SELF-REPORTED MATERNAL MORBIDITY AND ASSOCIATED FACTORS AMONG BRAZILIAN WOMEN

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SUMMARY

Purpose. Demographic health surveys may constitute a valuable source of information on maternal morbidity, particularly in locations where an integrated system of epidemiological surveillance with wide geographic coverage has not yet been developed.

Methods. This study analyzed the database obtained from a national Demographic Health Survey carried out in Brasil in 1996. Data regarding how the survey was conducted, characteristics of the women interviewed who had given birth to live infants in the five preceding years, characteristics of the obstetrical care received and complications reported were evaluated.

Results. Responses from a weighted total of 3,635 women were analyzed. Statistically significant differences ($p<0.001$) were found between geographic domains for most characteristics studied. Deliveries were predominantly hospital-based throughout the whole country. Prevalence of self-reported maternal morbidity ranged from 15.5-22.9% in the various geographic domains analyzed. This geographic factor was found to be associated to differences in the occurrence of complications, generally and specifically, for cases of prolonged labour .

Conclusions. Differences in morbidity may reflect the intricate relationship between determinants of human development and maternal health conditions.

KEY WORDS: Maternal morbidity. Near miss. Demographic health survey. Brasil.

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INTRODUCTION

Annually, an estimated 529,000 women lose their lives due to causes related to pregnancy and childbirth, worldwide and approximately 10 million women suffer from complications during pregnancy[1]. Although there is some controversy related to Brazilian statistics on maternal mortality, around 73 deaths for every 100,000 live births are believed to occur [2]; however, even fewer data are available on the situation of maternal morbidity.

One of the Millennium Development Goals adopted by the United Nations Member States was reduction of the worldwide maternal death ratio by three-quarters by the year 2015 [3], however, current trends indicate that this reduction is not likely to be achieved[1,3]. In Brasil also, official statistics on maternal mortality have tended to remain stagnant for some years [2]. The Brazilian government and the international community therefore need to maximize efforts to improve maternal health indexes and thereby avoid a greater number of fatalities in the country[4].

Data collected on severe maternal morbidity has been considered potentially useful for the improvement of obstetric care, principally by enabling planners and health service administrators to set priorities[5, 6]. However, in Brasil, the magnitude and the characteristics of severe maternal morbidity have only recently begun to receive more specific attention, albeit the potential of this subject as basis for the development of public policies remains to be evaluated. Therefore, demographic health surveys may be a valuable source of information on maternal morbidity, particularly in locations where integrated epidemiological surveillance with wide geographical coverage is yet to be established[7].

Data from the most recent national demographic health survey (DHS), carried out in Brasil in 1996, raised the issue of maternal morbidity and investigated complications during deliveries that had occurred in the preceding five years as reported by the women interviewed [8]. However, little seems to have been done with the data, because the concept of severe maternal morbidity as an alternative or complement to the study of maternal mortality was not well-established at that time. The present study was developed to evaluate the information from the DHS-96 on occurrence of severe maternal morbidity caused by complications during delivery or in the puerperium, and factors that may have been associated with these complications.

Abbreviations: BMI = body mass index; DHS = Demographic Health Survey; MDG = Millennium Development Goal; PSU = primary sample unit

METHODS

This study analyzed a database from the most recent national demographic health survey, which is a sub-sample of a national survey carried out in a randomized sample of household in Brasil, in 1995. The "MEASURE DHS" project combines various databases resulting from demographic and health surveys carried out throughout the world [8]. Specific authorization to use the DHS-96 data was obtained from Macro International. The original survey was conducted using procedures in accordance with the ethical standards of the Helsinki Declaration and had been previously approved by the corresponding committee.

In the DHS-96, sampling strategy involved geographical strata consolidated in two stages, and data weighting (the inverse of the unit's probability of selection) to guarantee that the sample was representative of the country as a whole. The census sector constituted the primary sample unit (PSU) and the geographical domains corresponded to the seven regions of the survey: São Paulo, Rio de Janeiro, the East-Central (states of Minas Gerais and Espirito Santo), the South, Midwest, North and Northeast of Brasil [9].

