Original Article

Aspects of infant mortality, according to an investigation of death*

Aspectos da mortalidade infantil, conforme informações da investigação do óbito

Aspectos de la mort alidad infantil, conforme informaciones de la investigación del óbito

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ABSTRACT

Objective: To analyze some characteristics of infant mortality of residents in the area of the 15th Health Region of Paraná, from 2005 to 2008. **Methods:** A descriptive exploratory study covering 397 deaths investigated by the Committee for the Prevention of Infant Mortality, using data from the research data sheets. **Results:** In 82.3% of families, monthly income was up to three times the minimum wage; 65.1% of the mothers received prenatal care through the public network; 83.4% of births were financed by the National Health System; and, 59 2% of women began prenatal care in the first trimester. Of the mothers, 68.5% had complications during pregnancy: 18.2% had preterm labor; 18.2% had a urinary tract infection, and 16.5% had arterial hypertension. **Conclusion:** Low income, the use of public services for prenatal care and childbirth shows that public institutions, public health workers and nurses are improving the care of pregnant women with attributes of gestational risk, and contribute to the continued reduction of infant mortality.

Keywords: Infant mortality; Program evaluation; Professional staff committees; Epidemiologic surveillance; Public health nursing

RESUMO

Objetivo: Analisar algumas características da mortalidade infantil de residentes na área da 15º Regional de Saúde do Paraná, de 2005 a 2008. **Métodos:** Estudo descritivo exploratório que abrangem 397 óbitos investigados pelo Comitê de Prevenção da Mortalidade Infantil, utilizando os dados das fichas de investigação. **Resultados:** Para 82,3% das famílias, a renda mensal foi de até três salários mínimos; 65,1% das mães realizaram o pré-natal em rede pública; 83,4% dos partos foram financiados pelo Sistema Único de Saúde e 59,2% das mulheres iniciaram o pré-natal no primeiro trimestre. Das mães, 68,5% tiveram complicações durante a gestação, 18,2% tiveram trabalho de parto prematuro; 18,2% infecção urinária e 16,5% hipertensão arterial. **Conclusão:** A baixa renda, a utilização do serviço público para o pré-natal e parto evidenciam que as instituições públicas, as equipes de saúde e o enfermeiro devem aprimorar o atendimento à gestante, com atribuição do risco gestacional, para contribuir com a continuidade da redução da mortalidade infantil.

Descritores: Mortalidade infantil; Avaliação de programas e projetos de saúde; Comitê de profissionais; Vigilância epidemiológica; Enfermagem em saúde pública

RESUMEN

Objetivo: Analizar algunas características de la mortalidad infantil de residentes en el área de la 15º Región de Salud de Paraná, del 2005 al 2008. **Métodos:** Estudio descriptivo exploratorio que abarcan 397 óbitos investigados por el Comité de Prevención de la Mortalidad Infantil, utilizando los datos de las fichas de investigación. **Resultados:** Para el 82,3% de las familias, el ingreso mensual fue de hasta tres salarios mínimos; el 65,1% de las madres realizaron el prenatal en una red pública; el 83,4% de los partos fueron financiados por el Sistema Único de Salud y el 59,2% de las mujeres iniciaron el prenatal en el primer trimestre. De las madres, el 68,5% tuvieron complicaciones durante la gestación, el 18,2% tuvieron trabajo de parto prematuro; el 18,2% infección urinaria y el 16,5% hipertensión arterial. **Conclusión:** El bajo ingreso, la utilización del servicio público para el prenatal y parto evidencian que las instituciones públicas, los equipos de salud y el enfermero deben perfeccionar la atención a la gestante, con atribución del riesgo gestacional, a fin de contribuir con la continuidad de la reducción de la mortalidad infantil.

Descriptores: Mortalidad infantil; Evaluación de programas y proyectos de salud; Comité de profesionales; Vigilancia epidemiológica; Enfermería en salud pública

** Study conducted at the 15th Regional Health Agency in the state of Paraná, Maringá (PR), Brazil.*

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INTRODUCTION

Infant mortality is determined by a set of biological and socioeconomic factors in addition to the availability and quality of prenatal health care, ease of access to services and the quality of services[1].

