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Original Article

Predictive factors for the admission of a newborn in an intensive care unit

Fatores preditores para a admissão do recém-nascido na unidade de terapia intensiva

Factores predictivos para admisión de recién nacido en unidad de cuidados intensivos

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Analytical documentary and retrospective study aiming at determining association between predictive factors for admission of a newborn in a public Intensive Care Unit and maternal features. The study sample had 376 neonates admitted in 2009. Results showed: mothers aged between 19 and 25 years (43.4%), primary education (52.4%), living with a partner (66.2%). Prenatal care was done by 84.8% of them, and 62% presented gestational pathologies. Out of all neonates, 55.1% were male, 85.4% preterm, 83% underweight, 57.2% presented respiratory problems. The bivariate analysis showed a significant association between birth weight and growth (p = 0.04) between maternal age and Apgar in the 1st minute (p = 0.04) and maternal age and Apgar score in the 5th minute (p = 0.01). Maternal age and number of prenatal appointments influence on the admission of the neonates to the Intensive Care Unit because they are related to birth weight and Apgar scores.
Descriptors: Neonatal Nursing; Infant, Newborn; Intensive Care Units, Neonatal.

Estudo analítico, documental e retrospectivo com objetivo de determinar a associação entre os fatores preditores da admissão do recém-nascido em Unidade de Terapia Intensiva e características maternas. A amostra foi de 376 neonatos admitidos em 2009. Os resultados apontaram: mães com idade entre 19 e 25 anos (43,4%), nível primário de escolaridade (52,4%),vivendo com companheiro (66,2%). O pré-natal foi realizado por 84,8% e 62% apresentaram patologias gestacionais. Dos neonatos, 55,1% eram do sexo masculino, 85,4% pré-termo, 83% baixo peso, 57,2% apresentaram problemas respiratórios. A análise bivariada mostrou associação significativa entre peso ao nascer e evolução (p=0,04); entre idade materna e Apgar 1º minuto (p=0,04); e idade materna e Apgar no 5º minuto (p=0,01). A idade materna e o número de consultas pré-natal influenciam na admissão dos neonatos na Unidade de Terapia Intensiva, pois estão relacionados ao peso ao nascer e aos escores de Apgar.
Descritores: Enfermagem Neonatal; Recém-Nascido; Unidade de Terapia Intensiva Neonatal.

Estudio analítico, documental y retrospectivo con objetivo de determinar asociación entre factores predictivos para admisión de recién nacidos en Unidad de Cuidados Intensivosy características maternas. Muestra de 376 recién nacidos ingresados en 2009. Resultados señalaron: madres entre 19-25 años (43,4%), nivel primario de escolaridad (52,4%), viviendo en pareja (66,2%). La atención prenatal fue realizada por 84,8%, y 62% presentaron patologías gestacionales. De los recién nacidos, 55,1% eran del sexo masculino, 85,4% pretérmino, 83% de bajo peso, 57,2% con problemas respiratorios. En el análisis bivariado,hubo asociación significativa entre peso al nacer y crecimiento (p = 0,04); entre edad materna y Apgar 1º minuto (p = 0,04); y edad materna y Apgaren el 5º minuto (p = 0,01). La edad materna y el número de consultas prenatales influencian en la admisión de neonatos en Unidad de Cuidados Intensivos, pues están relacionados con peso al nacer y puntuaciones de Apgar.
Descriptores: Enfermería Neonatal; Recién Nacidos; Unidades de Cuidado Intensivo Neonatal.

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Introduction

The assistance in neonatology starts from the familiar planning, when the couple gets ready for pregnancy. The gestation will happen in a healthy way once it is assisted through a humanized prenatal care of quality, with easy access to the health services and with the minimum of six doctor´s appointments during all the gestation. With the assistance of quality during pregnancy, it is possible to detect intercurrences which anticipate or prolong the birth of the child[1].

