Collecting population-based perinatal data efficiently: the example of the Lebanese National Perinatal Survey.

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Abstract
Summary

We describe the methodology and the main results of the Lebanese perinatal health survey; the aim of the survey was to obtain a minimum data set on all births occurring during a short period of time. The survey was carried out during two consecutive weeks in fall 1999 and in spring 2000. All live births and stillbirths occurring during these periods in medical settings were recorded. The sample included 5231 women and 5333 newborns. Data were obtained from medical records and by interviewing the women in hospital after delivery. All maternity units and birth centers agreed to participate. Maternal characteristics, medical care during pregnancy and delivery, and pregnancy outcome were similar for the two study periods. However gestational age distribution differed between the two periods. In total, 9.0% of infants were born before 37 weeks of gestation and 7.0% weighed less than 2500 grams at birth. Wide regional variations were observed for many indicators of health, care and risk factors. For instance, the cesarean section rate varied from 16.2% in the North Region to 28.0% in Beirut. The survey protocol was successfully applied in Lebanon and may be useful in other countries that have a relatively well-developed health care system, but few sources of reliable population-based statistics on health and medical care. This type of survey may also be an appropriate instrument for collecting additional data for health policy evaluations.

MESH Keywords Adult ; Birth Weight ; Cesarean Section ; Delivery, Obstetric ; methods ; Developing Countries ; Educational Status ; Female ; Gestational Age ; Health Care Surveys ; methods ; Home Childbirth ; Humans ; Infant, Newborn ; Infant, Premature ; Lebanon ; epidemiology ; Mothers ; Parity ; Perinatal Care ; methods ; Pregnancy ; Pregnancy Outcome ; Prenatal Care ; methods ; Risk Factors

Introduction

There is an increasing need for statistics on morbidity, risk factors and medical care in all countries to make it possible to define health priorities, to allocate resources and to prepare regulations. In many countries in Europe and North of America, the main sources are medical birth registries or civil registration systems, including data on all births.1 ,2 These data are usually derived from the medical records of maternity units. Annual statistics concerning all births are not available in some other countries, because of unfavorable conditions or a lack of resources.

A survey on a national sample of births was first conducted in the United Kingdom where data were collected on all births occurring during one week in 1946, 1958 and 1970.3 –5 Other countries lacking routine data on births have since used this method to collect data on a regular basis on a large range of topics related to the perinatal period6 –9 or on special topics.10 Some countries have used this method just once to study perinatal health.11

The Lebanese Ministry of Public Health wished to launch a new policy to reduce perinatal mortality and to improve health services for mothers and newborns. Very little information was available for designing this policy after 20 years of war.12 ,13 A national survey was carried out in 1999–2000, using a protocol applied in France for routine surveys.6 The objective of these surveys was to obtain a minimum data set concerning all births occurring during a short period of time by using data from hospital records and by interviewing mothers.

In this paper, we describe the methodology of the Lebanese perinatal survey. We provide the main results and discuss the strengths and limitations of this type of survey protocol in a country characterized by a relatively well-developed health care system, but few reliable statistics on health and medical care and major disparities between regions and social groups.

Population and method

Lebanon has a population of about four million inhabitants.14 About 80,000 infants are born per year. All births and deaths are registered, but official annual statistics are imprecise and data on maternal characteristics or perinatal morbidity are not collected. There are wide variations in the organization of medical services and access to care. Deliveries can take place in public or private hospitals, in

small birth centers run by a gynecologist or a midwife, or occasionally at home. Standards and costs of care for pregnant women vary widely between care givers and places of care.15 In 1999, 50% of women who delivered in a hospital had health insurance and 21% received free care or financial help from the Ministry of Health.16

Study sample

Data were collected on births occurring in medical settings (public or private hospitals, or birth centers). Births that occurred at home or during transportation were also considered if the mother and newborn were subsequently hospitalized. All live births and stillbirths were included if gestational age was at least 22 weeks or if birthweight was at least 500 grams. Deliveries occurring in medical settings located in Palestinian camps were not considered.

The survey was extended to home deliveries in the quada (district) of Akkar in the North Region, using the same questionnaire. This area is known for its high proportion of home births.13

Data collection

We determined the size of the sample necessary to provide regional statistics with sufficient precision. With a sample of 500 births per region, the 95% CI for an indicator observed in 10% of the population was estimated to be [7.4%, 12.6%]. To obtain this number of births per region, we needed a national sample of about 5000 births, i.e. all births during four weeks. As some indicators may vary according to season, we collected data during 15 consecutive days during the fall (1st to 15th November, 1999) and spring (17th April to 1st May, 2000).

