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# Study of the Association between the social conditions of households and the severity of perinatal asphyxia at the National Reference Center for Neonatology and Nutrition of Rabat

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**Conflicts of Interest:** Nil

**Abstract**

**The objective of this work:** is to draw the existing association between the social conditions of households and the severity of perinatal asphyxia.

**Materials and Methods:** this is a retrospective study lasting 24 months. It was conducted at the National Reference Center for Neonatology and Nutrition at the Children's Hospital of University Hospital Center of Rabat. It includes all newborns admitted with a diagnosis of neonatal pain regardless of their origin.

**Results:** 568 asphyxial neonates were collected from 7265 hospitalizations during the 2015-2016 period. With a response rate of 84.51%, this study demonstrated the existence of association between the severity of perinatal asphyxia and the origin of households (P = 0.003); maternal education level (P = 0.002); household type of housing (P = 0.005); the household situation in the housing (P = 0.005); and the connection of the housing to a drinking water distribution network (P = 0.005).

**Conclusion:** This study demonstrated the existence of a relationship between social conditions of households, having a newborn asphyxia, and the severity of the recorded perinatal asphyxia, so it is important to consider these conditions during prenatal consultations to help reduce the rate of neonatal asphyxia.

**Keywords:** Perinatal asphyxia, social conditions, households.

## Introduction

Perinatal asphyxia is the consequence of a lack of fetal and neonatal oxygenation in the peripartum, at birth, and in the first minutes of life. It is a severe alteration of uteroplacental gas exchange, causing severe hypoxia and gas acidosis, followed by metabolic acidosis and impaired cellular metabolism [1]. It constitutes a real public health

problem at the international level, because of its importance as a cause of morbidity and neonatal mortality. It generates the main morbid risk of the neonatal period, namely, hypoxic-ischemic encephalopathy (HIE) [2]. It represents a socio-economic burden following the consequences that do not allow newborn babies to become development actors in their own country because of their reduced physical capacities.

According to the « santé en chiffre » of 2014, the causes of neonatal mortality in Morocco are mainly prematurity, neonatal asphyxia, and infection [3]. This ranking according to the degree of importance does not coincide with the situation at the global and African level. 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 and morbidity.

According to Thérèse Biselele et al, the reduction of perinatal mortality in low-income countries is imperative by concentrating investigations on perinatal asphyxia [2]. The analysis of 170 studies and articles carried out between 1980 and 2011 on this pathology demonstrated the lack of a sociological elucidation of this health problem [2]. Given the delay in Morocco in achieving the fourth Millennium Development Goal, despite all the efforts and strategies deployed by the Ministry of Health, a sociological study of perinatal asphyxia is important.

The aim of this study is to produce objective data on the influences of household social conditions on the severity of perinatal asphyxia of newborns.

## 1. Material and methods

This retrospective study was conducted over a 24-month period from January 2015 to December 2016. At the National Reference Center for Neonatology and Nutrition in Rabat. With an average occupancy rate of 92.05, this center recorded during the period 2015-2016 a number of hospitalization of 7265 newborns, about 8% of which were due to perinatal asphyxia. Of this percentage, 55 deaths are reported, or 9.68% of asphyxiated newborns [4].

### 1.1 Inclusion criteria

Were Included in this study all newborns admitted to the National Reference Center for Neonatology and Nutrition with a diagnosis of perinatal asphyxia, regardless of their origin.

### 1.2 Exclusion criteria

Were Excluded from this study asphyxial neonates with an associated pathology, neonates whose families refused 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 medical information, the degree of perinatal asphyxia, and household social data, such; the origin of the households, the educational level of the mother and the father; the type of housing of the household; the supply of drinking water. The study was completed by the analysis and extraction of additional information using the medical file.

### 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 have agreed to carry out this study. Informed consent was obtained from each head of household at the time of entry into the study. Participation in the study was free, respecting confidentiality and anonymity.