In accordance with the objectives of this study, the unit of analysis was pregnancy resulting in a live birth. Therefore, data processing with respect to live births in the five years preceding the survey consisted of selecting equivalent sets of variables corresponding to each infant born alive during the period (limited to 6 live births per woman interviewed), based on the database of women (mothers). Following this selection and considering the unit of analysis of interest, a new database was constructed with information on all live born infants and respective pregnancies.

Data on study methods, characteristics of the women interviewed whose pregnancies resulted in live births in the five preceding years, characteristics of the obstetric care and complications reported, were analyzed. Data obtained were presented in tables according to the set of characteristics and geographic regions of Brasil. For statistical analysis of data, the chi-squared test was used for comparisons between proportions, and 95% confidence intervals were constructed for comparison between the means, taking the peculiarities of the complex sampling design of DHS into consideration (geographical stratum, primary sample unit and sampling weight). For the analysis of some variables for which much data was missing, geographical strata with fewer than two primary sample units were regrouped.

Finally, associations between some characteristics of the women and obstetric care they received and reported morbidities were analyzed, using multiple logistic regression analysis, taking the sampling plan into consideration and regrouping strata with only one PSU (due to missing data in the case of some variables or to the selection of cases of liveborn infants). Five multiple logistic regression models were used, in each case the dependent variable being the complications or the morbidities investigated: prolonged labour, excessive bleeding, high fever, convulsion or any combination of these complications. For all models, the predictive variables available in the database and used in this study were: geographical region of residence, age of the woman at time of childbirth, place of residence (urban/rural), number of living children, religion, ethnic group, health professional responsible fo r prenatal care, place of delivery, health professional responsible for delivery and the type of delivery. The software used for processing and analyzing data was the SPSS software program, version 11.5, and the Strata software program, version 7.0.

RESULTS

In the DHS carried out in Brasil in 1996, a total of 16,451 households were selected for visits, and 12,612 women were interviewed. Of these, 3,761 women had had at least one pregnancy resulting in a liveborn infant in the five preceding years, adding to 5,045 live born infants (2,690 women had only one; 882 had two; 166 had three; 22 had four; and one woman had five). The mechanism of data weighting adopted by the DHS resulted in a weighted total of 3,635 women with at least one pregnancy resulting in a livebirth and 4,782 liveborn infants. Considering the geographical domains adopted the response rate of the women interviewed in relation to the eligible women ranged from 76.4-93.6%, which was lower in the state of Rio de Janeiro and higher in the North (Table 1).

Table 1 also shows the general characteristics of women interviewed who had a liveborn infant in the five preceding years, according to the geographical domain studied. Statistically significant differences ($p<0.001$) were found between geographical domains for most characteristics studied, notably the lower education level of women interviewed in the Northeast compared to a predomination of women with some high school or university education in the South and in the states of Rio de Janeiro and São Paulo. In general, women interviewed came from urban areas. This proportion was particularly high in the North and in the states of Rio de Janeiro and São Paulo. The mean number of living children per woman was 2.4 (95%CI 2.4-2.5), and was lower in the states of São Paulo and Rio de Janeiro and in the Midwest, and higher in the Northeast (2.8; 95%CI 2.7-2.9). Body mass index, based on information reported by the women, was higher in the state of São Paulo and lower in the North and Northeast of the country. With relation to ethnic group, more women declared themselves to be Caucasian in the South and Southeast.

Table 2 shows the characteristics of the obstetric care received during each pregnancy and prevalence of self-reported maternal morbidity. The mean number of prenatal visits by the women interviewed was lowest in the North and Northeast. In these regions, participation of physicians in prenatal care and at delivery was also lowest, being predominantly carried out by nursing professionals. Care during delivery was predominantly hospital-based throughout the country; however, lower rates of hospital-based care were found in the North and Northeast where caesarean section was also less frequent. Delivery by traditional midwives was practically an exception in most of the geographical domains studied; but it was more common in the North and Northeast. Regarding prevalence of self-reported maternal morbidity, no statistically significant differences were found between the geographical domains. From 15.5 to 22.9% of women reported at least one complication in their pregnancies. The most commonly reported was prolonged labour (7.4-14.9%), while convulsion was the least reported (1.7-4.5%).

