

http://www.uem.br/acta ISSN printed: 1679-9291 ISSN on-line: 1807-8648 Doi: 10.4025/actascihealthsci.v37i1.21597

Gestational risks determinants of mothers of newborns in neonatal death

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ABSTRACT. Describes the socio-economic, reproductive and obstetric characteristics of mothers of newborn children that had neonatal death in Londrina, Paraná State, Brazil. The quantitative descriptive retrospective research is based on data retrieved from the declaration of live birth, death certificate and infant death investigation form, between 2000 and 2009. During a period of 10 years, 537 newborn children died; 50.5% of mothers were nulliparous; 60.0% were between 12 and 27 years old; 30.8% had less than seven years of schooling; 55.2% had an income of more than two minimum wages. Over 90.0% of mothers had previous history of infant death prior to pregnancy. Further, 91.4% attended prenatal courses and all of them showed some type of disease during pregnancy which, in most cases, led to the death of the newborn child in the early neonatal period (p<0.05). Most maternal characteristics investigated could be detected early and controlled in prenatal care.

Keywords: pregnancy, pregnancy complications, neonatal mortality, health assistance.

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RESUMO. Descrever as características socioeconômicas, reprodutivas e obstétricas das mães de recém-nascidos que tiveram óbito neonatal, em Londrina, Paraná, Brasil. Pesquisa quantitativa descritiva retrospectiva, com base na declaração de nascido vivo, declaração de óbito e ficha de investigação do óbito infantil, entre 2000 e 2009. Nos dez anos de estudo ocorreram 537 óbitos, 50,5% das mães eram nulíparas, 60.0% tinham idade entre 12 e 27 anos, 30,8% com menos de sete anos de estudo, 55,2% com mais de dois salários-mínimos. Mais de 90.0% havia história de morte infantil anterior à gestação. Do total, 91,4% realizaram o acompanhamento pré-natal e todas apresentaram algum tipo de afecção na gestação que, em sua maioria, teve óbito no período neonatal precoce (p < 0,05). A maioria das características maternas investigadas poderia ser detectada precocemente e controlada durante o acompanhamento pré-natal.

Palavras-chave: gravidez, complicações na gravidez, mortalidade neonatal, assistência à saúde.

Introduction

Pregnancy is a time of many changes in women, caused by the inter-relationships between hormonal and psychological factors. Experiences during this period are complex and many items should be taken into account, such as the personal history of the pregnant woman (psychosexual, gynecologicalobstetric and her relationship with her mother), the timing the pregnancy occurred (type of relationship with partner, age of the mother's episodes of abortion), the characteristics of its evolution (risk of fetal loss or death to the mother), the socioeconomic factors (financially able to care for the child) and health care (quality of care professionals in the prenatal period) (MALDONADO, 2002).

Since women experience several changes during pregnancy, prenatal care becomes essential because it meets the unique needs of women during this period. A greater protective effect on the health of pregnant women and newborns contributes towards lower incidence of maternal and fetal complications. From the moment pregnancy posits some kind of grievance, attention should be focused on the evolution of a high-risk pregnancy which will require a complex care network to minimize risks of maternal morbidity and mortality, low birth weight, prematurity and perinatal death. Therefore, several studies point towards policies to expand coverage of prenatal monitoring and implementation of measures that provide improved care quality and

disease control (MALDONADO, 2002; GAMA et al., 2004; WHO, 2008; SCHOEPS et al., 2007; VIDAL, 2008; BRASIL, 2010).

Control may be achieved by an appropriate evaluation of the risk of developing pregnancy complications. It should be underscored that this assessment

[...] may be a tricky job, since the concept of risk is associated with possibilities and the bonding between a risk factor and an injury is not always explained (BRASIL, 2010, p. 11).

