Bulletin of the World Health Organization, 65 (1): 95–104 (1987)

Perinatal mortality in southern Brazil: a population-based study of 7392 births

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Perinatal, fetal and early neonatal mortality rates were determined in a population of 7392 babies born in hospitals in Pelotas (total population, 260 000) during 1982. These babies represented over 99% of all births in the city in that year. The perinatal mortality rate for singletons was 31.9 per 1000 total births, the fetal mortality rate being 16.2 and the early neonatal mortality rate 15.9 per 1000 total births.

The most important variable influencing perinatal mortality was birth weight; low-birth-weight babies were 17 times more likely to die in the perinatal period than those weighing 2500 g or more. Perinatal mortality was also strongly influenced by socio-economic status, which was measured by family income. Babies belonging to the poorest families were 3 times more likely to die during the perinatal period than those in families with the highest incomes. Other variables significantly associated with perinatal mortality were gestational age, maternal age, maternal weight and height, reproductive history, attendance in antenatal clinics, parity, and birth interval. Information on most of these risk factors can easily be obtained by health workers at the beginning of pregnancy and should be taken into consideration when allocating women to the proper level of care.

Although most epidemiological studies of the perinatal period have been performed in industrialized countries (*1–4*), there is evidence that perinatal events are very important determinants of infant and child health in the less developed countries as well (*5*). It is known that birth weight strongly influences infant nutrition (*6–8*), morbidity (*9*), and mortality (*5*). As low birth weight is more common in the developing countries (*10*), its consequences will be more marked in these areas. One reason why many of these countries still lack sound studies in perinatal epidemiology is that they still face high post-perinatal mortality rates and therefore tend to concentrate their preventive efforts in this period. Also, epidemiological studies need to be properly designed and funded, and these conditions are not easily available; medical education is mainly concentrated on curative care, and financing agencies are less interested in such projects.

In Brazil, a vast country with over 130 million inhabitants and considerable social disparities, the few studies of perinatal epidemiology available are either based on official statistics or restricted to births from particular hospitals. These studies are flawed, in the first case by the under-registration of deaths and in the second by the lack of representativeness of the sample under study.

The present paper is based on a large study of perinatal health carried out in the city of Pelotas, southern Brazil.[a] It is, to our knowledge, the first population-based study of perinatal health in this country. Its main objective was to estimate perinatal mortality rates and to identify risk factors with a view to prevention.

METHODOLOGY

All 7392 hospital births occurring in Pelotas (population, 260 000) in the year 1982 were studied. Access to hospital confinement is almost universal and a recent household census revealed that less than 1% of the births occurred at home in that year (*11*). This perinatal research was carried out at three levels: in

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[a] BARROS, F. C. *The epidemiology of perinatal health in southern Brazil. A study of perinatal mortality, low birth weight and the utilisation of health care* (Ph.D. thesis, University of London, 1985).

maternity hospitals, through home visits, and at local registries for births and deaths.

Hospital study

All mothers giving birth in the three city hospitals were interviewed with the help of a previously tested and structured questionnaire focused on demographic, environmental and socioeconomic variables and on health care utilization; at the same time a detailed history was taken about previous pregnancies. The mothers were measured and weighed upon arrival, and the newborns were weighed on the first day of life. The interviews were conducted by paediatricians, obstetricians, and senior medical students previously trained during two pilot studies.

All newborns were followed up during their hospital stay, special attention being paid to morbidity and mortality. The criteria for their admission into the study were (*a*) when the birth weight was equal to 500 g or more and there were signs of life (liveborns), and (*b*) in the case of stillbirths, when the gestational age was 28 weeks or more (if the period of gestation was unknown, fetuses weighing 1000 g or more were included). These limits were adopted because for stillborns 1000 g is usually considered to be the weight of fetuses at 28 weeks, whereas some live babies weighing 500–1000 g are known to survive the perinatal period and must therefore be taken into consideration when this period is studied.