In this sense, the newborn (NB) must receive a specialized assistance still in the delivery room, assistance which consists in keeping body temperature, establishing an opening airway and stimulates the beginning of respiration. The health team must still evaluate him according to the score of Apgar in the 1st and 5th minutes of life after the birth, the moment in which five general clinic signs of the child are analyzed: respiratory effort, cardiac frequency, muscular tonus, irritability and color[2].

This process is useful to describe the vitality of the child at birth and his consequent adaptation to the life out of the uterus, besides preventing the neonatal morbimortality. According to the answer shown during evaluation, the health professional must take the NB to the rooming-in or the Neonatal Intermediate Care Unit (NICU) or to the Neonatal Intensive Therapy Unit (NITU)[3].

For the reduction of the mortality in the neonatal period, the policies of health increased the offer of neonatal units. In the last years, the number of intermediate beds and neonatal intensive therapy in the public sector was increased, especially in the metropolitan regions of the south and southeast. The implantation of these units of treatment provides a survival of NB each time more premature and under weight. But, part of this population, even with specific care, still dies precociously[4].

In Piauí, Brazil, there was a predominance of neonatal mortality when compared to late child mortality or post neonatal (from 28 days until 1 year, incomplete). In 2008, the coefficient of child mortality in the state was 25.28 per 1,000 thousand alive, the coefficient of neonatal mortality was 18.51 and the late child mortality, 6.77 per 1,000 thousand born alive[5]. So, this research was aimed at determining the association between the predictive factor for the admission of NB in Intensive Therapy Unit (ITU) and the maternal features of a public maternity in Terezina, Piauí, Brazil.

Method

It is an analytical, documentary and retrospective study with quantitative approach, made in a public maternity in the state of Piauí, Brazil, which is a reference in the assistance of the most diverse complexities of the woman and child health attention.

The sample of the study was calculated by all the NB admitted at the NITU in the year 2009 in the maternity under study, constituting a total of 569. But 87 medical records were not found in the institution and 106 were excluded because they did not have all the variables selected for the making of the study. With that, 376 neonatal medical records who were admitted in the ITU in 2009 were studied.

For the data collection, a form with numbered variables of socio-demographic and maternal characteristics was used: age, origin, schooling, marital status, prenatal care, type of delivery, pathology in the gestation; and characteristic of the NB: sex, gestational age, birth weight, score of Apgar in the 1st and 5th minutes of life, initial diagnosis of admission in ITU and evolution. The collection was made from July to September 2010 together with the Services of File and Statistics of the maternity, which provides the medical records.

After the data collection, the data information was compiled in the *Excel* 2010 *software* and, after that, they were processed in the *Statistical Package for the Social Sciences* (SPSS) *for Windows*, version 17.0. Descriptive analysis of the variables related to the socio-demographic profile was made (measure of

central trend and variability), features of the mother and the NB of the population under this study. Besides this procedure, bivariate analysis with non parametric tests of $\chi 2$ (chi-squared) and *p* coefficient of *Spearman,* once great part of correlated variables had no normal distribution, thus making the use of parametric tests impossible. The interval of confidence adopted for the study was 95% and hypothesis of nullity was accepted whenever the value of p was above to 0.05.

Regarding the ethical precepts of Resolution 196/96 of the National Council of Health, this study was submitted to the Committee of Ethics in Research of the Dona Evangelina Rosa Maternity, which issued a favorable legal opinion under protocol no. 910/10.

Results

Regarding the variables of socio-demographic profile and the maternal characteristics of NBs admitted in the ITU, it was observed that 43.4% (no. = 163) of them, aged between 19 and 25 years and that 20.2% (no. =76) aged between 13 and 18 years. Regarding the origin, 83.5% (no. =314) were from the state of Piauí, Brazil, and 16.2% (no. =61) were from the neighboring state of Maranhão, of those 60.4% (no. =227) were from the countryside and 39.6% (no =149) were from capital city. Besides that, 73.7% (no. =277) lived in the urban area 26.3% (no =99) in the rural area.