Accordingly, the Brazilian Ministry of Health listed in 2000 the determinants of pregnancy risks that have become a benchmark for basic health units (BHU). They are classified into four groups: Group I: Individual characteristics and unfavorable sociodemographic conditions; Group II: Previous reproductive history; Group III: Medical conditions; Group IV: Other groups of risk factors that are divided into: a) improper or accidental exposure to teratogenic factors, b) obstetric disease in pregnancy and c) clinical events (BRASIL, 2010, p. 12-13).

The first group: 'Individual characteristics and unfavorable socio-demographic conditions' refers to women less than 15-years old; to women with menarche less than two years; to women over 35 years old; height less than 1.45 m; pre-pregnancy weight less than 45 kg and over 75 kg; structural abnormalities in the reproduction organs; insecure marital status; family conflicts; low schooling; unfavorable environmental conditions; dependence on licit or illicit habits (smoking and alcoholic beverages); exposure to occupational hazards (physical stress, workload, turnovers, exposure to physical, chemical and biological effects and stress).

The second group: 'Previous reproductive history' deals with habitual abortion; explained and unexplained perinatal death; history of newborn with restricted growth or malformation; preterm delivery; sterility/infertility, birth interval of less than two years or more than five years; nulliparity and grand multiparity; hemorrhagic syndrome or hypertension, gestational diabetes, previous uterine surgery (including two or more previous cesareans). 'The pre-existing medical' conditions are related to chronic diseases such as hypertension, heart conditions, lung disease, kidney disease, endocrine diseases (mainly diabetes and thyroid), hematological, epilepsy, infectious diseases (within the context of the local epidemiological situation), autoimmune diseases, gynaecopathies and neoplasms.

The 'Other groups of risk factors' refer to conditions or complications that may arise during

pregnancy transforming it into a high-risk pregnancy: a) improper or accidental exposure to teratogenic factors b) obstetric disease in pregnancy: deviation of uterine growth, number of fetuses and amniotic fluid volume, preterm labor and prolonged pregnancy, inadequate weight gain, pre-eclampsia and eclampsia, gestational diabetes, premature rupture of membranes, bleeding during pregnancy; isthmus-cervical insufficiency; alloimmunization; stillbirth; c) clinical complications: infectious diseases experienced during current pregnancy (infection of genitourinary tract, respiratory tract diseases, rubella, toxoplasmosis etc.); clinical diseases diagnosed for the first time during current pregnancy (cardiac, endocrine).

Further, national and international studies indicate statistical relationship between maternal diseases and increased risk of neonatal death as unfavorable socioeconomic status, reproductive history, previous diseases and pregnancy (GAMA et al., 2004; KOFFMAN; BONADIO, 2005; HEALY et al., 2006; NABHAN; OLIVEIRA, 2009; ANDREUCCI et al., 2011; MENDOZA-SASSI et al., 2011). Since the identification of the determinants of risk pregnancy during prenatal care by professionals may minimize the problems with maternal prevention and health promotion to reduce neonatal deaths. current studv describes socioeconomic, reproductive and obstetric issues in mothers who experienced neonatal death in Londrina, Paraná State, Brazil.

Material and methods

A retrospective, descriptive and quantitative research was conducted between 2000 and 2009 from data retrieved from the Declaration of Live Birth, Death Certificate and Infant Death Investigation Factsheets of the Municipal Committee for the Prevention of Maternal and Infant Mortality (CPMIM), in Londrina.

Londrina, a municipality in the northern region of the state of Paraná, Brazil, has a population of approximately 510.000 inhabitants, and is provided with a health system that provides care in 54 Basic Health Units in rural and urban areas, mobile service emergency rooms, laboratories and emergency outpatient clinics. Hospital service with 1,889 beds offers small, medium and large private and public care, of which 1.344 beds are reserved for patients assisted by the National Health System (NHS), comprising 311 beds for maternal and child care within the municipality and throughout the region.

Statistics for the ten-year period showed that the total number of deaths of children less than 1 year

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old amounted to 793. Further, 783 deaths, including 537 neonatal deaths (68.6%), were investigated by the Municipal Committee for the Prevention of Maternal and Infant Mortality.