### 1.5 Some definitions

#### 1.5.1 Severity 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 Household

This study adopted the definition of the High Commission-plan; a group of individuals living in the same housing and having common expenses [5].

### 1.5.3 Provenance of households

The origin of households of asphyxial neonates has been studied according to three typologies, urban, pre-urban and rural.

### 1.5.4 Level of education

The educational level of the father and the mother is subdivided into eight categories; Illiterate; M'Cid or Koranic school; Primary; Secondary; High school ; Superior 1st cycle; Superior 2nd cycle; Superior 3rd cycle and doctorate.

### 1.5.5 The type of housing of the household

Household housing types are classified in this study according to the classification of the High Commission-Plan, namely; apartment in a building, traditional Moroccan house, modern Moroccan house, room of a house, slum, place is not provided for housing, and house to companion [5].

### 1.6 Statistical Analysis

The data were collected using a mixed individual questionnaire. These data were imported into an Excel file and 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 the results showing the relationship between the severity of neonatal asphyxia and the social conditions of the households included in this research.

### 2.1. Flow Chart of the study

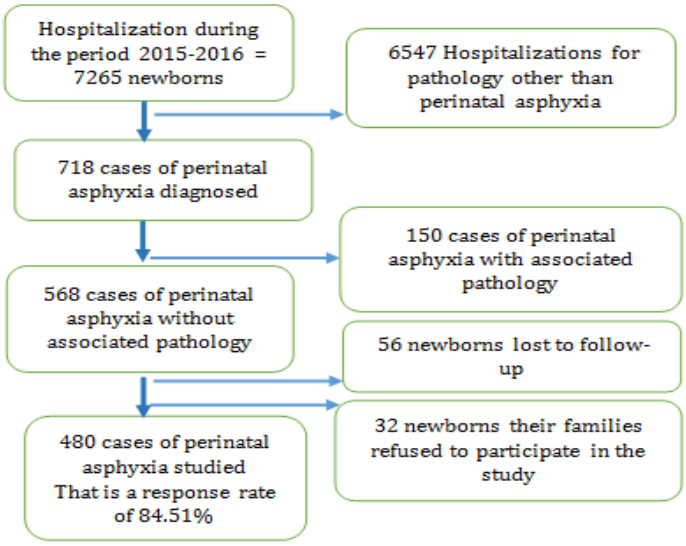


Figure 1: Summary of the flow of newborns participating in the study

2.2 Household characteristics of asphyxial newborns

According to the survey of 480 households with asphyxia newborns (Table 1), more than half of the of newborns are female (54.8%), and in almost the majority of households the father is declared as head of household (88.6%). Almost all mothers are married (97.3%), with a level of education as follows: illiterate (40.21%), primary (14.17%), secondary, (21.46%), Lycian ( 13.12%), and university (11.04%). The level of education of fathers is as follows: illiterate (29.8%), M'Cid or Koranic school (1.7%), primary (19.4%), secondary (22.5%), Lycian ( 16.5%), and academic (10.2%). More than half of the households live in a suburban (34.8%) or rural (23.3%) area, with almost total membership in the Rabat-Salé-Kenitra region (96.04%). Almost half of the households live in a traditional Moroccan house (42.5%), with about half of the tenants (47.39%). Approximately all households have electricity in the house (94%). In the absence of electricity, gas is used by most households (82.76%). Most homes are connected to a drinking water distribution network

(83.8%). When the houses are not connected to a drinking water distribution network, 75.64% of households do not process the water used, 55.13% travel one kilometer or more, the average distance traveled to reach the water source is 1,49 km ± 1,24 km, and 78.21% require more than 10 minutes to get to the water source, the average time needed to reach the water source is 15.25 minutes ± 3.48 minutes, And more than half of households live in a two-bedroom house (59%), the average number of rooms occupied by the family is 2.27 ± 0.5.