Home visits

Based on a random sample of approximately 15% of the births, 1093 babies were visited at home after the first week of life. These visits had three main objectives. Firstly, as the perinatal period ends on the seventh day and hospital discharges occurred very early (often less than 24 hours after birth), a sample of the babies was followed up to check their health status. Secondly, this was a way of double-checking some of the information collected in hospital. And thirdly, information relating to the homes and other environmental conditions could be gathered. These home visits yielded only one extra death which failed to reach the official registration system.

Monitoring of death certificates

All death certificates of the babies born in 1982 were checked every month and were later linked to the information provided by the hospital questionnaires.

Variables studied

The outcome variables were the perinatal mortality rate (PMR, or the number of perinatal deaths per 1000 total births), the fetal mortality rate (FMR, or number of fetal deaths per 1000 total births), and the early neonatal mortality rate (ENMR, or number of deaths in the first week per 1000 live births).

The following variables were studied:

—*Birth weight.* Babies were weighed during the first 24 hours of life with calibrated scales; low birth weight (LBW) was defined as less than 2500 g.
—*Gestational age* was calculated in complete weeks from the first day of the last menstrual period (LMP) to the date of birth; this information was not available in 21.4% of births. Babies with a gestational age of less than 37 weeks were considered as pre-term.
—*Family income* was expressed as minimum wages (MW) per month (currently about US$ 50).
—*Smoking during pregnancy.* Mothers were classified as ever-smokers or non-smokers.
—*Maternal age* was expressed in years.
—*Maternal weight at the beginning of pregnancy* was expressed in kilograms, based on the figure given in the antenatal card or as remembered by the mother; this information was not obtained for 15.7% of the mothers.
—*Maternal weight at the end of pregnancy* was obtained from either the hospital admission card or the antenatal card, if the mother had been weighed in the previous 10 days; this information was not available for 16.6% of the mothers.
—*Weight gain during pregnancy* was the difference between maternal weights at the end and at the beginning of pregnancy; in 27.5% of cases this could not be calculated.
—*Maternal height* was expressed in centimetres; only 2.3% of the mothers were not measured.
—*Previous reproductive history* included previous abortions, stillbirths, neonatal deaths, LBW babies and caesarean sections.
—*Parity* indicated the number of previous births.
—*Birth interval* was given by the number of months since the last birth.
—*Number of attendances at the antenatal clinic (ANC)* was obtained from the antenatal card or, if unavailable, by asking the mother.

Data analysis

The statistical package for the social sciences (SPSS) (*12*) was used for descriptive analysis and contingency tables. Logistic regression analyses were performed with the GLIM (generalized linear interactive modelling) system (*13*).

RESULTS

Perinatal mortality rates and causes of death

The perinatal outcome of single, multiple, and all

Table 1. Percentage incidence of low birth weight (LBW) births and the fetal, early neonatal and perinatal mortality rates of single, multiple and total births, Pelotas, 1982

	LBW (%)	Fetal mortality[a]	Early neonatal mortality[a]	Perinatal mortality[a]	No of births
Single	8.1	16.2 (118)[b]	15.9 (114)	31.9 (232)	7267
Multiple	58.0	32.0 (4)	107.4 (13)	136.0 (17)	125
All births	8.8	16.5 (122)	17.5 (127)	33.7 (249)	7392

[a] Rates are given per 1000 births for fetal and perinatal mortality and 1000 live births for early neonatal mortality

[b] Figures in parentheses are the number of deaths

births and the proportions of low-birth-weight babies are shown in Table 1. The overall perinatal mortality rate was 33.7 per 1000 total births, nearly equally split between fetal and early neonatal deaths, and 31.9 per 1000 singleton births.

The causes of death are shown in Table 2. In 40% of these deaths it was impossible to ascertain the cause with confidence; the majority were stillbirths. Preterm-related problems, such as immaturity and hyaline membrane disease, were responsible for nearly 40% of deaths with a known cause.

Birth weight and gestational age as risk factors

The study of risk factors was restricted to singletons, as proposed by Macfarlane et al. (*14*). Table 3 shows the perinatal, fetal and early neonatal mortality rates for various birth weight groups. More than one in five babies weighing less than 2500 g died in the perinatal period. This was 17 times higher than the PMR of babies weighing $\geqslant$2500 g. More than 60% of all perinatal deaths, and 71.2% of deaths in the first week occurred in LBW babies, which gives a relative risk of 28 compared with babies weighing $\geqslant$2500 g for early neonatal mortality.