The variables related to previous reproduction characteristics and to obstetric and maternal socioeconomic features of newborns who died between 0 and 27 days of age may be listed: a) socioeconomic factors: age, education, income, occupation, marital status and habits (use of licit and illicit drugs); b) reproductive factors: number of pregnancies, number of abortions, number of children living and dead, type of pregnancy and number of prenatal visits to the doctor's; c) obstetrical factors: diseases developed during pregnancy.

Data collection took place between March and July 2010 and was fed into database Epi Info 2002[®]. Statistical Package for the Social Sciences[®] for univariate and bivariate analyses was employed, applying Chi-Square and Fisher's Exact tests, at a significance rate of p < 0.05.

The research project CAAE 0044.0.196.000-09/843/2009 was approved by the Committee of Ethics in Research of the School of Nursing of the University of São Paulo (CER-SNUSP). The Board of Health Care of the Municipal Health Authority in Londrina also authorized current research.

Results

Average maternal age was 25.8 years, with minimum age of 12 years and maximum age of 46 years. Data given in Table 1 showed that young women amounted to 60.2%, of which 22.0% were teenagers. Women with more than 8 years of schooling accounted for about 70.0%. The average household income was 3.9 minimum wages; 52.5% had an income up to 4 minimum wages and 14.1% received one minimum wage. Just over 50.0% of women worked outside their homes. No statistical association seems to exist between maternal variables and the time of death, although there was an increasing frequency of adolescent women, featuring less than 7-year schooling and less than one minimum wage in the early neonatal period (0 - 6 days), when compared to the late neonatal (7 - 27 days).

In current study, 27.2% reported that they maintained the habit of smoking, drinking alcoholic beverages and using drugs, with smoking being the most frequently reported habit (17.9%). Among the mothers who said they used drugs, only 37.0 identified the type, 57.1 and 28.6% used crack and pot respectively.

Table 1. Maternal sociodemographic characteristics and period of neonatal death, 2000-2009, Londrina, Paraná State, Brazil.

Maternal	Period of Death		Total	
socio-demographic	0-6 days	7-27 days	_	Value
characteristics	n %	n %	n %	р**
	395 - 100.0	142 - 100.0	537 - 100.0	
Age (in years)				
12 - 19	85 - 15.8	33 - 6.1	118 - 21.9	
20 - 27	158 - 29.4	47 - 8.8	205 - 38.2	≥ 0.05
28 - 35	104 - 19.4	40 - 7.4	144 - 26.8	
≥36	47 - 8.7	22 - 4.1	69 - 12.8	
Literacy (in years)				
0 - 3	33 - 6.1	10 - 1.9	43 - 8.0	
4 - 7	81 - 15.1	40 - 7.4	121 - 22.5	≥ 0.05
8 - 11	207 - 38.5	66 - 12.3	273 - 50.8	
≥12	72 - 13.4	24 - 4.5	96 - 7.9	
Family income (MW*)				
Up to 1	56 - 10.4	20 - 3.7	76 - 14.1	
2-4	150 - 28.0	56 - 10.4	206 - 38.4	≥0.05
≥5	68 - 2.7	22 - 4.1	90 - 16.8	
Occupation				
Paid	191 - 35.6	58 - 10.8	249 - 46.4	≥ 0.05
Unpaid	195 - 36.3	82 - 15.3	277 - 51.6	
Marital status				
With a partner	321 - 59.8	120 - 22.3	441 - 82.1	≥ 0.05
Without a partner	67 - 12.5	20 - 3.7	87 - 16.2	

Note: All Percentages exclude unknown subjects; *MW: Minimum Wage; **Statistical test - Chi-square and Fisher 's Exact tests.