**Table 1. Household characteristics of asphyxial newborns**

| Variables | Newborn asphyxia N = 480 | |
|---|---|---|
| | Effective | Percentage (%) |
| **Sex of the newborn** | | |
| Female | 263 | 54,8 |
| Male | 217 | 45,2 |
| **Head of the family** | | |
| Father | 425 | 88,6 |
| Mother | 17 | 3,5 |
| Mother in law | 38 | 7,9 |
| **Marital status of the mother** | | |
| Married | 467 | 97,3 |
| Single | 1 | 0,2 |
| Divorcee | 11 | 2,3 |
| Widow | 1 | 0,2 |
| **Mother's level of education** | | |
| illiterate | 193 | 40,21 |
| Primary | 68 | 14,17 |
| Secondary | 103 | 21,46 |
| High school | 63 | 13,12 |
| Superior 1st cycle | 25 | 5,21 |
| Superior 2nd cycle | 28 | 5,83 |
| **Father's level of education** | | |
| illiterate | 143 | 29,8 |
| M'Cid ou école coranique | 8 | 1,7 |
| Primary | 93 | 19,4 |
| Secondary | 108 | 22,5 |
| High school | 79 | 16,5 |
| Superior 1st cycle | 46 | 9,6 |
| Superior 2nd cycle | 3 | 0,6 |
| **Provenance of households (zone)** | | |

| | | |
|---|---|---|
| urban | 201 | 41,9 |
| suburban | 167 | 34,8 |
| rural | 112 | 23,3 |
| **Provenance of households (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 |
| **Type of housing of the household** | | |
| Apartment in a building | 112 | 23,3 |
| Traditional Moroccan house | 204 | 42,5 |
| Modern Moroccan house | 9 | 1,9 |
| Room in a house | 28 | 5,8 |
| Slum | 26 | 5,4 |
| Location is not intended for housing | 7 | 1,5 |
| House to the companion | 94 | 19,6 |
| **Household status in the house** | | |
| Owner | 91 | 18,96 |
| Tenant (house) | 165 | 34,38 |
| Tenant (room) | 1 | 0,21 |
| Housing with the family | 165 | 34,38 |
| **Presence of electricity in household housing** | | |
| Yes | 451 | 94,0 |
| No | 29 | 6,0 |
| **Lighting method used** | | |
| Gaz | 24 | 82,76 |
| Bougie | 5 | 17,24 |
| **Presence of a drinking water distribution network in the housing** | | |
| Yes | 402 | 83,8 |
| No | 78 | 16,2 |
| **Water treatment** | | |
| Yes | 19 | 24,36 |
| No | 59 | 75,64 |

| | | |
|---|---|---|
| **Distance traveled to reach the water (mean ± SD)** | 1,49 km± 1,24 km | |
| **Distance traveled to reach the water** | | |
| <1km | 35 | 44,87 |
| [1km, 2km] | 30 | 38,46 |
| >2km | 13 | 16,67 |
| **Time needed to reach the water source (mean ± SD)** | 15,25 min ± 3,48 min | |
| **Time needed to reach the water source** | | |
| 10 min | 17 | 21,79 |
| [10min, 20min] | 61 | 78,21 |
| **Number of rooms occupied by the family (mean ± SD)** | 2,27 ± 0,56 | |
| **Number of rooms occupied by the family** | | |
| 1 room | 43 | 9,0 |
| 2 rooms | 283 | 59,0 |
| 3 rooms | 135 | 28,1 |
| 4 rooms | 19 | 4,0 |

**2.3 The stages of severity of perinatal asphyxia recorded**

The analysis in Table 2 shows that the condition of the newborn who had perinatal asphyxia is three degrees, Normal, (Perinatal asphyxiaI (SNNI), 19.8%), moderate encephalopathy, (SNN II, 38, 75%), and severe encephalopathy (SNNIII, 41.45%).

