CLINICS

CLINICAL SCIENCE

Maternal morbidity and near miss associated with maternal age: the innovative approach of the 2006 Brazilian demographic health survey

Fernando César de Oliveira Jr., Maria Laura Costa, Jose Guilherme Cecatti, João Luiz Pinto e Silva, Fernanda Garanhani Surita

University of Campinas (UNICAMP), School of Medical Sciences, Department of Obstetrics and Gynecology, Campinas/SP, Brazil.

OBJECTIVE: To study the prevalence of potentially life-threatening maternal conditions and near miss in Brazil according to maternal age.

METHODS: A secondary analysis of the 2006 Brazilian demographic health survey database using a validated questionnaire to evaluate maternal morbidity with a focus on age extremes. The study included 5,025 women with at least 1 live birth in the 5-year reference period preceding their interviews. Three age range periods were used: 15-19 years (younger age), 20-34 years (control), and 35-49 years (advanced maternal age). According to a pragmatic definition, any woman reporting eclampsia, hysterectomy, blood transfusion, or admission to the intensive care unit during her pregnancy/childbirth was considered a near-miss case. The associations between age and severe maternal morbidity were further assessed.

RESULTS: For the 6,833 reported pregnancies, 73.7% of the women were 20-34 years old, 17.9% were of advanced maternal age, and only 8.4% were of younger age. More than 22% of the women had at least one of the complications appraised, and blood transfusion, which was more prevalent among the controls, was the only variable with a significant difference among the age groups. The overall rate of maternal near miss was 21.1 per 1000 live births. There was a trend of higher maternal near miss with increasing age. The only significant risk factor identified for maternal near miss was a lower literacy level among older women.

CONCLUSIONS: There is a trend towards worse results with increasing age. The investigation of the determinants of maternal near miss at the community level using an innovative approach through a demographic health survey is an example suggested for under-resourced settings.

KEYWORDS: Morbidity; Obstetric Complication; Pregnancy in Adolescence; Maternal Age.

Oliveira Jr FC, Costa ML, Cecatti JG, Pinto e Silva JL, Surita FG. Maternal morbidity and near miss associated with maternal age: the innovative approach of the 2006 Brazilian demographic health survey. Clinics. 2013;68(7):922-927.

Received for publication on January 18, 2013; **First review completed on** February 8, 2013; **Accepted for publication on** March 7, 2013

E-mail: surita@unicamp.br

Tel.: 55 19 3521-9304

INTRODUCTION

In the past few decades, an increasing proportion of women have delayed childbearing for numerous reasons, particularly educational, social, career, and economic (1). Pregnancy at an advanced maternal age (AMA), defined as 35 years or older, has been associated with several adverse pregnancy and perinatal outcomes, including preterm birth, low birth weight, still birth, chromosomal defects, labor complications, increased incidence of gestational diabetes, cesarean section (2,3), and hypertensive disorders (4). Therefore, such pregnancies are generally considered to be high risk.

The same trend appears to occur at the opposite age extreme, with pregnancies at a younger age (15-19 years). Adolescent childbearing is particularly concerning in low and medium income countries and accounts for approximately 11% of all births worldwide (5). It also has significant medical, emotional and social consequences for the mother, her child, and her family (6). However, whether the association with maternal and infant morbidity is causal or instead attributed to the relatively poorer social statuses of child brides and adolescent mothers remains highly controversial (7).

These conditions must be further explored in several settings to evaluate their actual impact on overall maternal morbidity and mortality. It is estimated that 10 million women worldwide experience severe pregnancy complications every year, with high proportion of these women dying (mainly in developing countries) as a result (8).

No potential conflict of interest was reported.

DOI: 10.6061/clinics/2013(07)06

Although several international efforts have been implemented to achieve the Millennium Development Goal 5 in 2015, reaching an estimated number of maternal death of approximately 340,000 in 2008 and 273,000 in 2011, these efforts are still not sufficient for reaching that goal, specially in most of less developed countries (9,10). In Brazil, the maternal mortality ratio is estimated to be approximately 68 maternal deaths per 100,000 live births (LBs), but uncertainty exists concerning the occurrence of severe maternal complications (11).

Currently, there is worldwide agreement that maternal morbidity has been neglected as a method of measuring and assessing maternal health, and this deficiency should be addressed to improve maternal health conditions (12,13). An important tool and source of information on maternal morbidity and mortality in settings with no integrated routine data, epidemiological surveillance, and wide geographical coverage is the demographic health survey (DHS) (14). In Brazil, the 2006 DHS for the first time used a validated questionnaire to assess information on severe maternal morbidity and near miss. According to a pragmatic definition, any woman reporting experiencing eclampsia, hysterectomy, blood transfusion or admission to the intensive care unit (ICU) during pregnancy or childbirth during the reference period was considered as having experienced a near-miss event (15). Using this data, approximately 70,000 maternal near-miss cases and approximately 750,000 cases with potentially life-threatening conditions were estimated to occur in Brazil per year (16).

Studying the underlying conditions that might cause severe complications during pregnancy is necessary, and maternal age is a key parameter for defining potential changes in clinical practice and management, with a real possibility of effective outcomes. The purpose of this study was to study the prevalence of potentially life threatening maternal conditions and near miss in Brazil and evaluate the association with maternal age (specifically extreme reproductive ages) using data from the last DHS performed.