Regarding maternal reproduction history, Table 2 shows that slightly more than 50.0% of the women were nulliparous. Average births were 2.1 children/ woman and 95.3% of pregnancies occurred with a single fetus. Further, 14.5% had a history of previous abortion, averaging 1.3/woman, whereas approximately 92.0% of women had up to two infant deaths. There was no statistical association between variables.

Table 2. History of former obstetrical and maternal characteristics and neonatal death period, between 2000 and 2009, Londrina, Paraná State, Brazil.

	Period o			
	0-6 days	7-27 days	Total	Value
Past obstetric history	n (%)	n (%)	n (%)	p*
	395 - 100.0	142 - 100.0	537 - 100.0	
Number of pregnancies/bi	rths			
nulliparous	199 - 50.6	72 - 50.7	271 - 50.5	≥0.05
multiparous	194 - 49.4	70 - 49.3	264 - 49.2	
Previous abortions				
1	66 - 84.6	127 - 70.6	78 - 14.5	≥0.05
≥ 2	12 - 15.4	52 - 9.4	17 - 3.2	
Dead Births				
1 to 2	362 - 92.1	128 - 90.1	490 - 91.2	≥ 0.05
≥ 3	31 - 7.9	14 - 9.9	45 - 8.4	
Live children				
1 to 2	123 - 77.4	47 - 72.3	170 - 31.7	≥0.05
≥ 3	54 - 22.6	182 - 7.7	54 - 10.0	
Type of pregnancy				
single	325 - 82.3	125 - 88.0	450 - 91.2	≥0.05
multiple	68 - 17.2	17 - 12.0	85 - 8.4	

Note - All percentages exclude unknown subjects; 'Statistical - Chi-square and Fischer's Exact tests.

In the case of prenatal care, Table 3 shows that more than 91.0% of women underwent prenatal consultations. The number of visits ranged between 1 and 20, with an average of 6.3 consultations. More than 70.0% of women began prenatal care on the 1^{st} trimester of pregnancy. During prenatal care, 33.6% of pregnancies were considered slightly risky, while 19.0% were referred to specialized services provided by the municipality. Less than 50.0% of women had tetanus vaccine updated. However, there was no statistical association between prenatal monitoring and period of death, even though there was a higher frequency of women in the early neonatal period (0 - 6 days) with less than seven visits when compared to the late neonatal period (7-27 days).

Table 3. Features of the monitoring program of prenatal and period of death, between 2000 and 2009, Londrina, Paraná State, Brazil.

Prenatal Monitoring	Period of Death					
Program	0-6 days	7 - 27 days	Total	Value		
-	n (%)	n (%)	n (%)	р*		
-	395 - 100.0	142 - 100.0	537 - 100.0	-		
Number of Prenatal Consultations						
1 to 6	215 - 60.4	81 - 60.0	296 - 55.1	≥ 0.05		
≥ 7	141 - 39.6	54 - 40.0	195 - 36.3			
Beginning of Pre-Natal (in trimester)						
First	281 - 79.4	104 - 77.6	385 - 71.7			
Second	71 - 20.1	30 - 22.4	101 - 18.8	≥ 0.05		
Third	2 - 0.6	-	2 - 0.4			
Prenatal condition						
Considered risk pregnancy	y					
Yes	129 - 36.1	51 - 37.8	180 - 33.5	≥ 0.05		
No	228 - 63.9	84 - 62.2	312 - 58.1			
Specialized monitoring						
Yes	69 - 19.3	34 - 25.2	103 - 19.2	≥ 0.05		
No	288 - 80.7	101 - 74.8	389 - 72.4			
Examinations during prenatal period						
Ultrasonography (USG)						
Yes	331 - 98.5	129 - 100.0	460 - 85.7	≥ 0.05		
No	5 - 1.5	-	5 - 0.9			
Laboratory (blood and urine)						
Yes	332 - 99.7	131 - 100.0	463 - 86.2	≥ 0.05		
No	1 - 0.3	-	1 - 0.2			
Updating Tetanus Vaccination						
Yes	189 - 82.9	67 - 79.8	256 - 47.4	≥ 0.05		
No	39 - 17.1	17 - 20.2	56 - 10.4			

Note - All percentages exclude unknown subjects; *Statistical Test - Chi-square and Fisher's Exact tests.

