to 31 December 2023. It was conducted in the maternity ward of the Idrissi Hospital in Kénitra, more specifically in the "mother and child" unit.

The target population of the study included all suffering newborns born between 2019 and 2023and admitted to the "mother-child" unit of the Idrissi Hospital in Kénitra. A total of 1416 casesof neonatal distress were identified and included in this analysis. Data were collected from delivery partograms and birth records archived in the hospital archives department.

Data collection was based on an exhaustive analysis of the medical records of mothers and newborns. The variables studied were carefully selected and adjusted to minimise data loss andensure robust statistical analysis.

RESULTS AND DISCUSSION

Prevalence of comorbidities in the study population

From the results shown in Table 4, we note that the majority of mothers (96.2%) reported no comorbidities, which is an encouraging sign of the general good health of the study population.However, a small percentage of patients had medical conditions that required special attention. Diabetes, for example, affects 2.4% of mothers. This condition, particularly in the case of

Gestational diabetes, can lead to serious complications, such as foetal macrosomia, pre- eclampsia and the need for a caesarean delivery.

High blood pressure (hypertension) affects 1.3% of mothers and is another major risk factor. During pregnancy, hypertension can lead to severe complications such as pre-eclampsia, whichposes risks for both mother and child, including the possibility of premature birth and intrauterine growth retardation[4]. Although rare in this population (0.1%), asthma is also a condition to be closely monitored, as the physiological changes of pregnancy can worsen this condition, requiring careful management to avoid attacks that can compromisefetal oxygenation[5].

Table 4: Prevalence of maternal comorbidities in patients at delivery

Maternal comorbidities	Percentage
Nothing to report	96,2 b
Diabetes	02,4 a
Hypertension	01,3 a
Asthma	00,1 a
Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% level.

Prevalence of previous surgery and complications

Gynaecology

The results of this study show that 98.7% of patients had no significant previous surgical history, indicating a population that was predominantly healthy or had not required major surgery prior to pregnancy. However, a small proportion of patients had undergone specific surgical procedures: 0.6% had been operated for a goiter, 0.3% for a gall bladder, and 0.1% fora cyst. Other less frequent procedures included surgery for liver cysts (0.1%) and uterine fibroids (0.1%). The presence of a Double Scar Uterus (DSU) was reported in 0.2% of patients(Table 5).

Obstetrically, 92.5% of patients reported no significant complications during their current pregnancy. However, 5.2% were diagnosed with threatened preterm birth (CPB), the most common obstetric complication in this cohort. Other complications, although less common, included the association of threatened preterm birth with gestational hypertension (GVHD) in 0.8% of patients, as well as dystocia (0.2%) and preterm birth (0.3%). Caesarean section was performed in 0.2% of patients, while uterine fibroids and cysts were observed in 0.1% of patients.

These results show that although the majority of women do not have a history of surgery, a small proportion of patients do have a history of surgery that may influence the course of theirpregnancy and delivery. In particular, a history of surgery for goitre or abdominal pathologies such as cysts and gallbladder procedures may be associated with potential complications during pregnancy, requiring increased monitoring[6]. While a relatively high prevalence of threatened preterm birth has been noted, which is consistent with obstetric concerns related to neonatal and maternal morbidity[7].

Table 5: Prevalence of surgical history among patients at delivery

History of surgery	Percentage
Nothing to report	98,7 b
Operated on for goitre	00,6 a
Operated on for gall bladder	00,3 a
Operated on for cyst	00,1 a
Operated on for liver cyst	00,1 a
Operated for uteromyonetus	00,1 a
Double Cicatricial Uterus (DCU)	00,2 a
Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% level.

Table 6: Prevalence of previous gynaecological complications in patients at delivery

Complications gynaecology previous	Percentage
Nothing to report	92,5 b
Scar uterus	05,2 a
UC + HTAGravidic	00,8 a
UC + dystocia	00,2 a
Premature delivery	00,3 a
Caesarean delivery	00,6 a
Caesarean section	00,2 a
Uterine fibroma	00,1 a
Cyst	00,1 a
Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% level.

Obstetrical profile of mothers

Number of births

The data revealed that 56.1% of patients had never given birth, which is consistent with the high proportion of primiparous patients in this cohort. Around 21.1% had had one birth, and 11.9% had had two. The proportion decreased as the number of deliveries increased, with only 0.8% of patients having had six deliveries, and a small proportion (0.1%) having had seven deliveries (Table 9).

This distribution indicates that the majority of patients are at the beginning of their maternal journey, with little childbirth experience. Primiparous women, in particular, may require increased support and closer monitoring during pregnancy and birth to prevent complications[8].