Table 1 - Percentage of women with at least one liveborn child in the five years preceding the survey# according to sociodemographic characteristics, mean BMI and number of liveborn children at the time of the interview, by region of the country

Characteristics of the women	Region							
	São Paulo	Rio de Janeiro	Central-east	South	North-east	North	Central-west	Total
Women Interviewed	1,355	800	1,368	1,571	4,774	1,340	1,407	12,612
Response rate (%)	78.8	76.4	86.4	86.9	89.4	93.6	85.3	86.5
Liveborn infants born in the preceding 5 years (weighted number)	904	359	572	703	1,647	256	341	4,782
Age at interview (years)*								
15-19	9.0	10.3	6.9	8.0	11.1	14.9	8.3	9.6
20-29	53.3	40.7	48.9	46.2	52.5	56.0	62.0	51.1
30-39	34.2	41.2	37.8	37.0	30.5	23.5	26.4	33.3
40-49	3.6	7.7	6.4	8.8	5.9	5.6	3.3	5.9
Education level*								
None	1.9	2.1	3.9	1.7	12.6	5.7	5.0	5.9
Primary	28.1	23.7	48.0	34.7	44.9	32.0	33.0	37.0
High school	61.7	66.0	43.1	57.4	40.7	58.4	57.3	52.1
University	8.2	8.2	5.0	6.2	1.8	3.9	4.7	5.0
Still in education*	3.8	7.2	3.7	6.5	5.4	16.4	8.4	6.0
Marital status*								
Single	7.4	6.2	7.9	5.6	6.4	13.7	8.6	7.1
Married	65.0	53.6	70.6	72.3	52.2	47.9	66.4	61.2
Stable union	18.9	33.0	13.2	14.0	30.6	27.2	15.5	22.4
Widowed	0.0	1.0	0.9	1.2	0.6	0.4	0.3	0.6
Separated / divorced	8.7	6.2	7.4	6.9	10.3	10.8	9.3	8.7
Ethnic group(a)*								
White	53.8	39.2	40.0	61.0	23.9	15.4	41.2	39.9
Non-white	46.2	60.8	60.0	39.0	76.1	84.6	58.8	60.1
Religion*								
None	6.8	11.3	3.2	4.4	6.8	3.8	5.3	6.1
Catholic	73.8	64.4	76.9	80.2	83.7	82.8	70.6	77.8
Spiritualist	3.6	3.6	1.3	1.8	0.4	0.0	3.4	1.8
Evangelical	14.2	14.4	16.0	10.0	7.5	12.5	19.9	12.0
Other	1.6	6.2	2.6	3.6	1.5	0.9	0.8	2.3
Has not worked in the previous 12 months (b) +	44.7	44.6	33.1	38.9	36.0	31.5	38.0	38.7
Residence*								
Urban	90.2	92.8	82.3	74.3	62.7	92.6	78.5	77.5
Mean BMI (kg/m²)(c)	25.0	23.9	24.7	24.8	23.6	23.2	23.8	24.2
95% CI	24.4-25.6	23.3-24.5	23.9-25.5	24.3-25.2	23.3-23.9	22.7-23.7	23.3-24.4	[24.0-24.4]
Mean number of liveborn children	2.1	2.2	2.6	2.3	2.8	2.6	2.1	2.4
95% CI	1.9-2.2	1.9-2.5	2.4-2.8	2.1-2.4	2.7-2.9	2.3-2.9	2.0-2.2	[2.4-2.5]
(Weighted total)	(724)	(293)	(433)	(588)	(1,137)	(186)	(274)	(3,635)
(Total number of women)	(366)	(194)	(379)	(430)	(1,566)	(399)	(427)	(3,761)

Strata with fewer than two PSU were re-grouped / * $p<0.001$; + $p<0.02$ (chi-squared test based on complex sampling design) / Data missing for: (a) 5 women; (b) 632 women; (c) 308 women.