The questionnaire included 64 questions. Data were derived from two sources. Data concerning socio-demographic characteristics of the parents, obstetrical history, tobacco consumption, and prenatal care were obtained by interviewing the mother during her stay in hospital after delivery. Characteristics of the delivery and health status of the newborn were obtained from the hospital records or directly from the medical staff or the birth attendant.

A technical committee, consisting of members of the Ministry of Health, United Nations Children's Fund (UNICEF) and the Lebanese Society of Perinatal Medicine, defined the protocol and the questionnaires (Table 1). This committee was also responsible for data analysis and the diffusion of results. Data were collected in hospitals and birth centers by midwives or nurses working in these settings. Local study coordinators visited every hospital and birth center to ensure that all births were included. Each coordinator was responsible for three to five hospitals or birth centers, which they visited at least three times a week. At each visit they collected the questionnaires and controlled the quality of the data. They sent questionnaires daily to the regional coordinators. The regional coordinators were responsible for the management of the survey in each region. The protocol and questionnaire were designed and the analysis done with the support of the Epidemiological Research Unit on Perinatal Health and Women's Health (INSERM, Paris, France), which designed the protocol for the French National Perinatal Surveys.

The cost of the survey was 102 000 US $. The figure does not include however the time spent by the members of the technical committee.

Analysis

Most of the analysis involved births occurring in medical settings. We first compared the samples obtained in November and April. We then estimated the proportions of preterm deliveries (before 37 completed weeks of gestation) and low birthweight infants (< 2500 g) according to vital status and the number of fetuses. Finally, we studied variations in maternal characteristics, medical care and pregnancy outcome by region of residence and region of birth. In the quada of Akkar, we also compared births in medical settings and home births.

When analyzing preterm deliveries in medical settings, we assessed inaccuracies in the estimated gestational age (GA), focusing on babies who were very large for their GA. Babies were considered to be very large if: ≥1500 g for GA≤ 27 weeks, ≥2000 g for GA=28 or 29 weeks, ≥2500 g for GA=30, 31 or 32 weeks, ≥3000 g for GA=33 or 34 weeks, ≥ 3500 g for GA=35 weeks and ≥4000 g for GA=36 weeks.

The analysis was performed with the SAS software. Estimates were provided with 95% confidence intervals. The Chi square test was used for comparisons in the overall sample. For the analysis of regional variations, we used two-sided binomial tests.

Results

In 1999, there were 14 maternity units located in public hospitals, 111 maternity units in private hospitals, 7 private maternity units and 69 small birth centers in Lebanon. All these facilities agreed to participate. During the two study periods, 5231 women delivered and 5333 children were included in the survey. Ninety-nine of the children were stillborn. There were 2840 births in November and 2493 births in April. Four women refused the interview. None of the women who delivered at home in the district of Akkar refused to be interviewed.

Table 2 shows the main indicators in the overall sample. The proportion of unknown items was very small. It reached 1% or less for maternal age, parity, educational level, number of prenatal visits, onset of labor, mode of delivery and birthweight. It was 2% for gestational age.

The main maternal characteristics, the number of prenatal visits, the medical interventions during labor and delivery, and birthweight were similar in November and April. Furthermore, no significant differences were observed in the distribution of the samples by region of maternal residence, region of birth, and place of birth (public hospital, private hospital, maternity unit or birth center). However, births occurred less frequently at 39 or 40 weeks in November than in April. The proportion of births before 37 completed weeks of gestation was not statistically different between the two periods (p=0.15).

The main indicators described in table 2 show both high and low levels of medical care and interventions. For example, almost half of the women had more than seven prenatal visits, whereas 19.1% had no prenatal care or less than three visits. Labor and delivery were characterized by a low proportion of inductions and operative vaginal births, whereas the overall cesarean section rate reached 23.1%. Almost three quarters of these cesarean sections were done before the onset of labor.

In the overall sample, the preterm delivery rate was 9.0% and the proportion of low birthweight infants was 7.0% (Table 3). These rates varied according to the vital status and the number of fetuses. Among live-born singletons, the preterm delivery rate was 6.6% and the proportion of low birthweight infants was 4.7%. These proportions were 40.4% and 40.3% respectively for live-born twins and triplets.

After excluding preterm newborns very large for their GA, the preterm delivery rate was 8.3% for the overall population, 7.1% for singletons and 41.9% for twins and triplets. These proportions were respectively 7.3, 6.1 and 40.4% for live births.

Among preterm births (live births, stillbirths and large for GA newborns included), 26.2% had a cesarean section before labor, and 7.5 % had an induction. Among term births, 14.9% had cesarean section and 9.1% had an induction.