Table 9: Total number of deliveries by women

Number of births	Percentage
0	56,1
1	21,1
2	11,9
3	4,9
4	2,8
5	2,3
6	0,8
7	0,1
Total	**100**

Means in the same column with the same letter do not differ significantly at the 5% level.

Obstetric parameters of patients at delivery

Following analysis of the results, we recorded that uterine height, which is an indicator of foetalgrowth and amniotic volume, varied considerably among patients. However, the most common measurements were between 28 and 32 cm, with peaks at 30 cm (18.7%) and 32 cm (15.5%). These values are typical of full-term pregnancies, indicating normal foetal growth. Lower uterine heights (10-25 cm) are uncommon, but when present may indicate intrauterine growth restriction or low amniotic fluid volume, requiring increased monitoring[9] (Table 18).

On the other hand, we note that a high percentage of women (91.9%) reported uterine contractions, which is expected during active labour. This is because the presence of contractions is a positive sign that labour is progressing. Similarly, the intensity of uterine contractions was reported as normal for 100% of patients, suggesting a progression of labour without abnormalities[10].

Fetal heart sounds were perceived in 86.9% of cases, while in 13.1% of cases they were not. Indeed, the absence of perception of fetal heart sounds may indicate fetal suffering, deterioration of the fetal condition, or technical errors during monitoring[11].

The shape of the cervix was found to be effacing in

47.3% of cases and completely effaced in 49.3%, while 3.2% were still long and only 0.1% closed. On the other hand, cervical effacementand dilation are critical indicators of the progress of labour. Cervical dilatation, on the other hand, showed that the majority of patients had a dilated cervix at 2 cm (40.1%) and 3 cm (13.5%), indicating that most were in the early active phase of labour. More advanced dilatations (7-10 cm) were less frequent but present, signalling progression to the transition phase[12].

Regarding foetal presentation, we noted that 92.8% of cases were apex, which is the optimal presentation for vaginal delivery. Abnormal presentations such as full breech (5.9%) or face (1.3%) were rare but important to identify, as they may require intervention such as caesarean section[13]. In relation to the height of presentation, the majority of fetuses were mobile (51.8%) or fixed (47.8%), while only 0.4% were engaged, which is expected in early labour.

Membranes were intact in 59% of patients, while 41% had ruptured membranes. The colour of the amniotic fluid, which was predominantly clear (84%), was a good indicator of foetal health. However, 14.8% of cases showed stained fluid, and 1.2% showed "pea puree" fluid, indicatingpotential fetal distress requiring immediate intervention[14].

In addition, the majority of patients had a normal body temperature of 37°C (88.8%). However, 8.3% of patients had a fever of 38°C, and 2.2% had a fever of 39°C, which may indicate an infection, requiring rapid assessment and treatment to avoid maternal and foetal complications.

Examination of the pelvis was normal in all cases, which is favourable for a vaginal birth. As for the examination of the perineum, 89.8% of patients had nothing to report, while 10.2% had a scarred perineum, which certainly influences the course of the delivery and the decision to perform an episiotomy or other interventions[15].

Table 18: Results of t-test analysis of obstetric and neonatal variables

Variables	t	df	Sig (2-tailed)	Mean Difference	95% Confidence Interval of the Difference				
					Lower	Upper			
Uterine height (cm)	369,887	1415	0	30,133	29,97	30,29			
Uterine contraction	126,523	1415	0	0,919	0,9	0,93			
Foetal heart sound	96,733	1415	0	0,869	0,85	0,89			
ColUterine shape	37,405	1415	0	0,562	0,53	0,59			
Dilation of the uterine cervix	47,003	1415	0	3,176	3,04	3,31			
Presentation of the foetus	9,934	1415	0	0,085	0,07	0,1			
Height of foetal presentation	36,011	1415	0	0,485	0,46	0,51			
State of placental membranes	45,096	1415	0	0,59	0,56	0,62			
Colour of the liquid on breaking	86,527	1415	0	0,864	0,84	0,88			
Maternal temperature	3235,009	1415	0	37,11511	37,0926	37,1376			
Examination of the pelvis and perineum	12,657	1415	0	0,102	0,09	0,12			

Mode of delivery and obstetric interventions

A total of 462 births (32.6% of the total) took place without any medical intervention. These cases represent spontaneous deliveries, where no instrumental or surgical assistance was required. This is generally a positive indicator of a normal progression of labour and birth, where neither the mother nor the foetus developed complications requiring intervention (Table 19). The remaining 954 deliveries (67.4%) required medical intervention. The most common interventions were episiotomy (584 cases) and caesarean section (336 cases). Episiotomy, an incision made to widen the perineum and facilitate the exit of the baby, was the most frequently used procedure. Indeed, this type of intervention indicates a high prevalence of situations where the practitioner deemed it necessary to prevent serious perineal tears or to facilitate a rapid delivery to avoid foetal distress[16].