Table 2 - Mean number of prenatal visits and percentage of liveborn infants # in the five years preceding the survey according to the characteristics of obstetrical care and complications related to pregnancy, by geographical region of Brasil

Characteristic	Region							
	São Paulo	Rio de Janeiro	Central-east	South	North-east	North	Central-west	Total
Mean number of prenatal visits [95%CI]	7.6 [7.2-8.0]	7.8 [7.2-8.4]	6.6 [6.0-7.1]	7.6 [7.2-8.0]	4.4 [4.1-4.6]	4.8 [4.3-5.3]	6.8 [6.3-7.3]	6.2 [6.0-6.3]
Professional responsible for prenatal care								
Physician*	92.8	94.5	88.4	91.6	65.8	68.2	89.8	81.4
Nurse or auxiliary nurse*	0.4	0.4	2.1	2.0	7.9	12.8	2.0	4.2
Midwife•	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.1
No prenatal care*	5.5	3.8	8.6	5.0	25.2	17.1	7.0	13.2
Did not answer	1.3	1.3	0.8	1.4	0.9	1.5	1.2	1.1
Place of delivery								
Hospital $*	98.2	96.2	95.1	97.4	83.4	81.9	97.1	91.5
Home*	0.4	1.7	3.7	1.2	15.2	15.3	1.7	7.0
Other•	0.0	0.8	0.1	0.0	0.4	0.5	0.0	0.2
Does not know/did not respond	1.3	1.3	1.1	1.4	1.0	2.3	1.2	1.3
Principal person responsible for delivery								
Physician*	93.4	95.0	89.4	87.6	57.4	55.1	92.0	77.6
Nurse / auxiliary nurse*	3.1	1.3	5.4	5.6	18.9	19.9	4.4	10.0
Midwife*	1.8	0.4	2.4	5.1	19.7	20.3	1.3	9.4
Relatives / others·	0.7	1.7	0.6	0.4	2.0	2.3	0.3	1.2
No-one•	0.0	0.8	1.5	0.0	1.1	1.0	0.4	0.7
Did not answer	1.1	0.8	0.7	1.4	0.9	1.4	1.6	1.1
Cesarean section*	52.1	43.3	41.0	44.6	20.4	25.5	49.1	36.4
Low birthweight @	8.3	9.7	9.4	7.6	7.4	7.4	9.1	8.1
Complications related to pregnancy								
Prolonged labour @	7.4	10.1	11.5	9.0	11.0	14.9	11.7	10.3
Excessive bleeding @	3.5	7.1	6.4	5.8	5.2	6.5	6.5	5.4
High fever @	3.5	2.9	4.0	4.3	3.1	4.6	4.8	3.7
Convulsions @	3.1	2.1	4.2	1.7	2.2	2.1	4.5	2.7
No complications @	84.5	81.9	82.2	81.8	82.4	77.1	78.1	82.1
(Weighted total)	(904)	(359)	(572)	(703)	(1.647)	(256)	(341)	(4,782)
(Total number of liveborn infants)	(457)	(238)	(498)	(513)	(2.248)	(551)	(540)	(5.045)

Some strata had fewer than two PSU and were regrouped / * $p<0.001$ (chi-squared test based on complex sampling design) / • Chi-squared test invalid / @ P-value not significant / $ Includes public and private hospitals, maternity homes and healthcare centres.

Table 3 shows results of the multiple logistic regression analyses. Associations were found among various factors with respect to maternal morbidities. Notably, in comparison with the state of São Paulo, some geographical regions were associated to a greater risk of occurrence of prolonged labour (East-Central, Northeast, North and Midwest regions) and complications in general (North and East-Central regions). Obstetric care provided by non-medical personnel was found to be associated with pregnancies in which fewer complications were reported, while hospital delivery tended to be associated with excessive bleeding. A larger number of liveborn infants was associated with a greater risk of complications, in general excessive bleeding and high fever. Caesarean delivery was associated with a greater risk of high fever. None of the factors tested was associated with occurrence of convulsions (a proxy to eclampsia).