Regarding gestational age, almost 20% of the preterm babies died during the perinatal period. Term babies of 37–38 weeks of gestation were twice as likely to die in the perinatal period than those of 39–41 weeks (Table 3). Babies with an unknown length of gestation presented a PMR of 54.0 per 1000 total births.

The relationship between perinatal mortality, gestational age and birth weight was also studied; 42% of the LBW babies were preterm and the remaining 58% had a gestational age of 37 weeks or more, and were probably growth-retarded. Table 3 also shows that one third of the LBW, preterm babies died during the perinatal period, whereas only one in 10 died among LBW babies born at term. Deaths were evenly distributed between fetal and early neonatal periods for the LBW, preterm babies, but occurred predominantly during the fetal period for the intrauterine growth-retarded group. Babies weighing $\geqslant$2500 g presented a low perinatal mortality rate irrespective of their gestational age, which suggests that low birth weight was a much stronger determinant of perinatal mortality than gestational age. However, as large preterm babies comprised a small group with only 3 deaths, the pattern of mortality described for this group should be judged with caution.

Table 2. Number of perinatal deaths and mortality rates by cause (all births included), Pelotas, 1982

Cause of death	Fetal deaths	Deaths in first week	Total	Mortality rates[a]
Immaturity	0	38	38 (15.3)[b]	5.2
Asphyxia	18	10	28 (11.2)	3.8
Malformation	5	19	24 (9.7)	3.2
Hyaline membrane disease	0	19	19 (7.6)	2.6
Infection	2	10	12 (4.8)	1.6
Trauma	0	5	5 (2.0)	0.7
Other causes	11	12	23 (9.2)	3.1
Ill-defined	86	14	100 (40.2)	13.5
Total	122	127	249 (100.0)	33.7

[a] Rates per 1000 births

[b] Figures in parentheses are percentages

Table 3. Perinatal, fetal and early neonatal mortality rates by different birth weight groups (singletons only), gestational age, and combined birth weight and gestational age categories, Pelotas, 1982

	Perinatal mortality[a]	Fetal mortality[a]	Early neonatal mortality[a]	No. of births
Birth weights (g):				
<1000	958.3	41.7	956.5	24
1000–1499	690.1	322 9	541 7	71
1500–1999	219.5	138.2	94 3	123
2000–2499	97.1	47.4	52 2	422
2500–2999	16.6	9.8	6.8	1629
3000–3499	13 1	7.6	5 5	2750
3500–3999	9 0	6.2	2 8	1768
⩾4000	17.0	14 8	2.1	471
<2500	218.7	95 3	136.4	640
⩾2500	13 1	8.3	4.8	6618
All groups	31.9	16.2	15.9	7267
Gestational age (weeks):				
>37	188.0	99.7	98.1	351
37–38	22.0	14 7	7.4	1226
39–41	10 4	6 4	3.9	3567
⩾42	31.7	19.4	12 6	567
All groups	25.9	15.2	10 8	5711
χ^2	401 08	186 02	241 40	
P	0 00001	0 00001	0.00001	
LBW, preterm[b] (<2500 g, <37 weeks)	337.0	171 3	200.0	181
LBW, term (IUGR)[b] (<2500 g, ⩾37 weeks)	98.6	71 7	29.0	223
Large, preterm (⩾2500 g, <37 weeks)	18.0	12 0	6 1	167
ABW, term[b] (⩾2500 g, ⩾37 weeks)	11 3	7 0	4 3	5133
χ^2	804.70	372.42	544 32	
P	0 000001	0 000001	0 000001	

[a] Rates per 1000 births for fetal and perinatal mortality and 1000 live births for early neonatal mortality

[b] LBW (low birth weight), IUGR (intra-uterine growth retardation), ABW ("appropriate" birth weight)

Social factors

Family income. Table 4 shows that babies in the poorest families (1 minimum wage (MW) or less per month) were more than 3 times more likely to die in the perinatal period than babies from the richest families (over 10 times the minimum wage per month). This difference was nearly fivefold for the fetal mortality rate, which showed a steady decline in mortality with rising income.