**Table 2. Stages of severity of perinatal asphyxia recorded**

| **Degrees of perinatal asphyxia** | **Newborn asphyxia N = 480** | |
|---|---|---|
| | **Effective** | **Percentage (%)** |
| **SNNI** | 95 | 19,8 |
| **SNNII** | 186 | 38,75 |
| **SNNIII** | 199 | 41,45 |

**2.4 Association between the social conditions of households and the stages of severity of perinatal asphyxia**

Table 3 shows that degrees of asphyxia are influenced by the type of head of the family (P = 0.005), household source (P = 0.003), mother's education level (P = 0.002) and father's education level (P=0,024).

**Table 3. The influence of household social conditions on the severity of perinatal asphyxia**

| | SNN (n=95) | SNNII (n=186) | SNNIII (n=199) | P-value |
|---|---|---|---|---|
| **Family situation** | | | | |
| Married | 95 (100 %) | 177 (95,16%) | 195 (98,99%) | |
| Single | 0 | 0 | 1 (0,50%) | 0,062 |
| Divorcee | 0 | 8 (4,30%) | 3 (1,50%) | |
| Widow | 0 | 1 (0,54%) | 0 | |
| **Head of the family** | | | | |
| Father | 91 (95,79%) | 167 (89,78%) | 167 (83,91%) | |
| Mother | 0 | 6 (3,22%) | 11 (5,52%) | 0,005 |
| Mother in law | 4 (4,21%) | 13 (6,99%) | 21 (10,55%) | |
| **Provenance of the household** | | | | 0,003 |
| urban | 46 (48,42%) | 74 (39,79%) | 81 (40,7%) | |
| Periurban + Rural | 49 (51,58%) | 112 (60,21%) | 118 (59,3%) | |
| **Mother's level of education** | | | | |
| Illiterate | 18 (18,95%) | 84 (45,16%) | 91 (45,73%) | |
| Primary | 17 (17,89%) | 22 (11,83%) | 29 (14,57%) | |
| Secondary | 00 | 45 (24,19%) | 58 (29,15%) | 0,002 |
| High school | 37 (38,95%) | 18 (9,68%) | 8 (4,02%) | |
| Superior 1st cycle | 13 (13,68%) | 7(3,76%) | 5 (2,51%) | |
| Superior 2nd cycle | 10 (10,52%) | 10 (5,38%) | 8 (4,02%) | |
| **Father's level of education** | | | | |
| Illiterate | 20 (23,53%) | 51 (27,41%) | 72 (36,18%) | |
| M'Cid or Koranic school | 3 (23,53%) | 3 (1,61%) | 2 (1,01%) | |
| Primary | 14 (11,76%) | 36 (19,35 %) | 43 (21,60%) | |
| Secondary | 34 (42,65%) | 41 (22,04%) | 33 (16,58%) | 0,024 |
| High school | 14 (1,47%) | 38 (20,43%) | 27(13,57%) | |
| Superior 1st cycle | 10 (7,35%) | 17 (9,14%) | 19(9,55%) | |
| Superior 2nd cycle | 0 | 0 | 3 (1,51%) | |

Using the Pearson Chi 2 test, Table 4 reports on the influence of household housing type (P = 0.005), household housing situation (0.005) and the housing connection to a distribution network of drinking water (0.005) on the severity of perinatal asphyxia. While, the other conditions do not have an influence on these, with P-values that exceed 0.05.

