Perinatal health and mother-child health care in the municipality of São Luís, Maranhão State, Brazil

Saúde perinatal e atenção à saúde da mãe e da criança no Município de São Luís, Maranhão, Brasil

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Abstract *The purpose of this article was to evaluate socioeconomic and demographic indicators, reproductive health, use of prenatal, childbirth, and neonatal services, and anthropometric data for mothers and infants. The authors performed a cross-sectional analysis of a systematic sample of 2,831 hospital births in São Luís, Maranhão State, from March 1997 to February 1998 at ten public and private maternity hospitals. The sample was stratified proportionally according to the number of births in each maternity hospital. Mothers answered a standard questionnaire. Of the total, 97.9% were live births and 98% were singletons. Prenatal coverage was 89.5%, and prevalence of cesarean sections was 33.8%. A physician provided prenatal care in 75.7% of cases and performed 73.8% of the deliveries. The Unified Health System covered the costs of 76.4% of the prenatal visits and 89.7% of the deliveries. A pediatrician was present in the delivery room in 50.2% of cases. The low birth weight rate was 9.6% and the preterm birth rate 13.9%. Reasons for concern included a high percentage of adolescent mothers, single mothers (or without partners), the high cesarean rate, and the high percentage of births attended by unqualified personnel.*
Key words *Low Birth Weight; Premature; Fetal Growth Retardation; Prenatal Care; Cesarean Section*

Resumo *Este artigo teve o objetivo de estimar indicadores sócio-econômicos, demográficos, saúde reprodutiva, utilização de serviços pré-natais e de atenção ao parto e ao recém-nascido, dados antropométricos da mãe e da criança. Foi realizado estudo transversal em amostra sistemática de 2.831 nascimentos hospitalares ocorridos em São Luís, estratificada por maternidades, com partilha proporcional ao número de nascimentos em cada unidade, no período de março de 1997 a fevereiro de 1998. Utilizou-se questionário padronizado respondido pela puérpera. Analisaram-se nascimentos em dez unidades de saúde, públicas e privadas, dos quais, 97,9%, eram nascidos vivos e 98% de parto único. A cobertura do pré-natal foi de 89,5%. A prevalência de cesarianas 33,8%. O médico realizou 75,7% do atendimento pré-natal e 73,5% dos partos. O Sistema Único de Saúde custeou 76,4% do atendimento pré-natal e 89,7% da assistência ao parto. O atendimento por pediatra em sala de parto foi de 50,2%. A taxa de baixo peso ao nascer foi de 9,6% e de prematuridade 13,9%. Alta porcentagem de mães adolescentes e sem companheiro, alta taxa de cesáreas e de partos assistidos por pessoal não qualificado, são razões para preocupação.*
Palavras-chave *Baixo Peso ao Nascer; Prematuro; Retardo do Crescimento Fetal; Cuidado Pré-Natal; Cesárea*

Introduction

Mother-child health problems have been approached by several epidemiological studies in Brazil (Barbieri et al., 1989; Barros et al., 1996; Bettiol et al., 1998; Victora et al., 1996), but in the State of Maranhão the few available studies have failed to use a sufficiently systematic approach, and few investigations have been conducted on representative samples of different municipalities or counties (Coimbra et al., 1996; Estado do Maranhão/UNICEF, 1992; Silva et al., 1999; Tonial & Silva, 1997). Few studies are available assessing the coverage and quality of health care services (Estado do Maranhão/UNICEF, 1992; Silva et al., 1999).

Knowledge is insufficient on rates of pregnancy outcomes such as low birth weight, preterm birth, and intrauterine growth retardation in Brazil. Registry sources are generally unreliable. Specifically, the SINASC (National Live Birth Information System) lacks sufficient coverage in some places to allow valid estimates. In addition, perinatal mortality rates are unknown for most settings due to lack of proper records, especially concerning stillbirths.

Lack of reliable information for mother-child health indicators hinders the planning and evaluation of measures to improve living standards. It is thus extremely important to perform surveys to evaluate health conditions and the use of preventive and curative services.

We thus undertook the present cross-sectional survey based on a sample of hospital births in maternity hospitals in the municipality of São Luís from March 1997 to February 1998 in order to assess maternal and perinatal health conditions in this city.