DISCUSSION

There is little information available on the prevalence of severe maternal morbidity in Brasil and data on determinants and associated factors are even sparser. Information available in Brasil originates from

Table 3 - Variables associated with various complications during delivery (multiple logistic regression analysis)

Complication/ Associated variables	Estimated Coefficient	Standard error of coefficient	Estimated odds ratio	95%CI for Odds Ratio
Prolonged labour [n=4,971]				
Region of residence (vs. São Paulo):				
- Rio de Janeiro	0.33	0.30	1.40	0.77-2.53
- Central-east	0.49	0.24	**1.63**	**1.02-2.61**
- South	0.22	0.25	1.24	0.76-2.04
- Northeast	0.55	0.21	**1.74**	**1.14-2.65**
- North	0.92	0.25	**2.50**	**1.52-4.12**
- Central-west	0.50	0.26	**1.66**	**1.01-2.73**
Responsible for delivery (vs. physician):				
- Nurse or auxiliary nurse	-0.42	0.18	**0.66**	**0.46-0.93**
- Midwife	-0.36	0.18	**0.70**	**0.50-0.99**
- Relatives / others	-1.22	0.69	0.30	0.08-1.15
- No-one	-0.93	0.79	0.39	0.08-1.85
Constant	-2.48	0.20		
Excessive bleeding [n=4,972]				
Number of living children (>2)	0.42	0.15	**1.52**	**1.13-2.06**
Place of delivery (hospital)	0.83	0.29	**2.28**	**1.28-4.06**
Colour/race (coloured vs. white)	0.04	0.16	1.04	0.76-1.42
Colour/race (other vs. white)	0.54	0.27	**1.72**	**1.02-2.91**
Constant	-3.84	0.33		
High fever [n=4,970]				
Age of mother at delivery of liveborn infant (years)	-0.04	0.02	**0.96**	**0.93-0.99**
Number of living children (>2)	0.43	0.19	**1.54**	**1.07-2.21**
Caesarean section	0.53	0.20	**1.71**	**1.14-2.55**
Constant	-2.69	0.39		
Convulsion [n=4.968]				
With no associated variables	–	–	–	–
General complications [n=4,966]				
Region of residence (vs. São Paulo):				
- Rio de Janeiro	0.22	0.23	1.25	0.79-1.98
- Central-east	0.18	0.19	1.20	0.83-1.74
- South	0.23	0.20	1.26	0.85-1.87
- Northeast	0.34	0.18	1.41	0.99-2.01
- North	0.69	0.21	**2.00**	**1.33-3.00**
- Central-west	0.45	0.21	**1.56**	**1.04-2.34**
Number of living children (>2)	0.28	0.09	**1.33**	**1.10-1.60**
Person responsible for delivery (vs. physician):				
- Nurse or auxiliary nurse	-0.41	0.15	**0.66**	**0.49-0.90**
- Midwife	-0.57	0.15	**0.57**	**0.42-0.75**
- Relatives/others	-1.60	0.59	**0.20**	**0.06-0.65**
- No-one	-1.31	0.69	0.27	0.07-1.04
Constant	-1.86	0.17		

hospital-based cross-sectional studies and from an indirect analysis based on data from the Brazilian System of Hospital Information [10]. These studies were more directed towards clinical aspects and biomedical risk factors, while socioeconomic and behavioural aspects associated with severe maternal morbidity have rarely been investigated. To a certain extent, these facts have restricted discussions on the subject to the biomedical field, without permitting adequate consideration of other aspects involved in the evaluation of maternal morbidity and adequate ways to combat the problem.

Data used in the present study were obtained from the most recent population-based survey carried out in Brasil a decade ago. Considering the structure of the Brazilian healthcare system, this would seem to be a useful alternative for an initial evaluation of the problems related to severe maternal morbidity. Other investigators have already found that one of the principal problems associated with use of data obtained from health surveys is the often unsatisfactory correlation between reported symptoms or diagnoses and medical diagnoses[7, 11]. Nevertheless, it should be considered that in most cases the initial reason for seeking health services is the subjective perception by the patient him/herself of signs and symptoms understood as abnormal or suggestive of possible health problems. Therefore, use of data reported by the patients may be useful in organizing health services based on the potential demand in relation to obstetric complications[7].