Maternal characteristics, medical care and pregnancy outcome varied considerably according to region of residence (Table 4). The North Region and the Bekaa were characterized by a high proportion of women with high parity, low educational level, lack of medical insurance and lack of prenatal care. Such characteristics were less frequent in Beirut and Mount-Lebanon. The preterm delivery rate was more than twice as high in Beirut than in the North Region. Similar variations were observed by region of birth.

In the quada of Akkar, 23.7% of women delivered at home. These women had higher parity and lower educational level than the women who delivered in a medical setting (Table 5). More than half of these women had no prenatal visits. Home births were attended by a midwife (50%), a matron (40%), a medical doctor (8%) or a nurse (2%). The proportion of low birthweight infants was slightly lower in this group but the difference was not statistically significant.

Discussion

A survey that was originally designed for a Western country was successfully applied in Lebanon. With the exception of gestational age, all indicators were very similar in the two study periods. Indicators of medical care revealed a large proportion of women with little or no prenatal care and a high rate of cesarean section. Maternal characteristics, medical care and pregnancy outcome varied considerably according to region or place of birth (medical setting or home).

Before this survey, Lebanese health statistics were obtained through demographic surveys based on interviews with samples of households. Women were asked a few questions about their most recent birth in the years preceding the survey.12 ,13 This is a useful way of obtaining data on all births, both in maternity units and at home, but it presents some limitations. In particular, it is difficult to ask precise questions on medical care and children's health and there is a risk of the mother forgetting certain information. It was not possible to carry out a survey in the maternity units or with the medical doctors and midwives during the 20 years that the civil war lasted. Our survey was conducted successfully in 1999, even though the medical services were still disorganized. The success of the survey was to a large extent due to support from national medical and midewifery associations as well as the assistance of local clinicians. The participation rates were very high. The completeness of the data on deliveries in medical settings was very similar to that obtained in the French national surveys conducted in 1995 and 1998.17 Thus, this type of protocol can provide high quality data concerning births in medical settings.

The data are not representative of all births in Lebanon because home births and births in Palestinian camps were not included. Births among the Palestinian refugees represent about 10% of all births in Lebanon and at least half of such births occur in Palestinian camps.18 In the early 1990s, 11% of Lebanese women delivered at home.12 There is a trend towards a decrease in home deliveries. For example, in Beirut the proportion decreased from 10% in 1984 to 5% in 1994.12 The exclusion of these two groups resulted in a slight over estimation of the intervention rates during delivery and in a slight under estimation of the proportion of women of low social class and with poor prenatal care.

Our results confirm the magnitude of regional disparities. This justifies the collection of data in all regions, rather than in just one region or two very different regions. This also shows the need for a sufficiently large sample to make it possible to test regional disparities in the main indicators. However, with our sample, we were not able to estimate precisely indicators of rare events, such as perinatal mortality. For example, the confidence interval of the stillbirth rate was 10 to 16 per 1000 (point estimate 13 per 1000).

Our sample was based on consecutive births that occurred in full weeks, like other national perinatal surveys carried out during a short period of time.3 ,17 This design was chosen because the number of births and obstetric interventions may vary according to the day of the week, especially in countries that have high rates of induction of labor and cesarean section.19 ,20 Our two data collection periods each lasted 15 days, i.e. two full weeks and one day. If this extra day was excluded, results were very similar. For instance, the induction rate was then 8.9% instead of 8.8%, and the total cesarean section rate was 23.3% instead of 23.1%. Furthermore, the distribution of gestational age was still slightly different between the two periods of data collection.

The survey was conducted in two stages to take into account possible seasonal variations. No difference was observed between the two periods, except for gestational age. The high proportion of births at 39–40 weeks in April cannot be explained by differences in maternal risk factors, place of birth or onset of labor. It may have occurred by chance. In France, data were collected in spring and fall in the late 1980s and no differences were found between the two periods.21 Seasonal variations in birthweight have been reported in rural areas of tropical countries, possibly related to food supply, work load and malaria.22 –24 In other countries, a few studies have shown variations in preterm delivery rates and the distribution of gestational age according to calendar month.25 –27 These variations differ according to country and women's groups and there is no clear explanation for this seasonality. In this context, it is difficult to impose two or more waves of data collection, especially for the first survey conducted in a given country. However, a two-period survey has the advantage of mobilizing the actors involved for short periods of time, thus maintaining interest in the project. This argument was important in Lebanon, as the people involved in data collection and management also had to continue their normal professional activity and could not disrupt their work for a long period.