Methodology

The study used the same methodology as two other perinatal studies, conducted in Ribeirão Preto, São Paulo State, in 1978-79 and 1994 (Barbieri et al., 1989; Bettiol et al., 1998; Gomes et al., 1999; Silva et al., 1998) as part of a multicenter project on perinatal health in Brazilian cities.

The municipality of São Luís is located on the island of São Luís in the northern part of the State of Maranhão and has an area of 518km^2. Total population is 781,068 (IBGE, 1997). Prenatal care is provided by 35 municipal health units, 7 State units, and 1 Federal unit, as well as by health services contracted out by the Unified Health System (SUS) and private units. Childbirth care is provided by 18 public and private maternity services.

Sampling

The study used a cross-sectional approach. We used a sample of hospital births in São Luís, including mothers residing in the city, non-residents, live births, stillbirths, singletons, and multiple births. Hospital births represented 96.3% (95% CI: 94.1-98.6) of all births in 1996, thus ensuring that the hospital birth sample is representative (Tonial & Silva, 1997). The study was conducted at 10 units consisting of public, contracted-out, and/or private facilities from March 1, 1997, to February 28, 1998. Maternity services where less than 100 deliveries were performed in 1996, i.e., only 2.2% of the deliveries that occurred during that year, were excluded from the study.

The sample was stratified proportionally according to the number of deliveries in each maternity hospital. All births in each unit were listed in order of occurrence. Systematic sampling was performed in each unit, with a sampling interval of seven. A random number between 1 and 7 was picked to determine the starting point for each study unit.

Calculation of sample size for the estimate of a proportion considering the population size of 20,092 births for the year preceding the study, with 2% precision, 5% type I error, and working with a maximum pxq product (50% event proportion) demonstrated that 2,145 interviews were necessary. Since the study also aimed to compare proportions considering a 5% type I error and 80% study power, working with a maximum pxq product (50% event proportion) and setting the minimum difference to be detected as significant at 4%, the minimum sample size was calculated at 2,499 births. Considering study losses, we opted to work with a sampling interval of seven, which would permit a sample size of approximately 2,870 births (Kalton, 1983).

Instruments

We worked with three research instruments: Birth and Interview Recording Card, Standardized Questionnaire, and Mortality Investigation Card. Information concerning all births in order of occurrence, all interviews performed, and cases of refusal to respond to the questionnaire or mother's discharge before the interview was recorded on the birth and interview card. The data recorded on this control card were birth date and mother's name and whether the infant was live-born or stillborn. In the case of multiple births the mother was recorded on two or more cards. In cases of early discharge,

the mother was interviewed at home if she resided in the municipality of São Luís. Losses due to refusal or inability to locate the mother occurred in 5.8% of cases.

Variables included in the questionnaire are described below.

Questions concerning *identification* were: questionnaire number, name of hospital, name of child and mother, address, reference point, neighborhood, city and State, and area of residence (urban or rural).

The following *demographic and socioeconomic data* were studied: whether mother and father lived in the home, number of siblings and number of persons residing in the household, maternal and paternal educational level, family and *per capita* income in minimum wages, mother working outside the home, and occupation of the head of the family (considered to be the person with the highest income), housing conditions, and presence of running water and sewage disposal. The occupation of the head of family was used for socioeconomic classification based on the International Classification of Occupations (ISCO) (Silva et al., 1998).

Data concerning *reproductive health* were birth date of the infant's mother, age of the infant's father, number of pregnancies, parity, number of live-borns and stillborns, number of abortions, and number of low birth weight newborns. All previous pregnancies and the current one were defined in terms of date of termination, length of gestation, and age of fetal or neonatal death when applicable.

Information was obtained about *smoking*, whether the mother smoked, at what age she started smoking, for how many years she had been smoking, what she smoked (cigarettes, cigars, or pipe), and number of times the mother smoked per day before and during pregnancy. The questionnaire also asked whether the father was currently smoking, what he smoked, and how many times a day he smoked during the mother's respective gestation.