During pregnancy, 491 women underwent prenatal care and 91.8% developed some type of disease. The 45 (88.9%) women who were not screened also developed disorders. Figure 1 shows that the four prevalent disorders were preterm labor (82.7%), kidney and urinary tract (36.7%), premature rupture of membranes (24.3%) and hypertension/pre-eclampsia/eclampsia (19.5%). Regarding to changes in the amniotic fluid, oligohydramnios represented 71.2% and endocrine disorders such as diabetes 'mellitus', 77.8%. In the case of infectious and parasitic diseases, 44.6% were caused by cytomegalovirus and 20.3% by 'Toxoplasma gondii'. Further, 85.0% of placental problems were associated with placental abruption.

Data in Table 4 show that most of the diseases analyzed in pregnancy were significantly associated with early neonatal death (0-6 days) when compared with late neonatal death (7-27 days). Premature membrane rupture, bleeding and cervical incompetence isthmus were not associated with pregnancy clinical disorders.



Figure 1. Main gestational maternal disorders, between 2000-2009, Londrina, Paraná State, Brazil.

 Table 4. Types of disorder and gestational period of death,

 2000-2009, Londrina, Paraná State, Brazil.

	Period o	of Death		
Type of Gestational Disorders**	0-6 days	7-27 days	Total ¹	Value
	n (%)	n (%)	n (%)	p*
	395 - 100.0	142 - 100.0	537 - 100.0	
Preterm labor	309 - 76.1	97 - 23.9	406 - 82.7	0.020
Maternal renal and urinary tract diseases	124 - 68.9	56 - 31.1	180 - 36.7	0.080
Premature rupture of membranes	94 - 79.0	25 - 21.0	119 - 24.3	0.020
Hypertension/eclampsia	58 - 60.4	38 - 39.6	96 - 19.5	0.000
Some infectious and parasite diseases	50 - 67.6	24 - 32.4	74 - 15.1	0.000
Placental problems	55 - 83.3	11 - 16.7	66 - 13.4	0.020
Changes in appearance/ amniotic fluid volume	51 - 77.3	15 - 22.7	66 - 13.4	0.040
Bleeding	44 - 75.9	14 - 24.1	58 - 11.8	0.440
Other aggravations	41 - 75.9	13 - 24.1	54 - 11.0	0.026
Intrauterine growth retardation	26 - 74.3	9 - 25.7	35 - 7.1	0.032
Cervical incompetence	23 - 71.9	9 - 28.1	32 - 6.5	0.410
Endocrine, nutritional and metabolic diseases	9 - 50.0	9 - 50.0	18 - 3.7	0.010

Note: "Multiple choice; ¹Calculated amount of = 491; *Statistical Test - Chi-square and Fisher's Exact tests.

Discussion

There are several factors that cause risk pregnancy and they may even be present prior to the onset of pregnancy. The identification of childbearing age women attended by the National Health System (NHS) enables a diagnosis of situational groups most likely to develop potential or possible complications during pregnancy (BRASIL, 2010). This diagnosis favors the organization and planning of an individualized prenatal plan targeted towards women's needs, especially those with a reproduction history somewhat unfavorable towards the development of a healthy pregnancy for the mother and the fetus.

Studies point to the fact that the assurance to proper health service implies prevention, diagnosis and treatment of adverse events during pregnancy, coupled to guidance to avoid specific problems in birth labor and the immediate care of the newborn. Therefore, women's access to such assistance is still considered insufficient despite the significant improvement through the implementation of NHS Prenatal program in the country (KOFFMAN; BONADIO, 2005; ANDREUCCI et al., 2011; MENDOZA-SASSI et al., 2011).