In Brazil, the coefficient of infant mortality has declined since the end of the 1980s due to environmental interventions, improved access and quality of health services, a reduced fertility rate, increased educational and nutritional levels; these factors, when combined, contribute to the reduction of infant mortality. Therefore, infant mortality is a sensitive indicator of quality of life[2] and a marker of inequalities in a population's living conditions[3]. Infant mortality is still a concern despite its decline, due to regional and inter-urban differences observed in its occurrence. Moreover, reducing it is a great challenge for health services and society as a whole, demanding health actions, especially those directed to primary health care initiated from prenatal care up to hospital care[4].

For prevention and control measures concerning infant morbidity and mortality to be improved, new actions need to be implemented, as well as having constant monitoring of epidemiological, socioeconomic and health data.

The databases most frequently used to identify the health situation of children are the Mortality Information System (SIM[1]) and the Live Births Information System (SINASC), though there are other data sources that could be explored, especially those that add information not available in these traditionally used databases. Information concerning family income, place where prenatal care was provided and delivery was performed, the source of funds for prenatal care and delivery, complications during pregnancy, or information concerning the newborn's hospitalization are some examples of information not available in SIM or SINASC and that can be useful to better know the family's, mother's and the infant's health conditions.

Much information can be regularly collected and recorded by the Child Mortality Prevention Committees when analyzing and investigating stillbirths and infant deaths. These committees were implemented through decree No. 1,399 by the Ministry of Health (MH)[5] as one of the strategies adopted to monitor and reduce infant mortality. It is intended to clarify the circumstances in which infant death occurs, identify risk factors, and propose measures to improve the quality of health care. More recently, decree No. 72/GM was enacted by the Brazilian Ministry of Health, which establishes that surveillance of child and fetal death is mandatory in health services integrating into the Single Health System (SUS), aiming to identify the factors that determine and support the adoption of measures able to prevent the occurrence of evitable deaths[6].

This study was proposed to consider the impact and severity of an infant death on the family, community and health services, given the fact that many of these deaths are evitable and also the need for studies addressing infant mortality and the possibility to use data that result from the committees' analyses. The objective was to analyze some characteristics of infant mortality using the analyses performed by the Child Mortality Prevention Committees at the 15th Regional Health Agency in the state of Paraná, Brazil between 2005 and 2008.

METHOD

This is a descriptive and exploratory study with information concerning 397 child deaths that occurred among residents in the area of the 15th Regional Health Agency of Paraná, Brazil between 2005 and 2008. These were investigated by the committee of the 15th Regional Health Agency, which is one of the 22 Regional Health Agencies in the state of Paraná with a population estimated at 718,267 inhabitants[7]. The State Health Department divides the state into Regional Health Agencies, which are characterized as territorial areas in a continuous geographical space. These are intermediate administrative authorities responsible for developing strategies to support cities in their ascribed area, influencing the management of regional issues, aiming to encourage the continuous and increasing search for efficient health care delivery[8].

The form used to investigate child death gathers information concerning the identification of the child, prenatal care, the mother's medical file, childbirth, outpatient clinic and hospital data from both the mother and child, and also information collected in home visits. The records analyzed by the committees include this investigation form, a copy of death certification, a copy of Live Birth Declaration, of the medical file at the Primary Health Care (PHC) unit where the mother attended prenatal care, and the child's hospital file.

The study's variables were grouped into socioeconomic variables that included monthly family income represented in comparison to the minimum wage (MW) (up to one times the minimum wage; two to three times; from four to five times); place where prenatal care was performed (PHC, private, PHC + private, others, did not attend prenatal appointments); source of funding for childbirth (SUS, particular, SUS+particular, home childbirth); pregnancy variables: first prenatal consultation (1st, 2nd, 3rd trimesters, did not attend prenatal); and whether the pregnancy was considered to be at risk (yes/no); complications during pregnancy (yes/no) and type of complication; in addition to variables concerning the newborn: hospitalization (yes/no); hospitalization in Intensive Care Unit (ICU) (yes/no); and whether it was considered at risk (yes/no). We note that the studied variables were chosen because these were not available

either on the death certification or live birth declaration and also because they were considered extremely important in order to complement the profile of child mortality in the 15th Regional Health Agency.