Caesarean sections, which account for 23.7% of deliveries, are also a major intervention. Theyare often performed in cases of complications such as foetal distress, cephalopelvic disproportion, or other obstetric emergencies where vaginal delivery is contraindicated or impossible. Other interventions, although less frequent, include the use of vacuum extraction (24 cases), forceps (9 cases), and laparotomy (1 case). These interventions are generally reserved for specific situations where it is necessary to actively assist the birthing process to prevent serious complications for the mother or child.

Table 19: Mode of delivery and types of obstetric intervention for patients at delivery

Intervention	No intervention	Episiotomy	Caesarean section	Suction cup	Forceps	Laparotomy	Total	
Delivery method	Without intervention	462	0	0	0	0	0	462
	With intervention	0	584	336	24	9	1	954
Total		462	584	336	24	9	1	1416

Logistic regression analysis

Logistic regression was used to examine factors associated with neonatal distress requiring resuscitation (dependent variable), based on a sample of 1416 newborns (Table 26). The regression model included a set of demographic, clinical and obstetric predictor variables.

In fact, the initial model (Step 0) has limited predictive capacity, with an accuracy of 85.2%, which is mainly due to the fact that the majority of observations belong to a single outcome category (requiring resuscitation). After including the variables in the model (Step 1), the overall accuracy increased slightly to 86.2%. The Nagelkerke R^2 value of 0.182 indicates that the model explains approximately 18.2% of the variance in the dependent variable, suggesting moderate explanatory power.

Among the variables included in this analysis, several were found to be significantly associatedwith the need for neonatal resuscitation, reflecting the importance of these factors in the management of newborns in distress.

Firstly, the mother's age proved to be a determining factor in the probability of neonatal resuscitation. The analysis revealed an odds ratio (OR) of 1.038 (95% CI: 1.010 - 1.067, p = 0.007), suggesting that each additional year of maternal age is associated with an increased riskof requiring resuscitation for the newborn. This relationship can be explained by the fact that older women are more likely to have obstetric complications and comorbidities such as hypertension and diabetes, which can influence neonatal wellbeing[17]. In addition, age-related physiological changes may affect the mother's ability to cope with the stress of childbirth, increasing the risk of fetal distress[18].

Another significant variable is the number of living children a mother has already had. The OR of 0.417 (95% CI: 0.215 - 0.810, p = 0.010) indicates that mothers who have already had several live children have a significantly reduced risk of having a newborn requiring resuscitation. This is because the increased obstetric experience of multiparous mothers enables them to better manage subsequent pregnancies, thereby reducing the risk of complications[18].

Table 26: Results of logistic regression analysis of risk factors associated with neonataldistress

Variables	B	H.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Year	-0,017	0,062	0,075	1	0,784	0,983	0,871	1,109
Age	0,037	0,014	7,218	1	0,007	1,038	1,01	1,067
Living environment	-0,269	0,175	2,362	1	0,124	0,764	0,542	1,077
Comorbidity	0,644	0,397	2,632	1	0,105	1,905	0,875	4,15
Previous surgery	0,055	0,265	0,043	1	0,836	1,056	0,628	1,775
Gynaecological history	-0,061	0,118	0,267	1	0,606	0,941	0,747	1,186
Number of pregnancies	0,184	0,39	0,221	1	0,638	1,202	0,559	2,583
Number of abortions	-0,37	0,383	0,934	1	0,334	0,691	0,326	1,463
Number of births	0,653	0,472	1,916	1	0,166	1,921	0,762	4,843
Number of living children	-0,874	0,338	6,667	1	0,01	0,417	0,215	0,81
Number of stillborn babies	-0,828	0,352	5,535	1	0,019	0,437	0,219	0,871
Date of last delivery	0,044	0,049	0,818	1	0,366	1,045	0,95	1,15
Place of last birth	-0,119	0,197	0,368	1	0,544	0,888	0,604	1,305
Mode of last delivery	-0,319	0,169	3,568	1	0,059	0,727	0,522	1,012
Age of pregnancy	0,009	0,018	0,27	1	0,603	1,009	0,975	1,045
Perinatal follow-up	-0,147	0,269	0,299	1	0,584	0,863	0,509	1,463