Regarding schooling, it is observed that 52.4% (n=197) had complete or incomplete grade school and 39.1% (no. =147) had high school. As to marital status, it was observed that 66.2% (no. =249) of the mothers had a partner. The maternal data regarding gestation revealed that 84.8% (no. =319) had prenatal care, of those 62.0% (no. =233) had some pathology during pregnancy and 40.8% (no. =95) had infection and 32.2% (no. =75) had Hypertensive Disorders of Pregnancy (HDP) and 16.7% (no. =39) premature amniorrexe. Of these women 55.1% (no. =207) had caesarian delivery and 44.4% (no. =167) normal delivery.

Table 1 - Variables of socio-demographic profile and characteristics of the mothers who had their newborn admitted in the ITU(n=376)

Variables	n (%)
Age Range (years)	
13 to 18	76 (20.2)
19 to 25	163 (43.4)
26 to 30	72 (19.1)
31 to 45	65 (17.3)
Origin	
Piauí	314 (83.5)
Maranhão	61 (16.2)
Others	1 (0.3)
County	
Capital city	149 (39.6)
Countryside	227 (60.4)
Area	
Urban	277 (73.7)
Rural	99 (26.3)
Schooling	
Iliterate	13 (3.5)
Grade school	197 (52.4)
High school	147 (39.1)
Universtity	19 (5.0)
Marital Status	
Without a partner	127 (33.8)
With a partner	249 (66.2)
Prenatal care	
Yes	319 (84.8)
No	57 (15.2)
Presence of pathology during gestation	
Yes	233 (62.0)
No	143 (38.0)
Pathologies of gestation	
Infection	95 (40.8)
HDP	75 (32.2)
Premature Amniorrexe	39 (16.7)
Others	24 (10.3)
Type of delivery	
Normal	167 (44.4)
Caesaren	207 (55.1)
Forceps	2 (0.5)

Of the variables related to the NB, the highest frequency was in the male sex with 55.1% (no. =207). Regarding the gestational age (GA), 85.4% (no. =321) was preterm and 14.6% (no. =55) were term. Regarding weight, 83% (no. =312) of the NB was classified as underweight.

Concerning the initial diagnosis of admission in the ITU, 57.2% (no. =215) presented some respiratory problem, 34.0% (no. =128) were admitted because they were premature and 4.5% (no. =17) due to some kind of infection. Of the total number of the samples, 64.1% were transferred to the unit of intermediate care and 35.9% died.

Table 2 - Characteristic of NB admitted in the ITU (n=376)

Variables	n (%)
Gender	
Male	207 (55.1)
Female	169 (44.9)
Gestational age	
Preterm	321 (85.4)
Term	55 (14.6)
Weight at birth	
< 2,500 g	312 (83.0)
≥ 2,500 g	64 (17.0)
Diagnosis	
Respiratory problems	215 (57.2)
Prematurity	128 (34.0)
Infection	17 (4.5)
Others	16 (4.3)
Evolution	
Discharge for ICU*	241 (64.1)
Death	135 (35.9)

*Intermediate Care Unit

Regarding the measures of central trend and variability of the variables: maternal age, number of prenatal appointments, GA, weight at birth and Apgar in the 1st and 5 th minutes (table 3), the maternal age presented an average of 24.4 years (standard deviation (SD) = 6.6), concerning the number of prenatal appointments, the average was 3.12 appointments (DP=2.4), the GA presented an average of de 32.5 weeks (DP=4.2), weight at birth had an average of 1.749.2 g (DP=849.8), as to Apgar in the 1 st minute, the average was 6 points (DP=2.2) and in the 5 th minute, 8.1 points (DP=1.5).