Concerning *utilization of prenatal services*, the mother was asked about prenatal care, the month she had started, number of visits, and tetanus immunization. The mother was also asked whether she had health insurance and which category of prenatal care she had received (government health coverage, private health plan, or out-of-pocket). Date of last menstrual period and gestational length in weeks were recorded, and the occurrence of prenatal diseases was investigated. With respect to utilization of childbirth care services, we recorded the number of fetuses, who provided care at delivery, type of delivery, category of care, and (in the case of maternal death) date of death and primary and associated causes.

Adequacy of prenatal care utilization was measured using the index of the same name (APNCU) (Kotelchuck, 1994) and by a new index created on the basis of the minimum number of scheduled visits as recommended by the Brazilian Health Ministry and timing of initiation (Coimbra, 1999). Both indices are adjusted on the basis of total gestational length, considering that mothers of premature infants tend to have fewer prenatal visits.

Gestational age was calculated from the date of the last normal menstrual period reported by the mother. At first, the 15th of the month was considered for all cases in which only the day (not month) of the last menstruation was unknown. Cases of weight incompatible with date of last menstrual period reported and located above the 99th percentile for the English curve were recorded as unknown (Altman & Coles, 1980). The same procedure was used for cases of improbable gestational age (less than 20 or more than 50 weeks). Finally, a process of imputation was carried out for all cases of missing data or data recorded as ignored in a regression model including birth weight, parity, family income, and sex of the newborn (Stata Corporation, 1997).

Classification of weight by gestational age was based on the Williams curve (Williams et al., 1982). Infants were considered to be large for gestational age when their weight was above the 90th percentile for this curve, adequate for gestational age when their weight was between the 10th and 90th percentile, and small for gestational age when their weight was below the 10th percentile, the latter representing cases of intrauterine growth retardation.

With respect to the *newborn*, we recorded sex, live-born or stillborn status, birth date, neonatal diseases and, in case of fetal or neonatal death, the date and time of death as well as the primary and associated causes.

A mortality study of this birth cohort is currently under way, identifying fetal deaths and infant deaths (under one year of age) in the five Civil Registry Offices in the municipality. Death certificates are being copied, hospital records of these deaths are being analyzed, and in some cases interviews are conducted with physicians, mothers, and/or other family members for a more precise definition of the primary cause of death.

Anthropometric data

Birth weight was measured using infant scales adjusted to 10 grams. The infant was weighed shortly after birth without clothes. Scales used in the hospitals were verified periodically and replaced whenever defects were detected. Newborns were measured at between 12 and 24 hours of life using an ARTHAG-type anthropometer. Mother's height was determined with a UNICEF (United Nations Children's Fund) portable wall anthropometer, and arm girth was measured with a standard tape measure. The mother was asked to report her weight at the beginning and end of pregnancy.

Statistical analysis

In the present paper we report the calculation of percentages for the major indicators investigated and some of their respective 95% confidence intervals.

Results

A total of 2,831 births were analyzed, including live-borns and stillborns and single and multiple births. Most deliveries (84.9%) occurred in the 4 largest hospitals (public or contracted out by the SUS); 89.8% of deliveries involved families residing in the municipality of São Luís, and 90.1% involved families from the greater metropolitan area.

Socioeconomic and demographic characteristics of families are listed in Table 1. Most families (52.7%) had an income of less than 3 times the minimum wage, and most heads of families (71%) were semi-skilled or unskilled hand laborers; 24.2% of the mothers also worked outside the home. Most households (61.1%) contained 5 or more members.

The highest percentage of mothers had 5 to 8 years of schooling (42.2%), nearly 30% were under 20 years of age, and 13.4% were under 18. Nearly half (47.2%) were in common-law marriages, and 24.4% had no partner. Most were having their first child (47.8%). Smoking prevalence among women in this population group was low, only 5.9%. Among smokers, 65% smoked up to 10 cigarettes per day during pregnancy, considered a low figure. Prevalence of previous stillbirth(s) was 3.1%, and prevalence of prior abortion was 20.8%. Prior low birth weight was reported by 7.8% of mothers (Table 2).

Prenatal care coverage was 89.5%, but the use of prenatal care is still not universal. Approximately 25% of mothers had fewer than 4 prenatal visits, but more than half (54.9%) started prenatal care during the first trimester of pregnancy. More than 75% of prenatal care was covered by the SUS. According to the APNCU index, only 13% of the pregnant women had received adequate prenatal care. However, according to the new index, nearly half the pregnant women had received adequate care (Table 3).