Data were grouped into two biennia, 2005-2006 and 2007-2008, to minimize variations of values between the periods. Data were collected and transcribed into spreadsheets through absolute and relative frequencies and analyzed through EpiInfo 6.0.

The study project was approved by the Ethics Research Committee at the Federal University of Maringá, PR, Brazil in accordance with Resolution 196/96, National Council of Health (Protocol 130/2006).

RESULTS

A total of 397 child deaths among residents of the 15th Regional Health Agency of Paraná were identified between 2005 and 2008: 205 (51.6%) in the first biennium and 192 (48.4%) in the second, with coefficients of infant mortality of 11.46 and 10.67 deaths per 1,000 live births for the first and second biennia, respectively. All the 397 deaths were analyzed and investigated by the regional committee.

Table 1 – Child mortality according to socioeconomic variables, 15th Regional Health Agency, Maringá, PR, Brazil – 2005 to 2008.

Variables	2005-2006		2007-2008		Total	
	nº	%	nº	%	nº	%
Monthly family income*						
Up 1 one times MW	50	41.7	39	28.9	89	34.9
2 to 3 times	54	45.0	67	49.9	121	47.4
4 to 5 MW	14	11.7	17	12.6	31	12.2
6 or more times MW	2	1.6	12	8.9	14	5.5
No information**	85	41.5	57	29.7	142	35.8
Place of prenatal care*						
PHC	112	67.5	112	62.9	224	65.1
Private	36	21.7	53	29.8	89	25.9
PHC+Private	2	1.2	-	-	2	0.6
Others	-	-	4	2.2	4	1.2
Did not attend prenatal care	16	9.6	9	5.1	25	7.2
No information**	39	19.0	14	7.3	53	13.3
Childbirth funding*						
SUS	112	87.5	114	79.7	226	83.4
Private	13	10.2	28	19.6	41	15.1
SUS + private	-	-	1	0.7	1	0.4
Home birth	3	2.3	-	-	3	1.1
No information**	77	37.6	49	25.5	126	31.7
Total in the biennium	205	100	192	100	397	100

Source: Investigation Form of Infant Death * Percentage does not include missing data in either biennium ** Percentage takes into account the general total in each biennium.

Table 2 – Child mortality according to pregnancy variables, 15th Regional Health Agency, Maringá, PR, Brazil – 2005 to 2008.

Variables	2005-2006		2007-2008		Total	
	nº	%	nº	%	nº	%
1st prenatal consultation*						
1st trimester	70	55.5	85	62.5	155	59.2
2nd trimester	36	28.6	34	25.0	70	26.7
3rd trimester	4	3.2	8	5.9	12	4.6
Did not attend prenatal	16	12.7	9	6.6	25	9.5
No information**	79	38.5	56	29.1	135	34.0
Risk pregnancy*						
Yes	41	34.2	58	47.5	99	40.2
No	79	65.8	64	52.4	143	59.1
No information**	85	41.5	70	36.4	155	39.0
Complications in the pregnancy						
Yes	100	69.0	96	68.1	196	68.5
No	45	31.0	45	31.9	90	31.5
No information**	60	15.1	51	26.6	111	28
Types of complications***						
Preterm labor	38	23.4	15	11.6	53	18.2
Urinary infection	26	16.0	27	21	53	18.2
Risk of abortion	18	11.0	9	7.0	27	9.3
Hypertension	26	16.0	23	17.8	49	16.8
Hemorrhaging	14	8.6	6	4.6	20	6.9
Diabetes	4	2.5	2	1.5	6	2.1
Toxoplasmosis	4	2.5	4	3.0	8	2.7
Others	32	9.7	43	33.3	75	25.8
Total in the biennium	205	100	192	100	397	100

Source: Investigation Form of Infant Death * Percentage does not include missing data in either biennium ** Percentage takes into account the general total in each biennium. *** Percentage considers the total of reported complications.