The mothers characteristics reported in current study reveal that just over half were nulliparous, young adults, with more than eight years of schooling, earning less than four minimum wages and almost half of the women with no salaried employment. These characteristics refer to the classification of high risk pregnancies mentioned above, with one or more risk factors that might have contributed to neonatal death. In most cases, the presence of one or more of these factors does not mean the immediate need for further resources with more advanced technology than commonly offered in prenatal care for low-risk pregnancies, although more attention from the health team is required (BRASIL, 2010).

The prenatal women in current study did not reach the average number of consultations recommended by the Ministry of Health, with at least seven visits in the three trimesters of pregnancy. Other studies have also indicated the characteristics of mothers of children who died in the neonatal period, namely, insufficient number of prenatal visits, young pregnant women and adolescents and limited socioeconomic resources (KOFFMAN; BONADIO, 2005; HEALY et al., 2006; SCHOEPS et al., 2007; VANDERLEI et al., 2010; TAVARES et al., 2012). Research pointing towards a significant association with increased risk of neonatal death among women at the extremes of reproductive life, or rather, 10 to 19 years or over 35, should be underscored (GIGLIO et al., 2005; SOLLA et al., 2008; SALA; ABRAHÃO, 2010).

Smoking, drinking alcoholic beverages and illicit drug use are significant factors in current study. It should be emphasized that this variable may be vastly under-reported since it constitutes a harmful practice which is not always referred to by users. The deleterious effects of using legal and illegal drugs are evidenced in the social and biological conditions of different age groups and genders. In fact, some studies show a strong association between tobacco use by women during pregnancy with low birth weight, premature birth and perinatal death. If this habit is reduced or curtailed during pregnancy, there will be a significant improvement in maternal and fetal health conditions (CORREIA et al., 2007; MATIJASEVICH et al., 2011).

Besides the identification of a small percentage of harmful habits, the survey registered that almost all women in current study had some kind of disease during pregnancy. The four most frequent diseases during pregnancy in current analysis study were preterm labor, genitourinary tract infections, premature rupture of membranes and hypertension/pre-eclampsia.

Some studies indicate a relationship between urinary tract diseases and the results of complications of pregnancy causing preterm birth and neonatal sepsis. It has been also reported that pregnancy favors genitourinary infections due to anatomical and functional issues. This boils down to the fact that between 2.0 and 10.0% of women have a predisposition to develop asymptomatic bacterial and that 30.0% may possibly contract pyelonephritis. Therefore, routine microbiological and antibiotic therapy appropriate for their management is recommended (GADELHA et al., 2008).

With regard to hypertension, the multicenter study conducted in six developing countries underscored that 28.7% of total early neonatal deaths derive from the mother's hypertension followed by perinatal (NGOC et al., 2006). The prevalence of hypertension was also found to be associated with prematurity by a research conducted in a public maternity specialized in high-risk pregnancies in the city of São Paulo, Brazil (CHAIM et al., 2008). Research by Silva et al. (2009) to identify risk factors for preterm birth underscored that factors such as lack of a steady partner, previous preterm delivery, urinary infections during pregnancy, pyelonephritis, bacterial vaginosis in pregnancy, pregnancy complications, bleeding during early pregnancy and twin pregnancies were statistically significant for preterm birth.

Conclusion

The socioeconomic, reproductive and obstetric characteristics of mothers may be classified as risk determinants of pregnancy. When detected early and controlled during prenatal care, they haven't presented a statistically significant association with neonatal death.

The identification of these risks in advance and precise interventions in prenatal reduces preterm births and neonatal deaths. It should be emphasized that the data are descriptive, presume specific changes and possible biases due to its status as a documentary research. However, further studies are needed to identify possible gaps in the provision of care to women during pregnancy and pinpoint factors that hinder comprehensive care.

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Received on August 12, 2013. Accepted on February 24, 2014.

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