Perinatal follow-up centre	1,2860,7360,9730,84810,0370,142-0,027
Pregnancy progress	1,220,5620,8280,34110,9080,198-0,189
Uterine height	1,0550,940,9960,89410,0180,029-0,004
Uterine contraction	1,530,4470,8270,54510,3670,314-0,19
Fetal heart sound	2,5540,9931,5930,05313,7320,2410,465
Shape of the cervix	1,1080,5930,810,18811,7330,16-0,21
Dilation of the uterinecervix	1,0280,9130,9690,311,0720,03-0,031
Presentation of the foetus	2,3490,7741,3480,29111,1140,2830,299
Height of foetal presentation	1,3490,6910,9660,83710,0420,171-0,035
Membranes of theplacenta	1,3480,6770,9550,79410,0680,176-0,046
Colour of the liquid on breaking	1,7440,7011,1060,66510,1880,2320,101
Maternal temperature	1,3150,5950,8840,54410,3680,203-0,123
Examination of the perineum	1,6540,5460,950,85710,0330,283-0,051
Delivery method	3,030,1230,6110,54610,3640,817-0,493
Presence of intervention	1,0490,5280,7450,09212,8390,175-0,295
Fetal condition at birth	7,0830,9912,650,05213,7720,5020,974
Apgar 1 min	0,910,7220,8110112,6760,059-0,21
Apgar 5 min	1,1280,9131,0150,78610,0740,0540,015
Sex of foetus	1,3440,6890,9620,82110,0510,171-0,039
Fetal weight	1,00111,0010118,18500,001
Appearance of the foetus	2,0670,7891,2770,3210,9880,2460,244
Constant	4,6009E+160,75910,094124,88938,368

Furthermore, the number of stillbirths was also associated with a reduced risk of neonatal resuscitation, with an OR of 0.437 (95% CI: 0.219 - 0.871, p = 0.019). This may reflect a selection bias whereby women with previous perinatal losses receive more intensive obstetric monitoring in subsequent pregnancies, which contributes to improved newborn outcomes.

The Apgar score, used to assess the vitality of the newborn immediately after birth, is strongly correlated with the need for resuscitation. A low Apgar score at 1 minute is associated with an increased need for resuscitation, with an OR of 0.811 (95% CI: 0.722 - 0.910, p < 0.001). A low score often reflects immediate respiratory or cardiac difficulties, justifying rapid intervention to stabilise the newborn. This indicator is essential for the early detection of at-risk newborns and guides immediate action in the delivery room.

Finally, foetal weight also appeared to be a significant factor in the analysis, although the effect observed was relatively small (OR = 1.001, p < 0.001). Although the OR is close to 1, low birth weight is often associated with neonatal complications, such as respiratory problems or hypothermia, which may require immediate intervention.

As a result, this logistic regression model identified key factors associated with the need for neonatal resuscitation, such as maternal age, number of live infants, 1-minute Apgar score, and fetal weight. Although the overall predictive power of the model is modest, it demonstrates an improved ability to anticipate resuscitation needs, providing valuable information for the management of prenatal and neonatal care. The statistical robustness of the associations identified reinforces the credibility of the results and their clinical applicability.

CONCLUSION

The results of this study identified risk factors associated with neonatal distress, including maternal age, number of live and stillborn infants, birth weight and 1-minute Apgar scores.

The high prevalence of neonatal resuscitation and obstetric interventions suggests a need to strengthen the capacity of health services to manage high-risk births. Improving antenatal care, particularly for women with high-risk pregnancies, is essential to reduce neonatal suffering. Careful monitoring of pregnancies, combined with targeted intervention strategies, could help improve outcomes for mothers and newborns. The results of this study call for better anticipation of the risks associated with complicated deliveries and the need for rapid neonatal intervention to ensure the survival and health of newborns

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Conflict of Interest

The authors assert that there are no conflicts of interest associated with this research.

Ethical clearence

There was no need for ethical clearance for this research.

Authorship contribution:

Rachid Elaazia: Acquisition of data, data analysis, interpretation of results, writing-original draft and submitting manuscript, Badreddine Dahou: involved in writing, reviewing, Amine Rkhaila: reviewing, Chahboun Mohammed.: supervision and writing-review, Chahboune Mohammed: supervision and writing-review, Rachid Elaazia, Chahboune Mohammed: interpretation of results, writing-original draft, reviewing and editing. All authors have read and agreed on the final version of the manuscript

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