Smoking. The perinatal mortality rates of babies of smokers and non-smokers were exactly the same (31.9 per 1000), even though the babies of smokers were twice as likely to be of low birth weight than those of non-smokers (11.4% and 6.5%, respectively).

Table 4. Perinatal, fetal and early neonatal mortality rates according to family income, measured in minimum wages (MW) per month,[a] Pelotas, 1982

Family income (MW/month)	Perinatal mortality[b]	Fetal mortality[b]	Early neonatal mortality[b]	No of births
⩽1	44 6	24 2	20.8	1772
1.1–3	31.9	15.9	16 2	3382
3.1–6	20.5	12.3	8.3	1218
6.1–10	22.5	6.7	15.8	444
>10	13.2	5 2	7.9	379
All groups	31.5	16.2	15 5	7195
χ^2	20.07	13 66	4 54	
P	0 0005	0.008	0.02	

[a] About US$ 50 per month

[b] See footnote *a* in Table 1

Biological factors

Maternal age. Fig. 1 shows a J-shaped curve for the perinatal mortality rates, which were lowest for the babies of mothers aged 25–29 years. The PMR for babies of teenagers was virtually the same as that for the total population (33.2 per 1000), the rates increasing markedly after 30 years of age. On the other hand, the lowest fetal mortality rates were seen among babies of adolescents (11.3 per 1000), the rates increasing progressively with age to 48.1 per 1000 in the oldest group. Deaths in the first week (early neonatal) were more common in the extreme age groups.

The association between maternal age, family income, antenatal care and perinatal mortality was explored further through logistic regression analysis. Fig. 2 shows the shapes of the curves relating maternal age to the relative risks for perinatal mortality, the value of 1 being given to the risk for adolescent mothers. While adolescents are at higher risk than mothers in their twenties in the unadjusted curve, after adjusting for family income and number of antenatal visits the adolescents become the group at lowest risk. The observed differences in the shapes are due to changes in the relative position of mothers aged under 25 relative to older women, for whom the slope of the curve remains virtually unchanged. A test for a linear trend of perinatal mortality with age becomes more significant in the adjusted curves ($P<0.001$) than in the unadjusted data ($P=0.01$). After adjustment, women aged 35–39 years are at a significantly higher risk than teenagers (odds ratio, 2.01; 95% confidence interval, 1.18–3.41), as well as those aged 40 years or more (odds ratio, 2.59; 95% confidence interval, 1.31–5.11).

Maternal weight at the beginning of pregnancy. There were no significant differences in perinatal or early neonatal mortality rates according to maternal weight (Table 5). On the other hand, fetal deaths increased with maternal weight ($P=0.05$).

Maternal weight at the end of pregnancy. Babies whose mothers weighed less than 55 kg were almost 4 times more likely to die in the first week of life than those of mothers weighing 75 kg or more (Table 5).

Weight gain in pregnancy. The perinatal and early neonatal mortality rates decreased smoothly with increases in maternal weight gain, and were lowest in the group that gained 16 kg or more during pregnancy (Table 5).

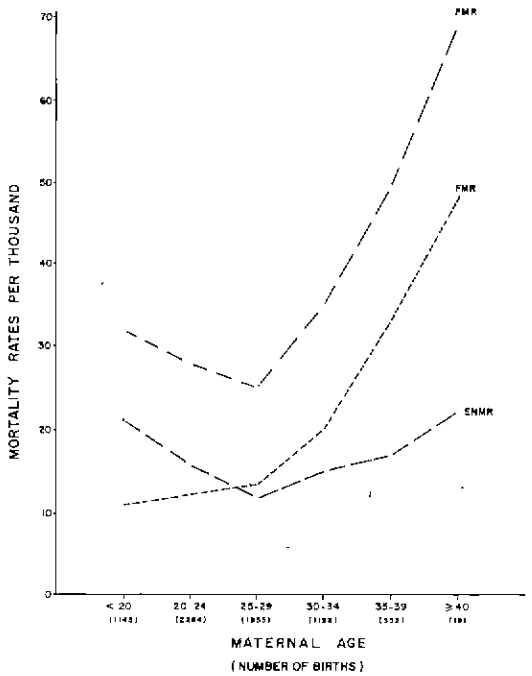

Fig 1. Perinatal, fetal and early neonatal mortality rates (PMR, FMR and ENMR) according to maternal age, Pelotas, 1982.