Data in Table 1 records infant deaths with information provided in the investigation form. 82.3% of the families received up to three times the MW per month (34.9% up to one MW and 47.4% received from two to three times the MW). Only 5.5% received six or more times the MW. It was observed that 65.1% of the mothers attended prenatal care in PHC units and 25.9% directly paid for care provided. In relation to the source of payments, 83.4% of the deliveries were performed by the SUS.

In relation to pregnancy variables, we observed that 59.2% of the total of women initiated prenatal care in the 1st trimester; 26.7% in the 2nd, and 4.6% (12 women) attended prenatal care only in the 3rd trimester. A total of 68.5% of the mothers were affected by complications during pregnancy, among which the most frequent were: 18.2% preterm labor; 18.2% had urinary infections; 16.8% hypertension; and 9.3% were at risk of abortion (Table 2). Of the 397 analyzed child deaths, 83.4% of the infants were hospitalized and 78.1% of them were admitted into the ICU (Table 3).

Table 3 – Child death according to newborns' variables, 15th Regional Health Agency, Maringá, PR, Brazil – 2005 to 2008.

Variables	2005-2006		2007-2008		Total	
	nº	%	nº	%	nº	%
Newborns' hospitalization*						
Yes	152	76.4	149	92.0	301	83.4
No	47	23.6	13	8.0	60	16.6
No information**	6	2.9	30	15.6	36	9.0
Hospitalization in ICU*						
Yes	131	71.2	129	86.6	260	78.1
No	53	28.8	20	13.4	73	21.9
No information	21	10.2	43	22.4	64	16.1
Considered newborn at risk*						
Yes	60	63.8	67	53.2	127	57.7
No	34	36.2	59	46.8	93	42.3
No information**	111	54.1	66	34.4	177	44.6
Total	205	100	192	100	397	100

Source: Investigation Form of Infant Death * Percentage does not include missing data in either biennium ** Percentage takes into account the general total in each biennium.

DISCUSSION

Most families of those infants who died were in a vulnerable socio-economic situation, that is, they had a monthly family income from one to three times the minimum wage (82.3%). In relation to the use of health services, about 65% of the mothers received prenatal care in PHC units, and 83.4% of the childbirths were funded by SUS, which agrees with a study conducted in Pelotas, RS, Brazil where socio-economic variables were significantly associated with the coefficient of child mortality; children of low income families had a 2.5 times greater risk of dying[9].

Another finding that should be highlighted is related to complications experienced during pregnancy and pregnancy risk. The results show that the percentage of mothers with complications during pregnancy remained practically the same (69% and 68.1% in the two biennia, respectively), though the number of pregnancies considered being at risk increased from the first to the second biennium (34.2% to 47.5%). Such a result suggests that filling in of data concerning risk was improved, as well as quality of care delivery.

It is known that some pregnant women experience some type of intercurrence, harm or present some specific characteristics during pregnancy that make them subject to unfavorable conditions, both the women and the fetuses, who becomes more prone to complications, characterizing a group of pregnant women at risk or high risk[10]. Additionally, the number of women who were considered to have a risky pregnancy increased. In the first biennium, 34.2% were considered to be at risk and this percentage reached 47.5% in the second biennium. Since there were no important differences in information concerning complications in pregnancy (69% and 68.1% in the two biennia, respectively), we propose that the filling in of data improved somewhat.

Among the main complications presented by women in the studied group are preterm labor (PL) and urinary tract infections (UTI), both with 18.2%, followed by hypertension with 16.8%, risk of abortion with 9.3%, and hemorrhaging with 6.9%. PL with UTI are the most frequent complications during pregnancy, perhaps because UTI is the main cause of PL and one of its consequences is low birth weight. This set of situations is responsible for 75% of the cases of child death[11]. Low weight at birth and prematurity are the most important factors determining infant mortality. Premature children with low birth weight present a significantly greater risk of dying than those born at term with a gestational age of 37 weeks or more and weight above 2,500 grams[12].