Approximately 75% of the women received prenatal care exclusively from a physician, while 10.8% received care solely from nurses. Multiprofessional prenatal care was observed in 13.5% of cases. Most women (84.1%) showed adequate tetanus immunization, adding those who received 2 or 3 doses of vaccines and those who had been previously immunized. Blood tests for detection of syphilis were ordered in 77.7% of cases, and blood typing was performed in 87.5%.

The cesarean rate was 33.8% (95%CI: 32.0-35,5). Although all births occurred in the hospital, only 73.5% were performed by physicians, demonstrating that a significant proportion of patients (19%) received care from nursing attendants. SUS covered nearly 90% of the deliveries. According to the records, 10.1% of women received tubal ligations in association with the cesarean section (Table 4). Thus, tubal ligation was performed in 29.8% of the cesarean deliveries. Considering primary and repeat cesarean deliveries separately, tubal ligation was performed in 16.7% and 57.1% of cases, respectively. Only 12.6% of the women were accompanied by the same health care professional during the prenatal period and at delivery.

Some characteristics of the newborns and care provided can be seen in Table 5. Of all births, 55% were males. The low birth weight rate was 9.6% (95%CI: 8.5-10.7) and the preterm birth rate was 13.9% (95%CI: 12.7-15.2). Intrauterine growth retardation was observed in 14.6% of cases (95%CI: 13.3-15.9). Mean birth weight was 3,142 grams.

Only 50.2% of the newborns were accompanied by a pediatrician in the delivery room, and rooming-in is still not universal, since 11.4% of the infants were transferred to a collective nursery. Most infants (76.3%) had already started breastfeeding and 47.9% were assessed by the Apgar score. Fewer infants (35.3%) were submitted to evaluation of gestational age by the Capurro method.

Table 1

Socioeconomic and demographic characteristics of families. São Luís, Maranhão State, Brazil, 1997/1998.

Variables	f	%
Family income (times minimum wage)		
≥ 1	486	17.2
1.1-1.9	459	16.2
2-2.9	545	19.3
3-4.9	464	16.4
5-9.9	413	14.6
≥ 10	262	9.3
Unknown	202	7.1
Per capita family income (times minimum wage)		
< 0.25	520	18.4
0.25-0.49	805	28.4
0.50-0.99	695	24.6
≥ 1	608	21.5
Unknown	203	7.2
Occupation of head of family		
Managers and upper level professionals	255	9.0
Middle level administrators	313	11.1
Skilled workers	162	5.7
Semi-skilled workers	1,075	38.0
Unskilled workers	935	33.0
Unemployed	17	0.6
Unknown	74	2.6
Number of persons per household		
1-4	1,100	38.9
≥ 5	1,729	61.1
Mother working outside the home		
Yes	684	24.2
No	2,146	75.8
Total	2,831	100.0

Discussion

In the municipality of São Luís, 85% of all births occurred in the four large public or SUS-contracted maternity hospitals. Ten percent of deliveries in São Luís involved families not residing in the municipality, mostly from the three other municipalities on the island of São Luís which are part of Greater Metropolitan São Luís.

Socioeconomic indicators generally revealed births in a population of low monthly income, predominantly consisting of semi-skilled or unskilled hand laborers, the typical reality of most capital cities in the Northeast region of Brazil. In addition, households with numerous members were common. Socioeconomic data showed that most mothers had intermediate schooling.

Among the most relevant indicators in the present survey was the high proportion of adolescent mothers, including many under 18 years of age. This was also reflected in the high proportion of primiparous mothers. Another outstanding indicator was the high percentage of mothers without a partner (24%). Both teenage pregnancy and not living with the child's father have been described as risk factors for poor perinatal outcomes such as low birth weight and intrauterine growth retardation (Lekea-Karanika et al., 1999).

Another item that deserves comment was the low proportion of smokers in this population, and the low number of cigarettes smoked by those who did smoke. This fact may reflect the low mean income of the population studied or may be due to other reasons

Table 2

Births according to some maternal characteristics. São Luís, Maranhão State, Brazil, 1997/1998.