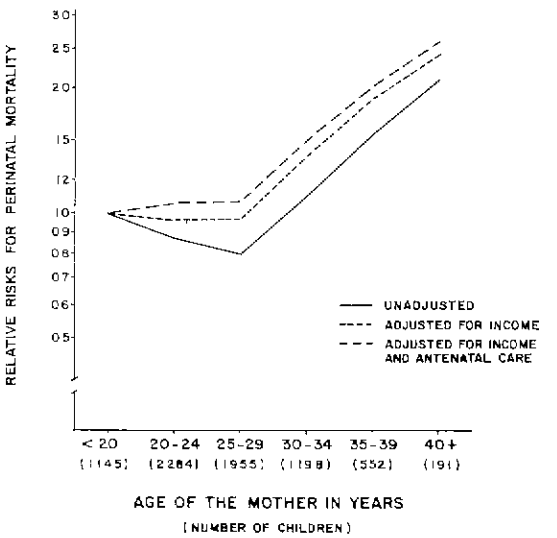

Fig 2. Comparison of relative risks for perinatal mortality by maternal age, using unadjusted data and after adjustment for family income and the combined effects of antenatal care and family income, Pelotas, 1982.

Table 5. Perinatal, fetal and early neonatal mortality rates according to maternal weights at the beginning and end of pregnancy, the weight gain during pregnancy, and maternal height, Pelotas, 1982

	Perinatal mortality[a]	Fetal mortality[a]	Early neonatal mortality[a]	No. of births
Initial weight (kg):				
<49.0	27.6	8.0	19.7	1378
49.0–53.9	30 1	15.7	14.6	1461
54.0–60 9	28.9	15 0	14.1	1660
⩾61.0	31.9	20 3	11.9	1628
All groups	29 7	15 0	14.9	6127
P	NS[b]	0.05	NS	
Final weight (kg):				
<55.0	30 4	7 1	23.4	559
55 0–64 9	31.3	15.1	16 3	2111
65.0–74 9	20 7	11.5	9 2	2154
⩾75.0	22 8	16 2	6.7	1288
All groups	25.7	13 4	12.4	6112
P	NS	NS	0.004	
Weight gain (kg):				
<7 0	45.6	15 9	31.3	877
7.9– 9.9	32.7	14.9	18.1	1008
10.0–12 9	22.4	12.7	9.8	1340
13 0–15.9	18.8	10 9	8.0	1011
⩾16 0	16.8	11 5	5 4	1129
All groups	26.3	13.0	13.6	5365
P	0 0003	NS	0.00001	
Height (cm):				
<150	27 0	6.4	20.7	777
150–154	34.0	19.1	15 1	1883
155–159	33.8	16.7	17.4	2217
160–164	32 5	18.2	14.6	1535
⩾165	11.6	10.2	1.5	687
All groups	30.7	15 9	15.0	7099
P	0 03	NS	0.02	

[a] See footnote *a* in Table 1

[b] NS, not significant

Maternal height. The perinatal mortality rate was significantly lower among babies of taller mothers (Table 5). However, when family income was controlled through logistic regression analysis the association between maternal height and perinatal mortality ceased to be significant (likelihood ratio test (LRT), 2.968; $P>0.05$). The fetal mortality rate was lowest for the shortest mothers (6.4 per 1000), but this was not statistically significant and may be the result of small numbers. The early neonatal mortality rate was lowest among the women over 164 cm, with only one death in 687 births.