Table 3 - Measures of central trend and variability of the variables maternal age, number of prenatal appointments, gestational age, weight at birth and Apgar in the 1st and 5th minutes

Variables	Average	IC[1]	SD[2]	Minimum	Maximum
Maternal age	24.4	23.7-25.1	6.6	13	45
Number of prenatal appointments	3.12	2.8-3.3	2.4	0	10
Gestational age	32.5	32.1-33.0	4.2	23	42
Weight at birth	1749.2	1663-1835	849.8	590	5175
Apgar 1st minute	6.0	5.8-6.2	2.2	0	10
Apgar 5th minute	8.1	7.9-8.3	1.5	0	10

[1]IC = Interval of confidence; [2]DP = Standard Deviation

Concerning the association of the evolution of NB with the variables GA, weight at birth and Apgar at the 1st minute, the test of $\chi 2$ revealed that only the weight at birth presented significant statistic association (p=0.04). Among the NB with weight below 2,500 g, 38.1% (no. =119) died and 61.9% (no. =193) went to the ICU. Among the NB with the weight above or equals to 2,500 g, 25.0% (no. =16) died and 75.0% (no. =48) had hospital discharge.

Table 4 - Association between the evolution of NB with the variables gestational age, weight at birth and Apgar in the 1st minute

Variables	Evolution of NB			$\chi 2$	p*
	Death	Discharge	Total		
	n (%)	n (%)	n (%)		
Gestational age				2.08	0.140
Preterm	120 (37.0)	201 (63.0)	321 (100.0)		
Term	15 (27.0)	40 (73.0)	55 (100.0)		
Weight at birth				3.98	0.040
<2500 g	119 (38.0)	193 (62.0)	312 (100.0)		
≥2500 g	16 (25.0)	48 (75.0)	64 (100.0)		
Apgar 1 st minute				3.51	0.060
0 to 6	85 (40.0)	128 (60.0)	213 (100.0)		
7 to 10	50 (31.0)	113 (69.0)	163 (100.0)		

*p value < 0.05

In search of correlations with the variable number of appointments, positive and dependent relations were found with the variables GA and weight at birth with the coefficient of Spearman 0.24 and 0.30 respectively, and p values of 0.01. So, the higher the number of appointments the higher the GA and weight at births are. In the correlation of the variable maternal age there was a significant relation with Apgar in the 1st and 5th minutes, with p value of 0.04 and 0.01 respectively.

Table 5 - Correlations among the number of prenatal appointments and the maternal age with the variables gestational age, weight at birth and Apgar in the 1st and 5th minutes

Variables	Number of appointments		Maternal age	
	p of Spearman	*p* value	*p of Spearman*	*p* value
Gestational age	0.24	0.01	0.22	0.330
Weight at birth	0.30	0.01	0.48	0.170
Apgar 1st minute	0.59	0.12	0.09	0.040
Apgar 5th minute	0.07	0.08	0.14	0.010

*p value < 0.05

Discussion

Several factors traditionally known, can determine the risk of death in the neonatal period, such as prematurity, low weight at birth and severe asphyxia at birth. These NBs need a more specialized assistance and can present a higher probability of admission in the NITU. Some factor related to the mothers can also contributed directly or indirectly to these indications such as high parity, low level of maternal schooling, low family income and advanced maternal age[6].

The results obtained in this study reveal that most mothers of this NB were in the age range of young adults between 19 and 25 years, with an average of 24.4 years, a period of life considered ideal for reproduction. But the adolescents from 13 to18 also present a significant number in the research. Among the pregnant adolescents, there is a greater possibility of having inadequate prenatal care, once this phenomenon is much more present in the excluded social group deprived of the family, partner and state support. With this, the pregnant adolescent starts prenatal care later and ends up having a lower number of appointments, when compared to the women aged twenty years or more[7].

Regarding origin, a significant number of women live in the state of Piauí, a fact that can be explained by the location of the maternity under study. But most mothers did not come from capital cities, but from the urban area of the countryside towns. It was perceived that there was a great demand of these women of the urban area of the countryside counties to the reference center in the capital city, a fact that could have been avoided if some intercurrences were precociously detected and treated.

So, it was observed that the decentralization of the health services, one of the principles of the Unified Health System (UHS), was presented as a severe problem of public health, once the NB admitted in the ITU of the maternity under study had characteristics which could be approached in regional centers of reference in the countryside of the state. Besides that, the time of transportation of these patients from the counties to the capital city gives fewer chances of survival due to the time spent with the transportation without initial assistance.