**Table 4. The influence of household housing conditions on the severity of perinatal asphyxia**

| | SNNI (n=95) | SNNII (n=186) | SNNIII (n=199) | P-value |
|---|---|---|---|---|
| **Type of household housing** | | | | |
| Apartment in a building | 28(29,47%) | 34 (18,28%) | 50 (25,12%) | |
| Traditional Moroccan house | 44 (46,31%) | 88 (47,31%) | 72 (36,18%) | |
| Modern Moroccan house | 0 | 8 (4,3%) | 1 (0,5%) | 0,005 |
| Room of a house | 6 (6,31%) | 9 (4,84%) | 13 (6,53%) | |
| slum | 6(6,31%) | 9 (4,84%) | 11(5,53%) | |
| Location is not intended for housing | 0 | 2 (1,07%) | 5 (2,52%) | |
| House to the companion | 11 (11,58%) | 36 (19,35%) | 47 (23,62%) | |
| **Presence of electricity in the house** | | | | |
| Yes | 92(96,84%) | 174 (93,55%) | 185 (92,96%) | 0,053 |
| No | 3 (3,16%) | 12 (6,45%) | 14 (7,04%) | |
| **How to discard wastewater** | | | | |
| Sewage channels | 71 (74,73%) | 147 (87,5%) | 140 (70,35%) | |
| Underground pit | 22 (23,16%) | 36 (19,35%) | 41 (20,6%) | 0,081 |
| In nature | 2 (2,11%) | 3 (1,61%) | 18 (9,04%) | |
| **Household situation in the house** | | | | |
| Owner | 48(50,53%) | 34 (18,28%) | 9 (4,52%) | |
| Tenant | 32 (33,68%) | 64 (34,41%) | 69 (34,67%) | |
| roomer | 0 | 0 | 1 (0,5%) | 0,005 |
| Mortgage with rent | 2 (2,11%) | 20(10,75%) | 36 (18,09%) | |
| Housing with the family | 13 (13,68%) | 68 (36,56%) | 84 (42,21%) | |
| **Number of rooms occupied by the family** | | | | |
| 1 room | 4 (4,21%) | 12 (6,45%) | 27 (13,56%) | |
| 2 rooms | 56 (58,94%) | 120 (64,51%) | 107(53,77%) | 0,241 |
| 3 rooms | 35(36,84%) | 48 (25,81%) | 52 (26,13%) | |
| 4 rooms | 0 | 6 (3,23%) | 13 (6,53%) | |
| **Composition of the family housing:** | | | | |
| Kitchen / Bathroom | 88 (92,63%) | 177 (95,16%) | 171 (85,93%) | |
| Toilet | 5 (5,26%) | 6 (3,23%) | 11 (5,53%) | 0,31 |
| Cooked | 2 (2,11%) | 3 (1,61%) | 17 (8,54%) | |

| | | | | |
|---|---|---|---|---|
| **Housing is granted to a drinking water distribution network** | | | | |
| Yes | 88(92,63%) | 149 (80,10%) | 165(82,91%) | 0,005 |
| No | 7 (7, 37%) | 37 (19,90%) | 34 (17,09%) | |

The analysis of how families perceive their social affiliation has shown, as shown inTable 5, the influence of this perception on the severity of perinatal asphyxia (0.001).

**Table 5. The influence of family perception of their social strata on the severity of perinatal asphyxia.**

| | SNNI (n=95) | SNNII (n=186) | SNNIII (n=199) | P-value |
|---|---|---|---|---|
| **Perception of the social stratum** | | | | |
| Poor | 20 (21,05%) | 114 (61,29%) | 130 (65,33%) | |
| Between poor and average | 14 (14,74%) | 38 (20,43%) | 39 (19,6%) | 0,001 |
| Average | 61 (64,21%) | 32 (17,20%) | 27 (13,57%) | |
| I do not know | 0 | 2 (1,08%) | 3 (1,5%) | |

## 3. Discussion

In this study we found several factors associated with the severity of perinatal asphyxia.

The marital status of the newborn mother has no influence on the severity of perinatal asphyxia at the National Reference Center for Neonatology and Nutrition of the C.H.U children's hospital in Rabat. Indeed, the P-value of this association is not statistically significant, it is 0.062. Thus invalidating the results of Douanla Nodem's study [6]; and the research of Raatikainen et al. [7].

One of the striking results of this study is that the severity of perinatal asphyxia is influenced by the type of head of the family. The p-value of this association is statistically significant of 0.005. Indeed, the monopolization of the role of head of the family by the husband or mother in law influences the autonomy of pregnant women in terms of access to timely care structures [8-9].