Considering the information reported by the women, prevalence of maternal morbidity seems to vary from 15.5% to 22.9% in the different geographical domains analyzed and this geographic factor was associated with differences in the risk for occurrence of complications in general and, more specifically, of prolonged labour.

Brasil is a country where great social contrasts prevail and where there are great differences in terms of human development between the macro-regions of the country. In general, lower indexes of human development are found in the North and Northeast, with higher indexes in the states of São Paulo and Rio de Janeiro and the South [12]. The association found between the geographical factor and occurrence of complications in general, and with prolonged labour in particular, may be related with differences in human development that exist between the different geographical domains, reflecting differences in obstetric care, as well as other sociocultural and economic factors that interfere in the health-disease process. In this study, poorer indicators of obstetric care were found in the regions with lower human development indexes.

In Brasil, physicians are the principal professionals responsible for identifying and managing complications related to pregnancy, childbirth and the puerperium. This may be the reason why the obstetric care provided by these professionals is associated, in this study, with the care provided to women who reported obstetrical complications. On the other hand, in regions where obstetric care is usually provided by other professionals, it may be that in most pregnancies and deliveries with no complications, physicians were not requested to attend.

This study is the first to evaluate data on severe maternal morbidity during and following delivery in Brasil. Some regional differences were found in the prevalence rates of reported maternal morbidities and these differences may reflect the intricate relationship between determinants of human development and maternal health conditions. Further in-depth studies on this subject, including a new population-based survey, preferably carried out using a validated questionnaire specifically developed for this purpose, are required before this issue can be fully understood. Results of this study will permit an evaluative comparison of the issue over time, and will also allow for a better evaluation of regional differences in the prevalence of reported maternal morbidity and its determinants, when further studies have been performed. Although the operational and financial complexity would be a limiting factor, a prospective cohort study should also be carried out to obtain more data on the determinants of maternal morbidity. This information would be useful for the development of strategies to deal with the problem and is a challenge for the future.

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Conflict of interest: none

RESUMO

MORBIDADE MATERNA AUTO-REFERIDA E FATORES ASSOCIADOS ENTRE MULHERES BRASILEIRAS

OBJETIVOS. Os estudos demográficos de saúde podem constituir fonte valiosa de informação sobre a morbidade materna, especialmente nos locais onde ainda não foi desenvolvido um sistema de vigilância epidemiológica integrado e de ampla cobertura geográfica.

MÉTODOS. Este estudo consiste na análise secundária do banco de dados da última Pesquisa Nacional sobre Demografia e Saúde, realizada no Brasil, em 1996.

Foram analisados os dados referentes à operacionalização da pesquisa, as características das mulheres entrevistadas que tiveram gestações resultantes em nascidos vivos nos cinco anos precedentes ao inquérito, as características da assistência obstétrica e das complicações referidas por estas mulheres.

RESULTADOS. As respostas de um total ponderado de 3.635 mulheres foram analisadas. Foram observadas diferenças significativas ($p<0,001$) entre os domínios geográficos para a maior parte das características estudadas. A assistência ao parto foi predominantemente hospitalar em todo o país. A prevalência de morbidade materna referida oscilou entre 15,5% e 22,9% nos diferentes domínios geográficos analisados. Este fator geográfico esteve associado a diferenças de risco para a ocorrência de complicações em geral e, mais especificamente, para a ocorrência de trabalho de parto prolongado.

CONCLUSÃO. Estas diferenças em morbidade possivelmente refletem o intrincado relacionamento existente entre as determinantes do desenvolvimento humano e as condições de saúde materna. [Rev Assoc Med Bras 2008; 54(3): 249-55]

UNITERMOS: Morbidade materna. Near miss. Inquérito demográfico de Saúde. Brasil.

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