In countries with no good quality, routine data on perinatal health derived from birth certificates or a medical register, national studies on a representative sample of births are an interesting alternative. They make it possible to assess the current state of health and health care practices before initiating a health program, like in Lebanon. These surveys can be carried out a second time following the application of such programs to evaluate the policy adopted and its effects on health. More generally, nationwide studies carried out at regular intervals make it possible to monitor changes in health and care.

Regular national studies can also be useful in countries that routinely collect data on all births. They make it possible to limit the amount of data collected for each birth; indeed, data concerning a number of indicators only need to be collected every three to five years. This type of study also makes it possible to introduce questions about emerging topics more easily than with registers. For example, in the French national perinatal survey in 1998, questions have been included on several topics, such as HIV screening,28 Down syndrome screening by ultrasound, maternal serum screening and amniocentesis,29 or fertility treatment (manuscript in preparation).

The rate of cesarean sections was high in Lebanon compared to in most European countries.30 It was similar to that observed in the United States2 and in Central American countries where most births occur in maternity units.31 This high level is essentially due to cesarean sections carried out before the onset of labor, which accounted for 70% of all cesarean sections compared to about 50% in Europe.30 A study is underway to identify factors that can explain this rate.

Another important finding of this survey was the high rate of preterm deliveries. Errors when estimating age may have led to the misclassification of preterm and term children. It is difficult to estimate the number of misclassified term newborns by taking into account birthweight, because those who are too small for their GA may have suffered from intrauterine growth retardation. On the contrary, we can estimate the number of misclassified preterm newborns who were too large for their GA; this altered the overall preterm delivery rate from 9.0% to 8.3%. However we think that the preterm delivery rate was not greatly overestimated for several reasons. First, the use of the last menstrual period instead of ultrasound to measure gestational age, and the tendency to round off gestational age at birth generally lead to an underestimation of the number of preterm deliveries.32 ,33 Second, among women who delivered in medical settings, the highest preterm delivery rates were observed in regions characterized by a high level of medical care. It is reasonable to assume that the quality of the estimation of GA was better in these regions than in the others. One partial explanation for the high rate of preterm deliveries is the active management of complications during pregnancy. We found that one third of preterm births were associated with an induction or a cesarean section before labor. A similar proportion is found in Western countries.34 ,35 This first study in Lebanon shows that it would be of value to assess medical management of complications during pregnancy and labor in Lebanese maternity units.

Conclusion

In countries where there are many materiel and administrative constraints, surveys on national samples can be used to assess perinatal health and to help policymakers, without having to record all births. This may represent the first step before the establishment of a routine

data collection system. This type of survey can also complement well-established data collection systems by providing information about the needs of the population or the application of certain policies.

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Table 1

Organization of the survey

Tasks	Groups or people involved	Level
Design of the survey and the questionnaires	Technical committee[1]	National
Recruitment and training of regional and local coordinators and data collectors	Executive committee[2]	National
Data collection	364 midwives and nurses	Maternity units
Collection of questionnaires and first verification of completeness	5 regional coordinators and 44 local coordinators	Regional and local
Second verification of completeness, data entry and analysis	Technical committee[1]	National

1 Representatives of the Ministry of Health, UNICEF and Lebanese Society of Perinatal Medicine

2 Members of the Ministry of Health, UNICEF and the Association of Midwives

Table 2

Comparison of maternal characteristics, medical care and pregnancy outcome by survey period (births in medical settings)