Variables	f	%
Maternal schooling (years)		
No schooling	199	7.1
1-4	314	11.1
5-8	1,192	42.2
9-11	994	35.2
≥ 12	124	4.4
Maternal age (years)		
< 18	380	13.4
18-19	466	16.5
20-24	1,072	37.9
25-29	548	19.4
30-34	235	8.3
35-39	104	3.7
≥ 40	24	0.9
Marital status		
Married	803	28.4
Cohabiting	1,337	47.2
No partner	639	22.6
Separated, widowed, divorced	51	1.8
Parity		
1	1,353	47.8
2	836	29.5
3-4	503	17.8
≥ 5	139	4.9
Maternal smoking		
Yes	166	5.9
No	2,665	94.1
Previous stillbirth		
Yes	87	3.1
No	2,744	96.9
Previous abortion		
Yes	588	20.8
No	2,243	79.2
Previous low birth weight		
Yes	219	7.8
No	2,591	92.2
Total	2,831	100.0

to be investigated in more detail in subsequent studies.

Prenatal coverage is good, but a significant percentage of mothers are still not covered, and quality of care is insufficient, with a significant proportion of precisely those pregnant women who are probably at greater perinatal risk still receiving no care. The adequacy index calculated on the basis of two indicators was low. The number of visits is insufficient and the proportion of patients who do not start prenatal care during the first trimester of pregnancy is high. Multiprofessional prenatal care is low. The three selected quality indicators also demonstrated that much is needed to improve prenatal care in the municipality. Only 12.6% of mothers were seen by the same professional during the prenatal period and at de-

Table 3

Prenatal care. São Luís, Maranhão State, Brazil, 1997/1998.

Variables	f	%
Number of prenatal visits		
0	263	9.3
1-3	449	15.9
4-5	703	24.8
≥ 6	1,381	48.8
Unknown	35	1.2
Trimester when prenatal care was started		
No prenatal care	263	9.3
First	1,547	54.9
Second	904	32.1
Third	102	3.6
Category of prenatal care		
No prenatal care	263	9.3
Unified Health System (SUS)	1,903	67.2
Contracted out by SUS	259	9.2
Health insurance plan	309	10.9
Out-of-pocket	97	3.4
Professional who provided prenatal care		
Physician	1,945	75.7
Registered nurse	276	10.8
Physician and registered nurse	347	13.5
Kotelchuck's adequacy of prenatal care utilization index		
Intensive	84	3.0
Adequate	282	10.0
Intermediate	1,072	37.9
Inadequate	1,393	49.1
Adequacy based on Health Ministry recommendations		
Adequate	1,403	49.6
Intermediate	430	15.2
Inadequate	998	35.3
Total	2,831	100.0

livery, although this is a widespread wish of mothers and an indicator of humanization of health care.

The cesarean rate was high and rising in the municipality (Estado do Maranhão/UNICEF, 1992). One of the probable causes of this cesarean rate is tubal ligation, performed together with nearly 30% of cesareans.

The persistence of a high percentage of hospital deliveries not assisted by qualified personnel (physician or registered nurse) is a phenomenon that must be evaluated in greater depth. The percentage of newborns examined by a pediatrician in the delivery room continues to be low despite a ruling by Ministry of Health instituting reimbursement for this procedure (Brasil, 1993). It is necessary to determine by audit whether this payment is being made to professionals who are in fact failing to provide the service, since in many cases we detected neonatal medical records signed by a pediatrician, while in the questionnaire the mothers stated that no pediatrician was present in the delivery room.

Neonatal care still leaves much to be desired. Rooming-in for normal infants is not practiced in all cases. In some hospitals, infants had still not begun breastfeeding after 24 hours.

Comparison of some demographic and medical care characteristics reported in the three perinatal studies conducted in Brazil in the 1990s showed that Pelotas had the highest

Table 4

Delivery care. São Luís, Maranhão State, Brazil, 1997/1998.