Previous reproductive history. The perinatal and fetal mortality rates were significantly increased for mothers with a previous abortion (Table 6), owing to a higher risk of having a fetal death. Mothers with a history of a previous fetal death were almost 4 times more likely to have another stillbirth compared with those without such a history. Mothers with a previous LBW baby had twice the risk of having a perinatal death than those without a previous LBW baby. The perinatal mortality rates for mothers with or without a previous caesarean section were almost significantly different (44.0/1000 and 31.3/1000, respectively) ($P=0.07$).

Parity. The fetal mortality rate was lowest among babies of parity-2 mothers (12.9 per 1000) and highest for babies whose mothers had 3 or more previous births (Table 7). The same trend was observed for perinatal deaths, but the differences were not quite significant ($P=0.07$).

Birth interval. The lowest early neonatal mortality rate was seen for babies born after a birth interval of 36 to 47 months (7.9 per 1000), and the highest rates were for the groups with a birth interval of less than 36 months (Table 7).

Health care

Antenatal care. There was a highly significant trend towards lower rates of perinatal, fetal and early neonatal mortality with increase in the number of antenatal visits. The perinatal mortality rate among babies of non-attenders was 56.2 per 1000 and for those with 10 or more visits it was 16.2 per 1000 (Table 7). When the effect of family income was controlled through logistic regression analysis, the association of number of ANC visits and perinatal mortality remained highly significant (LRT, 14.232; $P<0.001$).

Type of delivery. Although the perinatal mortality rate was higher for babies delivered by caesarean section (38.4 per 1000) compared with vaginal delivery (29.4 per 1000), this difference was not quite significant ($P=0.06$) (Table 7). Deaths in the first week were significantly more frequent in the caesarean section group than after a vaginal delivery (21.8/1000 and 13.7/1000, respectively).

DISCUSSION

The perinatal, fetal and early neonatal mortality rates described in this study are high, considering that our birth weight distribution compares favourably with countries showing lower perinatal mortality rates. For example, in Cuba a LBW incidence of

Table 6. Perinatal, fetal and early neonatal mortality rates of babies whose mothers had had a previous abortion, stillbirth, low-birth-weight baby, neonatal death, or caesarean section, Pelotas, 1982

	Perinatal mortality[a]	Fetal mortality[a]	Early neonatal mortality[a]	No. of births
Previous abortion:				
Yes	48.5	29.5	19·5	1319
No	27 7	12 4	15.5	3387
P	0.0005	0 0001	NS[b]	
Previous stillbirth:				
Yes	77.8	61.1	17 7	180
No	32 0	15.7	16.6	4526
P	0.001	0.00001	NS	
Previous LBW baby:				
Yes	54.0	25.6	29.1	741
No	27.5	12.8	14.9	3595
P	0 0003	0 01	0.01	
Previous neonatal death				
Yes	38.4	12.8	25.9	234
No	33 5	17.7	16.1	4472
P	NS	NS	NS	
Previous caesarean section:				
Yes	44.0	20.9	23.6	909
No	31 3	15.5	14.9	3798
P	NS	NS	NS	

[a] See footnote *a* in Table 1

[b] NS, not significant.

10.8% and a PMR of 26.9 per 1000 have been described (*4*), and in Cardiff (Wales) the respective values were 8.7% and 22.1 per 1000 in the period 1972–76 (*15*).

Although the birth weight distribution in Pelotas in terms of socioeconomic and other factors can be regarded as reasonably good, low birth weight was a leading risk factor for perinatal mortality and LBW babies were 17 times more likely to die in the perinatal period than babies weighing 2500 g or more. One way of lowering the perinatal mortality is theoretically, therefore, to improve the birth weight distribution, especially among socially deprived groups, where the incidence of LBW is highest. In fact, the striking variations observed in the PMR according to family income strongly suggest that social inequalities are important determinants of perinatal problems, largely by influencing biological factors (including birth weight) and the utilization of health care. Perinatal mortality was 3.3 times higher among babies of the poorest families compared with the richest. This difference is much greater than that observed in developed countries, such as the United Kingdom, where there is a twofold increase from social class I to V (*16*).