		November 1999 %	April 2000 %	p	All %	95% CI
Maternal age (yrs)[1]	< 20	6.5	4.9	0.04	5.8	[5.2, 6.4]
	20 – 34	76.8	78.5		77.6	[76.5, 78.8]
	≥ 35	16.6 (2766)	16.6 (2435)		16.6 (5201)	[15.6, 17.6]
Parity [1]	0	30.5	30.5	0.62	30.5	[29.3, 31.8]
	1 – 3	54.1	54.9		54.5	[53.1, 55.8]
	≥ 4	15.4 (2780)	14.5 (2442)		15.0 (5223)	[14.0, 16.0]
Level of education[1]	no schooling	6.3	7.1	0.80	6.6	[6.0, 7.3]
	primary	21.9	21.9		21.9	[20.8, 23.0]
	complementary	32.6	32.5		32.5	[31.3, 33.8]
	secondary	21.2	20.9		21.1	[20.0, 22.2]
	university	18.1 (2761)	17.7 (2439)		17.9 (5200)	[16.9, 19.0]
Prenatal visits[1]	0	4.9	5.2	0.69	5.1	[4.5, 5.7]
	1, 3	14.3	13.7		14.0	[13.1, 15.0]
	4, 7	35.0	36.4		35.7	[34.4, 37.0]
	≥ 8	45.8 (2758)	44.7 (2423)		45.2 (5181)	[43.9, 46.6]
Onset of labor[2]	spontaneous	74.4	75.7	0.52	75.0	[73.8, 76.1]
	induction	9.1	8.4		8.8	[8.1, 9.6]
	cesarean section	16.4 (2834)	15.6 (2489)		16.2 (5323)	[15.3, 17.2]
Mode of delivery[2]	vaginal	72.3	72.9	0.73	72.6	[71.4, 73.8]
	instrumental	4.5	4.1		4.3	[3.8, 4.9]
	cesarean section	23.2 (2840)	23.0 (2493)		23.1 (5333)	[22.0, 24.3]
Gestational age (wks)[2]	< 37	9.6	8.4	0.006	9.0	[8.3, 9.8]
	37 – 38	27.8	25.8		26.8	[25.7, 28.1]
	39 – 40	54.1	58.8		56.3	[55.0, 57.7]
	> 40	8.5 (2776)	7.0 (2453)		7.8 (5229)	[7.1, 8.6]
Birthweight (g)[2]	< 2500	7.0	7.0	0.97	7.0	[6.3, 7.7]
	2500 – 2999	15.8	15.8		15.8	[14.8, 16.8]
	3000 – 3999	68.7	68.4		68.6	[67.3, 69.8]
	≥ 4000	8.5 (2826)	8.8 (2488)		8.6 (5314)	[7.9, 9.4]

1 % of women

2 % of newborns

( ) total number of women or newborns

Table 3

Pregnancy outcome by plurality and vital status (births in medical settings)

	Preterm delivery < 37 weeks			Low birthweight < 2500 g		
	n	%	**95% CI**	**n**	%	**95% CI**
All births	5229	9.0	[8.3, 9.9]	5314	7.0	[6.3, 7.7]
singletons	5036	7.8	[7.0, 8.5]	5120	5.7	[5.1, 6.4]
twins or triplets	193	42.5	[35.5, 49.5]	194	41.2	[34.3, 48.2]
Live births	5131	7.8	[7.1, 8.5]	5225	6.0	[5.4, 6.7]
singletons	4948	6.6	[5.9, 7.3]	5039	4.7	[4.2, 5.3]
twins or triplets	183	40.4	[33.3, 47.6]	186	40.3	[33.3, 47.4]

Table 4

Maternal characteristics, health care and pregnancy outcome by region of residence (births in medical settings)

		North	Bekaa	South-Nabatieth	Mount-Lebanon	Beirut	All
No of women		1324	796	880	1857	365	5222
Age > 34 years[1]	%	17.4	14.3	16.8	16.2	20.1	16.6
Parity ≥ 4[1]	%	24.7***	19.7***	17.3*	6.3***	7.5***	14.9
No education[1]	%	11.5***	12.5***	4.5**	2.2***	3.3**	6.6
No medical insurance[1]	%	61.5***	60.6***	52.3*	45.2**	36.0***	48.8
0–3 prenatal visits[1]	%	33.1***	31.6***	32.6***	17.1	7.4***	19.1
No of newborns		1351	808	900	1893	372	5324
Induction of labor[2]	%	6.0***	6.0**	6.5*	11.8***	14.3***	8.7
Cesarean section[2]	%	16.2***	21.4	25.7	26.6***	28.0*	23.1
Birth < 37 weeks[2]	%	6.9**	9.3	7.2	10.0	16.0***	9.0
Birthweight < 2500 g[2]	%	6.5	6.2	6.7	7.6	8.9	7.0

1 % of women

2 % of newborns

Differences between the regional and national indicators:

*** p<0.001;

** p<0.01;

* p<0.05

Table 5

Maternal characteristics, health care and pregnancy outcome by place of birth in the quada of Akkar

		Place of birth		
	All %	**Medical setting %**	**Home %**	**p**
Parity ≥ 4 [1]	37.2 (500)	32.4 (380)	52.5 (120)	< 0.001
No education [1]	23.5 (490)	19.1 (377)	38.1 (113)	< 0.001
Prenatal visits [1]				
0	25.5	14.9	59.8	
1 – 3	27.9	29.4	23.1	< 0.001
≥ 4	46.6 (494)	55.7 (377)	17.1 (117)	
Birthweight < 2500 g [2]	6.3 (506)	7.0 (386)	4.2 (120)	0.266

( ) total number of women or newborns

1 based on women

2 based on newborns