A study conducted in the state of Parana, Brazil reports that 55.5% of deaths occurred in low weight children between 2003 and 2005, that is, they weighed less than 2,500 grams at birth and the proportion of deaths among those weighing extremely low was 21.5% (in the biennium 1997-1999) and subsequently increased to 33.9% (2003-2005). In relation to gestational age, 54.2% of the children were born at less than 36 weeks between 2003 and 2005 in the state of Paraná; this proportion was 31.7% in 1997-1999. This information strongly signals the need to improve prenatal access and quality[13].

Several factors make UTI an important complication during the gestational period, aggravating both the mother's and the perinatal prognosis. For many years, pregnancy was seen as a predisposing factor to all forms

of UTI[14]. However, some women develop asymptomatic bacteriuria, one of the main causes of intrauterine growth retardation and premature rupture of membrane, which definitively leads to PL[15].

The protocol for urine culture and antibiogram in pregnant women is being discussed in the state of Paraná following the experience of the city of Curitiba, which obtained satisfactory results by reducing prematurity by 30% after early detection and treatment of UTI through urine cultures[15].

Hypertension was the second most frequent complication among mothers of infants who died. For all pregnancies, gestational hypertension or hypertensive syndrome can occur in 5% of the cases that may progress to pre-eclampsia and of these 1% may progress to the severe form, which is eclampsia that affects both mother and fetus in different ways. Pregnant women with severe eclampsia have a greater chance of experiencing PL with fetuses small for their gestational age, who in most cases develop conditions associated with prematurity such as necrotizing enterocolitis, intraventricular hemorrhaging and respiratory distress syndrome[16].

Obstetric hemorrhaging affected 8.6% of the mothers in the first biennium, decreasing to 4.6% in the last biennium. There is, in first trimester of pregnancy, abortion or a risk of abortion, which occurred in 20% of the pregnancies[17], and also ectopic pregnancies, gestational trophoblastic disease, chorioamniotic separation[18], cervical cancer and cervicitis. Abortion usually occurs in women who hemorrhage in the 1st trimester[19], but hemorrhaging may also occur in the 2nd trimester due to placenta previa and uterine rupture[18], affecting up to 3% of pregnant women.

Another complication, less represented in the studied group, was diabetes with an occurrence on average in 2.1% of the pregnant women. It is estimated that 1% to 3% of women may develop diabetes during pregnancy[9]. The high glycemic levels presented by diabetic pregnant women or those who developed diabetes due to pregnancy may bring complications to the fetus and newborn, such as fetal macrosomia, intrauterine death, perinatal asphyxia, polyhydrammios, premature rupture of membranes, preterm labor, shoulder dystocia, skeletal trauma and clavicle fractures[20].

Toxoplasmosis appeared as a complication for 2.5% and 3.0% of pregnant women in the two studied biennia. This infection leads to anatomic and functional disorders in the fetus, mainly intrauterine growth retardation, prematurity, congenital toxoplasmosis, mental retardation and fetal death[18].

According to the Ministry of Health, prenatal care should be incorporated into women's services from the beginning of pregnancy, which is the appropriate time to prepare her for labor, enabling the detection of potential disorders[10], and the implementation of appropriate practices to promote the health of mother and child and reduce morbidity and mortality. Pregnant women were classified as being at risk after individual characteristics, unfavorable socio-demographic conditions, previous reproductive history, obstetrical diseases in the current pregnancy, and certain clinical intercurrences were considered[18]. Identifying women at risk is for the purpose of referring them to specialty services in order to reduce the chance of risks progressing to complications for either the mother or fetus[18]. Another result found in this analysis is related to the socioeconomic profiles of families. Even though child mortality is an event most frequently linked to more vulnerable population groups and families in communities, the results showed a change in this profile. The socioeconomic variables indicate that the situation of families improved, as did adherence of families to prenatal care. It draws our attention to the fact that monthly family income increased from the first to the second biennium, as well as deliveries performed in the private health network. There was a perceivable increase in the number of women who initiated prenatal care in the first trimester, while the percentage of women who did not attend prenatal care decreased. Such a situation indicates the importance of the Family Health Strategy (FHS) in monitoring the population in its ascribed area to identify pregnant women early on and whether they are linked to PHC units; it actively follows-up with them in case they fail to attend care.