Another important variable influencing perinatal mortality was gestational age, with the PMR reaching almost 200 per 1000 among preterm babies. In addition, term babies did not make up a homogeneous group, and babies after 37–38 weeks of gestation had a twofold increase in the PMR compared with those after 39–41 weeks. This finding has important applications in Brazil, where elective caesarean sections are frequently performed. In the present population, for example, 28% of all deliveries were by caesarean section (*17, 18*).

One interesting finding of this study was that the babies of smoking mothers did not show an increased perinatal mortality despite a twofold increase in low birth weight, and the fact that smoking mothers were significantly poorer and lighter than non-smokers. It appears that this comparatively lower mortality of babies of smokers occurred because smoking has a stronger effect on birth weight than on gestational age, so that when the newborns of the same birth weight are compared, those of smoking mothers tend

Table 7. Perinatal, fetal and early neonatal mortality rates according to parity, birth interval, number of antenatal clinic (ANC) attendances, and type of delivery, Pelotas, 1982

	Perinatal mortality[a]	Fetal mortality[a]	Early neonatal mortality[a]	No. of births
Parity				
0	28.9	14 1	15.0	2380
1	31.1	15.1	16 2	2054
2	26.7	12.9	13.9	1161
3	44 4	23.1	21 7	518
⩾4	45 7	28.0	18.2	678
All groups	31 9	16 2	15.9	7241
P	NS[b]	0.05	NS	
Birth interval (months):				
<24	36 3	12.6	24 0	1330
24–35	35.7	15 8	20 3	936
36–47	24.9	17 5	7 9	629
⩾48	33 5	22 6	11 2	1511
All groups	33.6	17.4	16 5	4406
P	NS	NS	0 01	
ANC attendance				
None	56.2	23 4	33.5	427
1–4	46 9	24.1	23.3	1449
5–9	27.1	14 0	13.3	4343
⩾10	16 2	7.1	9 2	983
All groups	31.4	15 7	15.9	7202
P	0 00001	0 003	0 0005	
Type of delivery:				
Vaginal	29 4	16 0	13 7	5260
Caesarean section	38.4	16.9	21.8	2005
Both groups	31.9	16 2	15.9	7265
P	NS	NS	0 01	

[a] See footnote *a* in Table 1

[b] NS, not significant.

to show lower levels of prematurity. As it is known that for babies of the same birth weight the mortality is higher for those of lower gestational age, this could be one reason for the findings described above. However, the literature is still controversial on this subject (*2, 19–22*) and further studies are needed, where the confounding effects of gestational age, family income, and other variables are taken into consideration.

The association of a higher number of antenatal care attendances with a better perinatal outcome was also an important finding. The fact that this association remained quite strong even after controlling for the possible confounding effects of family income reinforces the impression that frequent visits to antenatal care clinics should be encouraged. However, it is still not known whether antenatal care *per se* increases the likelihood of a better perinatal performance or if the women who attend more often are a self-selected group. Also, if antenatal care accounts for the difference, what are the specific aspects of such care that are responsible for the better outcome? Although further studies in this area are certainly needed, efforts to persuade pregnant women to attend antenatal clinics should continue, especially those who are at increased risk.

This study has identified a number of risk factors for perinatal, fetal and early neonatal mortality that could be used by health workers when allocating pregnant women to the appropriate level of care. These factors are summarized in Table 8. Those that can be identified at the outset of pregnancy are low family income, low maternal weight and height, unfavourable maternal ages (adolescents or older

Table 8. Significance of different social, biological and health care variables on perinatal, fetal and early neonatal mortality, Pelotas, 1982

Variables	Perinatal mortality[a]	Fetal mortality[a]	Early neonatal mortality[a]
Family income	+	+	+
Birth weight	+	+	+
Gestational age	+	+	+
Maternal age	+	+	NS
Maternal weight (initial)	NS	+	NS
Maternal weight (final)	NS	NS	+
Maternal weight gain	+	NS	+
Maternal height	+	NS	+
Previous abortion	+	+	NS
Previous stillbirth	+	+	NS
Previous LBW infant	+	+	+
Previous caesarean section	NS	NS	NS
Parity	NS	+	NS
Birth interval	NS	NS	+
Antenatal clinic attendance	+	+	+
Type of delivery	NS	NS	+

[a] The + sign indicates that P is $\leqslant 0.05$, NS means $P > 0.05$

mothers), a history of perinatal problems in previous pregnancies, multiparity, and a short birth interval. Poor mothers were more likely to be smokers and of younger ages. Poverty thus presented a set of unfavourable characteristics, in terms of the woman's nutritional status, age, smoking, not reporting for antenatal care, and reproductive history which increased the risk of a perinatal death. Thus, it appears that family income might be used as one of the major indicative risk factors for perinatal death, which can be assessed early in pregnancy.