The fact that the pregnant women lived outside the capital city can make their access to prenatal assistance of good quality difficult, that is, with able professionals for the assistance of these women and also a minimum infrastructure of material resources and diagnosis support. These conditions are probably directly linked to the low number of prenatal appointments during gestation. Such reality makes the effective assistance of quality difficult. The Health Department (HD) shows that despite the increase in the assistance to prenatal, and the continuity of these appointments, it is still small and with low quality[2].

The low schooling of the mother is another fact which can influence in the assistance to the pregnant woman, so it is considered by the HD as an obstetric risky factor. The lower maternal schooling is presented as a danger for the mother and for the NB, once it directly influences in the prenatal care, in the perinatal and neonatal assistance, thus increasing the morbi-mortality in this age range among those with unfavorable socio-economic conditions[8].

Another socio-demographic aspect observed is that most pregnant women live with their partners, which is considered a positive aspect. Living with the father of the child can influence in the psychological aspect of these women and this has been translated by some authors as emotional, financial and psychosocial security for them. On the other hand, the lack of this partner can be a risk factor, once they feel more insecure, weakened and many times deny pregnancy, which collaborates with undesirable effects of gestation[9].

It was also observed that the prenatal care program has a wide coverage in the state of Piauí, Brazil, once most of the mothers studied had access to this type of assistance. On the other hand, the number of appointments made was inferior to what indicates the World Health Organization and the HD, once the average of appointments was only 3.12, which reflects a precarious assistance to the woman´s health and contributes to increase the rates of neonatal morbi-mortality.

In Piauí, Brazil, searching the reversion of this context, the training of professionals was made aiming at improving the assistance to the mother and to the NB in the pregnancy-puerperal cycle and consequently reduce the maternal and neonatal mortality. The maternal deaths are predominantly associated to the deficiency of the assistance rendered to the public health system[10]. According to the data of the health department of Piauí, an increase of 100.52% in the number of prenatal care appointments occurred between 2003 and 2009[11].

Concerning the pathologies during pregnancy, the infection, the HDP and the premature amniorrexe were outstanding. These affections were associated to unfavorable gestational outcome such as prematurity, low weight at birth, premature rupture of the membrane and puerperal infection and the genitor-urinary infections were considered the most significant[12].

All these characteristics related to the pregnant woman can lead this woman to surgical delivery. This was observed in this study, once most of the NBs admitted in the ITU were born through caesarean delivery. But this data can be an indicative of the indiscriminate use of this medical procedure or the fear that the obstetrician undergoes a vaginal delivery with a history of previous caesarean delivery.

The increase in the number of caesarean deliveries became a problem of public health and these rates provoked a higher maternal and perinatal morbi-mortality, when this surgical procedure is indicated without precise indication. In Brazil, the reasons which lead to this procedure are associated to an inadequate medical assistance, precarious education of the pregnant women and inadequate prenatal care[13].

So, once the caesarean delivery is not indicated, this type of procedure can bring a greater risk for a premature birth and undesirable events may occur, such as respiratory problems, puerperal infection, maternal and neonatal morbi-mortality. This increases the costs of the health system, once the neonate will need a more specialized assistance[14].

Regarding the NBs which were admitted in the ITU, it was observed that the most of them were male. A study made in Caxias do Sul, Rio Grande do Sul, Brazil, observed that the NB of the male sex presented a death risk 4.16 higher than the girls and there is a higher mortality in the gestational age below 39 weeks. One of the main reasons of this mortality in the female sex is the fetal lung maturity which occurs earlier in girls[15].

In this research, the inadequate weight at birth was very relevant, especially for the NB of low weight. This can be a factor of predispositions for serious problems of health, once the NBs with weight below

2,500 grams presented biological disadvantages which involves respiratory, metabolic and immunologic alterations of severe repercussion in the immediate postpartum, and which can jeopardize the growth and postnatal development[16].

An early and adequate follow-up and intervention will provide the neonates conditions so that even after a hospitalization in a specialized unit, his development can occur in a satisfactory way, besides favoring the professionals to provide technical support and support to the family so that they can take care of this neonate in the future[17].