In relation to health services, the increased use of private services in providing care during pregnancy and labor was observed in this study, accompanying an increase in monthly family income. The increased use of private services for prenatal care and labor may also be a result of the growing trade of diverse private health care providers, which given greater competition, are forced to lower their prices, thus families are able to acquire health care plans. Lower prices of private health care providers are coupled to a lack of trust in the public health system and to the desire of women to have tubal ligation performed at the time of the delivery.

It is important to note the importance of using data contained in the committee's investigation form, which was this study's source, and are not available in the SIM and SINASC databases. Data analysis concerning family income, place where prenatal care and delivery was performed, source of financing, data on pregnancy as well as date of the first prenatal consultation, pregnancies at risk, and complications during pregnancy, add aspects of infant mortality that are less frequently addressed in studies of this nature.

Although, because of the way the results of this investigation are presented, a large number of variables without information also draws attention, despite a slight improvement from the first to the second biennium being observed. Lack of information in the investigation form may reflect difficulties found by the committee during the search for information, having to deal with a lack of information in medical files, unreadable data and notes, a lack of home visits due to the families' refusal or address changes, incompatibility between information provided in the medical files and that provided in interviews with families, among others[21].

Even though there was some increase in the quantity of data reported on the investigation forms, some information important to characterizing not only infant death but also to outline an epidemiological profile of these families exposed to risk conditions, continue to be lacking, such as family income, data from the first prenatal consultation, why the pregnancy was considered to be at risk, and also whether the newborn was considered to be at risk. The absence of data in documents indicates there is the possibility that professionals, both in primary health care and in more complex health care levels, have difficulty understanding the importance of properly reporting data, whether it is due lack of training, lack of time, or even due to difficulty to acknowledge the need of good recording as part of the process to understand reality to provide care to the family and child and prevent infant death[21].

The nursing team and nurses are in constant contact with patients whether through home visits within the FHS, PHC consultations, hospital interventions or in health programs implemented in the community. These professionals working in these situations come into contact with information inherent to care provided to patients. The nursing team is estimated to be responsible for more than 50% of information contained in medical files[22]. Hence, it is the role of nurses and the health team to incorporate the importance of gathering data and information on investigation forms because such variables are transformed into information useful for planning actions to reduce the rate of infant mortality based on the correct filling in and supplying of databases.

It is worth noting that there are limitations in studies using secondary data. Hence, the presented results should be viewed with caution, taking into account the expressive percentage of missing information observed in some variables collected from the investigation forms, which was the source of this study.'

On the other hand, the employment of data resulting from analyses of the committees investigating deaths add important information to data already used in studies addressing infant mortality. For that, one needs to improve the quality of documents as well as how data are gathered to investigate deaths, in addition to correctly filling in the blanks available in the documents for analysis[21].

CONCLUSIONS

This study revealed that most families received up to three times the minimum wage per month; many of these pregnancies were cared for in PHC units and most deliveries were paid for by the SUS. This fact is evidence of the role of the public health sector, that of the FHS, and of nurses in improving care provided to pregnant women during prenatal care, identifying them in the community as early as possible, possibly in the 1st trimester and accompanying them during the entire pregnancy, observing potential changes and complications. The identification of pregnancy risk is essential information for improving the quality of care delivered to mothers and infants and should be evaluated monthly, while interventions should be promptly implemented.

Finally, considering the complexity and dynamics of the processes involving infant mortality, continuous follow-up is necessary to provide information to enable health situations to be analyzed in order to help decision-making intended to improve the quality of life of the population, consequently reducing the rate of infant mortality.

In this context, using information not contained in national databases such as SIM and SINASC is extremely important to the process of adding information concerning the socioeconomic situation and history of pregnancy and delivery, enabling the analysis of critical issues in health policies and actions, revealing the main points where more effective intervention is required. The results indicate the great challenge in sensitizing health professionals to the importance of appropriate prenatal care, in addition to correctly filling in data to complement information systems.

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