Finally, the study showed that in 40% of the perinatal deaths the cause was ill-defined mainly because post-mortem examinations are not routinely performed. The diagnoses are almost always presumptive, and the cause of death of stillbirths cannot often be determined. Clearly, a better understanding of the causes of perinatal death is necessary, and the utilization of systems for ascertaining the causes of death that do not depend on high rates of post-mortems, like the one developed by Wigglesworth (*23*), should help.

ACKNOWLEDGEMENTS

This study was supported by the International Development Research Centre (IDRC), Ottawa, Canada

RÉSUMÉ

MORTALITÉ PÉRINATALE DANS LE SUD DU BRESIL ETUDE SUR 7392 NAISSANCES

L'étude de la mortalité périnatale a consisté à suivre tous (260 000 habitants), au sud du Brésil, a porté sur les 7392 enfants nes en milieu hospitalier. Toutes les femmes de cette ville ont accès à l'hôpital pour accoucher et un recensement des ménages a révélé que, cette année-là, moins de 1% des accouchements avaient eu lieu à domicile

L'étude de la mortalité périnatale a consisté à suivre tous les nouveau-nés pendant leur séjour à l'hôpital et, une semaine après leur naissance, un échantillon de 15% d'entre eux a fait l'objet d'une visite à domicile, visite rendue nécessaire du fait que 23% des femmes quittent l'hôpital dans les 24 heures suivant la naissance et que la période périnatale s'achève le septième jour Les certificats de décès ont en outre été contrôlés chaque mois dans les bureaux du Secrétariat à la Santé et comparés à l'information contenue dans les questionnaires des hôpitaux.

Le taux de mortalité périnatale était de 33,7 pour 1000 naissances vivantes et de 31,9 pour 1000 naissances uniques. Le taux de mortalité fœtale pour les naissances uniques était de 16,2 pour 1000, et le taux de mortalité néonatale précoce de 15,9 pour 1000 naissances vivantes.

La variable qui influait le plus sur la mortalite perinatale était le poids à la naissance et le risque de décès pendant la période périnatale était 17 fois plus élevé pour les nouveau-nés de poids insuffisant à la naissance que pour ceux qui pesaient 2500 g ou plus La mortalité périnatale dépendait aussi largement du statut socio-economique, mesuré d'après le revenu familial. Le risque de decès pendant la période périnatale était trois fois plus élevé chez les enfants des familles les plus pauvres que chez ceux des familles les plus aisées.

Une autre variable étroitement liée à la mortalité périnatale était l'âge gestationnel, la proportion d'enfants nés avant terme approchant de 200 pour 1000 naissances. Parmi les enfants nes a terme, le risque de décès pendant la période périnatale était deux fois plus élevé chez ceux qui étaient nés après 37 ou 38 semaines de gestation que chez ceux qui étaient nés à 39 ou 41 semaines (22,0 pour 1000 et 10,4 pour

1000 respectivement). Cette observation a des incidences importantes au Brésil où les césariennes sont souvent pratiquées systématiquement. Dans la population étudiée, par exemple, 27,6% de tous les accouchements ont eu lieu par césarienne. Au nombre des autres variables associées de près à la mortalité périnatale figurent l'âge de la mère, le poids et la taille de la mère, les grossesses antérieures, la fréquentation des dispensaires prénatals, la parité et l'intervalle entre les naissances. Les agents de santé peuvent facilement obtenir des renseignements sur ces facteurs de risque au début de la grossesse et ils doivent en tenir compte lorsqu'ils décident du niveau de soins qui convient à chaque mère.

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