The influence of households provenance on the severity of perinatal asphyxia reported in this study is presented by a significant P-value of 0.003. Thus corroborating the results of several researches attesting to the influence of the individuals origin on their state of health. Us the results of the surveys of the High Commissioner for the Plan on Perinatal Mortality [10]; the Lauchaud study on health vulnerability [11]; the Yaakoubd study on inequality in the face of death at young ages [12] and the Cherkaoui study on access to reproductive health of vulnerable populations in Morocco [13].

The level of mother’s education is related to the severity of perinatal asphyxia. This association is statistically significant (0.002). Reaffirming the advances of studies in other contexts that have demonstrated the correlation between maternal education and children's health status. Among these studies, it is worth mentioning; Niang's study of mother's education and the health of her child [14]; the works of Thomas Strauss and Henriques on family decisions [15]; Cleland et al's work on maternal education and child survival in developing countries [16]; and Baya's study of parental education and child survival in Burkina Faso [17].

The level of father’s education influences the severity of neonatal asphyxia. This finding is reflected in the cross-tabulation of this study. Because the P-value of this

influence is statistically significant, it is 0.024. This result corroborates the advances of the Baya study [17]. This study has shown that father's education has a very significant and positive influence on child survival, and that the risk of infant mortality decreases with increasing father's educational level.

The influence of household type of housing on the severity of perinatal asphyxia is statistically significant (0.005). Certifying the results of the declarations of the World Health Organization on the association between housing conditions and the state of health of the population [18]; the Ambapour and Hylod study on the direct and indirect impact of community factors on child health [19], and Krieger's study on the actions to be taken in public health in the existing influence between housing conditions and health problems [20].

The presence of electricity in the families home has no influence on the severity of perinatal asphyxia. And this, with a P-value of 0.053. This result does not confirm the studies that have demonstrated the existence of a correlation between the presence of electricity and the quality of health of individuals. Such as the results; of Thomas and Strauss's study on the influence of infrastructure on children's health [21]; the study of Ambapour and Hylod on the direct and indirect impact of community factors on child health [19]; and Barnes et al.'s study on the influence of the use of traditional electrification methods on health status [22].

The association between the way in which wastewater is discarded and the severity of perinatal asphyxia is not statistically significant with a P-value of 0.081. This result does not confirm the advances of the Thomas and Strauss study on the existing of infrastructure nifluence on children's health [21].

The household's housing situation is associated to the severity of perinatal asphyxia recorded in this study. The P-value of this asssociation is 0.005. Affirming the evidence of the theory of the psychosocial environment [23]. According to this theory, people's perceptions of their social situations are likely to generate negative emotions such as stress and distrust, which induces a poor state of health through hormonal production and more specifically through mechanisms psycho-neuro-endocrine.

If the household situation in their house is significant, the number of rooms occupied by the family and the composition of the household in their influence on the severity of perinatal asphyxia are not statistically significant. Moreover, the first dimension is expressed with a P-value of 0.241 and the second with a P-value of 0.31. These results do not support the stipulations of the Ambapour et al. Study on the environmental variables of health [19].

The association between the housing connection with a drinking water distribution network and the severity of perinatal asphyxia is statistically significant. And this with a P-value of 0.005. Confirming the results of several researches, including; the Niang study, which commented on the correlation between the access or not to the drinking water and infant mortality [14]; and the Galiani, Gertler and Schargrodsky study on infant mortality in Argentina [24].

The household's perception of their belonging to a social stratum has influenced the severity of perinatal asphyxia. The P-value of this influence is 0.005. Corroborating the advances of the psychosocial environment theory [23] and the theory of stress biology [25].

**Conclusion**

This research has highlighted the existence of associations between the severity of perinatal asphyxia and most of the social variables taken into consideration. Hence the need for action, the application of which will help to alleviate the influence of family social conditions on the prevalence of perinatal asphyxia and help in corollary to the reduction of national neonatal mortality and morbidity.

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**Conflicts of interest**

The authors stated that there are no competing interests.

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