Variables	f	%
Type of delivery		
Vaginal	1,875	66.2
Primary cesarean section	646	22.8
Repeat cesarean section	310	11.0
Tubal ligation during cesarean section		
Yes	285	10.1
No	2,546	89.9
Professional who performed the delivery		
Physician	2,080	73.5
Registered nurse	94	3.3
Nursing attendant	537	19.0
Midwife or health agent	98	3.5
Other	3	0.1
No information	19	0.7
Category of admission		
Unified Health System (SUS)	1,667	58.9
Contracted out by SUS	873	30.8
Health insurance plan	247	9.1
Out-of-pocket	34	1.2
Same professional providing prenatal and delivery care		
Yes	324	12.6
No	2,244	87.4
Total	2,831	100.0

percentage of families with an income of up to one minimum wage. The percentage of mothers without a partner was 12.3% in Pelotas, 11.4% in Ribeirão, and 24.4% in São Luís. Mothers under 20 years of age represented 17.4% of births in Pelotas, 17.5% in Ribeirão Preto, and 29.9% in São Luís (Bettiol et al., 1998; Costa et al., 1996; Victora et al., 1996).

Another major difference was in the percentage of smoking mothers: 5.7% in São Luís, 33.5% in Pelotas, and 20.3% in Ribeirão Preto. Primiparae represented 35.1% of births in Pelotas, 36.8% in Ribeirão Preto, and 47.8% in São Luís (Bettiol et al., 1998; Tomasi et al., 1996).

While in Ribeirão Preto only 2.4% of mothers failed to receive prenatal care, this percentage was higher in Pelotas (4.9%) and even higher in São Luís (9.3%). The cesarean rate also varied among the three municipalities: 30.5% in Pelotas, 53.2% in Ribeirão Preto, and 33.8% in São Luís. In Pelotas, 88.3% of the deliveries were attended by physicians, while the percentage was lower in São Luís (73.5%). The SUS reimbursed the cost of 55.1% of deliveries in Ribeirão and 89.7% in São Luís (Costa et al., 1996; Silva et al., 1998; Victora et al., 1996).

Considering only singleton live births, the low birth weight rate was lower in São Luís (7.6%) than in Pelotas (9.1%) and Ribeirão Preto (10.6%). A higher preterm birth rate was also observed in Ribeirão (14.8%), while an intermediate rate was observed in São Luís (12.4%) and a lower rate was observed in Pelotas (8.0%) (data not shown). As observed in São Luís, most premature infants showed no low birth weight in Ribeirão Preto. In Pelotas this phenomenon does not appear to occur. São Luís presented a much higher prevalence of intrauterine growth retardation than Pelotas (Silva et al., 1998; Victora et al., 1996).

Prevalence of low birth weight and preterm birth was approximately the same as described for the entire United States population in recent years (NCHS, 1999), an intriguing fact if we consider that the known risk factors for low birth weight are much more prevalent in the São Luís population.

Similarly, comparison of the statistical data with those of other Brazilian cities (Pelotas and

Table 5

Characteristics of newborns and type of care provided to them.
São Luís, Maranhão State, Brazil, 1997/1998.

Variables	f	%
Low birth weight		
Yes	270	9.6
No	2,548	90.4
Preterm birth		
Yes	394	13.9
No	2,437	86.1
Weight for gestational age classification		
Small	411	14.6
Adequate	2,195	77.9
Large	212	7.5
Professional assisting newborn		
Pediatrician	1,420	50.2
Obstetrician	32	1.1
Anesthesiologist	6	0.2
Registered nurse	204	7.2
Nursing attendant	946	33.4
Midwife	33	1.2
Other	5	0.2
No information	185	6.2
Type of lodging for newborn		
Bedside cradle	1,304	46.1
Collective nursery	324	11.4
Intermediate nursery	351	12.4
In bed with the mother	736	26.0
Intensive care unit	56	2.0
NA	60	2.2
Beginning of breastfeeding in the first 24 hours of life		
Yes	2,160	76.3
No	480	17.0
No information	191	6.7
Apgar measured		
Yes	1,355	47.9
No	1,365	48.2
No information	111	3.9
Capurro measured		
Yes	1,000	35.3
No	1,745	61.7
No information	86	3.0
Total	2,831	100.0

Ribeirão Preto) leads us to ask the following questions: why did São Luís present the lowest low birth weight rate among the three towns? Why did Ribeirão Preto present the highest preterm birth rate among the three towns? Why did approximately 60% of the preterm infants fail to present low birth weight? These questions need to be answered by future research. Low prevalence of maternal smoking may be one of the reasons for the lower than expected low birth weight rate detected by our study.

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