So, the low weight at birth and the prematurity are predisposing conditions to more severe morbidities, as it was observed in this research, in which most of the NBs admitted in the ITU had diagnosis of respiratory problems. In another research[18], they were evidenced as the main causes of diseases in the neonatal period, the problems and/or maternal disorders, such as complication during pregnancy and delivery; the length of gestation and fetal growth, as well as respiratory, cardiovascular problems and infections[17].

Regarding the evolution of the NB, it was noticed that most of the patients had discharge for the intermediate care unit, but a significant number died. This reality contributes for the persistency of the rate of the neonatal mortality, a fact that causes worry to the health professionals and authorities in order to pursuit solutions of control and reduction of those rates.

It was observed that the evolution of the NB presented significant statistics when associated to the weight at birth. The weight at birth is described by several authors as a risk factor for neonatal mortality, on the other hand, it has been demonstrated that in developed countries, each time more, premature neonates with gestation ages and weights extremely low survive, and there have been rates of survival superior to 90% for premature neonates with weights between 1,000 and 1,500 grams; 86% for the ones who weigh between 751-1,000 g; 54-70% for those who weigh less than 750 grams[18].

In the pursuit of correlations between the number of prenatal appointments and the characteristics of the NBs, a positive relation with the variables GA and the weight at birth was found. This shows that prenatal care is a factor of protection for the NB, once the higher the number of appointments is, the higher is the GA and the weight at birth. In the study made in Aracaju, SE, Brazil in 2009, it was observed that 64.5% of mothers had more than 6 prenatal care appointments, they had a delivery with GA between 37 and 41 weeks and children with weight at birth between 3,000 and 3,499 g[19].

Besides that, it was noticed that the maternal age presented significant correlation with the Apgar of the NB in the 1st and 5th minutes. The maternal age is a neonatal risk factor when it is below 18 and above 35 years. In term, the score of Apgar showed a degree of moderate asphyxia in the 1st minute and a good score in the 5th minute. It is understood from these findings that there was an efficient assistance in the first minutes of life, a fact which can be essential in the process of birth and adaptation of the NB to the extra-uterine environment in a fast way, until stability is reached.

AG below 30 weeks, the very low weight at birth and score of Apgar in the 5th minute of life lower than 7, were defined as conditions with risk of life specific to the NB. For that, at least one of those characteristics in approximately 80% of all the early neonatal deaths was identified[20].

The Apgar in the 1st and 5th minutes is important to evaluate the physiological conditions and identify the NB who needs reanimation or differentiated care. The Apgar in the 1st minute analyses the need of immediate resurrection, while the Apgar in the 5st minute is strongly associated to the quality of care and indicates a well succeeded reanimation. When the procedures are ineffective, the possibilities of hospitalization in the ITU are increased. So, the Apgar in the 1st and 5th minutes, the length of gestation and the weight at birth are factors which strongly influence death in the neonatal period[14].

This study was limited to the investigation of only one year of admission due to the unavailability of the medical records of later periods. The need of other studies to be developed in the same institution is perceived, approaching the changing established by the health department to the assistance of the women pregnancy-puerperal cycle and the care to the neonate in order to investigate the possible changes in the risk factors found.

Conclusion

It was noticed that the age of the pregnant woman and the number of appointments of prenatal care have influence in the admission of neonates in the ITU, once it contributes directly in the weight at birth, in the AG and in the scores of Apgar in the 1st and 5th minutes of life, a determinant factor of neonatal vitality. This analogy revealed that the maternal characteristics can directly influence in the birth of a healthy child.

Collaborations

Lages CDR and Sousa JCO contributed for the conception of the work, data collection, analysis and interpretation of data, writing of the article and final approval of the version to be published. Cunha KJB contributed in the orientation of the research and writing of the article. Silva NC contributed for the writing of the article and final approval of the version to be published. Santos TMMG contributed for the writing of the article and final approval of the version to be published.

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