METHODS

The 2006 Brazilian DHS database, which was conducted in 2006-2007 (17), was used to perform an analysis of the association between maternal age, severe maternal morbidity, and maternal near miss (MNM). A previous study has already evaluated the national estimates of MNM and life-threatening conditions in this DHS (16) using a validated questionnaire of maternal complications and interventions (15) that was incorporated into the survey; the corresponding information was, therefore, prospectively collected. The survey was conducted after receiving approval from the institutional review board of CEBRAP-Centro Brasileiro de Análise e Planejamento responsible for its development. Currently, the database is in the public domain and can be assessed and used by all interested parties (17).

The 2006 Brazilian DHS included a probabilistic subsample of the 2005 National Household Survey, which was performed in 5 regions of Brazil: South, Southeast, Central-West, Northeast, and North. The sampling method included 2 steps, with the census sectors being the primary sampling units (PSU) and individual households the secondary units. During stratification, the census sectors were grouped into urban or rural areas. Because the 2005 Household Survey samples were not self-weighted, the DHS used sample weighting. The weighting variable was calculated by using the inverse of the probability of selecting a unit and adjusting for nonresponse and post-stratification (17).

The strategy used for the DHS sampling allowed the consideration of the complex sampling design (i.e., strata, cluster and sample weights) (17). Therefore, the total number of events can be approximated; in this case, the total number of pregnancies during the last 5 years was estimated by region and for the whole country (the 'expanded sample'). The 2006 DHS initially selected 13,056 households in which 17,422 eligible women of reproductive age were identified, and 15,575 women were interviewed. The current analysis, which assessed the occurrence of maternal complications and used several complex procedures during the preceding 5 years, included 6,833 pregnancies among 5,025 women.

Considering the reference period as the 5 years preceding the interview and the pregnancies during that time, the respondents' characteristics, complications (self-reported), and data on the interventions listed by the women were analyzed according to the region of the country in which they lived. MNM was evaluated using a pragmatic definition; a near miss was defined as present only if a woman reported eclampsia, hysterectomy, blood transfusion, and/or admission to an ICU for any delivery that occurred within the reference period. This definition considered the results of a secondary analysis of the World Health Organization (WHO) database, which includes data on approximately 100,000 deliveries in Latin America; this analysis identified the same factors used in defining near miss and any cardiac or renal complication (18). This definition also considered a validation study, in which the information recalled by the women on the occurrence of hysterectomy, blood transfusion, ICU admission, and eclampsia was highly correlated with the data in the medical records (15). A maternal potentially life-threatening condition was defined as any reported complication that was not included in this pragmatic definition of MNM.

For the current analyses, we considered 3 age groups: 15-19 years (younger age), 20-34 years (controls) and 35-49 years (advanced maternal age). Initially, the occurrence of the main causes of maternal morbidity (hypertension, hemorrhage, and infection) and the main procedures were estimated for each age group. Then, crude, age-specific and adjusted rates of MNM were calculated using the chosen pragmatic definition of MNM. Associations between the socio-demographic characteristics of the women in each age range and the occurrence of MNM were evaluated. For the statistical analysis, the odds ratio (OR) and the respective 95% confidence interval (CI) were calculated, except for the adolescent group because of the low number of cases. Finally, a multiple logistic regression analysis was also performed to attempt to identify the factors independently associated with the occurrence of MNM in the extreme age groups compared with the controls. The peculiarities of the complex sampling design (geographical stratum, PSU, and sampling weight) of the DHS were considered during the statistical analysis. The SPSS software program version 11.5 (SPSS Inc., Chicago, IL, USA), the Stata software program version 7.0 (StataCorp LP, College Station, TX, USA) and Epi.Info version 6.04d (CDC, Atlanta, GA, USA) were used to process and analyze the data.

Table 1 - Response rates and live births by age group. DHS, Brazil, 2006.

Characteristics	Age group						Total
	15-19		20-34		35-49		
	n	%	n	%	n	%	
Women							
Eligible	3,122	17.9	7,980	45.8	6,320	36.3	17,422
Interviewed	2,488	16.0	7,244	46.5	5,843	37.5	15,575
Response rate among women (%) *	79.7		90.8		92.5		89.4
LB	436	8.7	3,850	76.1	770	15.2	5,056
Women with at least one LB	420	8.4	3,705	73.7	900	17.9	5,025
Pregnancies	527	7.7	5,175	75.7	1,131	16.6	6,833
Pregnancies (expanded sample)	1,842,099	9.2	14,700,148	73.6	3,445,017	17.2	19,987,263

*$p<0.001$, LB = live births.

RESULTS

The 2006 Brazilian DHS reported 15,575 women interviewed, out of 17,422 eligible, in the five national geographical regions considered. In the past 5 years, 5,025 women had at least one LB. These women were considered to be the study population for further analysis in this report. A total of 5,056 LBs and 6,833 pregnancies were available, allowing estimates of the expanded sample of 19,987,263 pregnancies for the whole country over the evaluated period. Considering all women with at least one LB during the five-year period, the great majority (approximately 74%) ranged in age from 20-34 years, whereas 18% were of advanced maternal age, and only 8% were of a younger age (Table 1). The response rate was significantly lower among adolescent mothers.

Table 2 shows the weighted prevalence of self-reported pregnancies with severe morbidities (complications and related interventions) according to the defined age groups. More than 22% of the women had at least one of the complications appraised: eclampsia, hemorrhage, infection, or an intervention, such as hysterectomy, ICU admission, blood transfusion, inter-hospital transfer, mechanical ventilation, and postpartum stay for more than one week. The only variable that showed a significant difference among the three age groups was blood transfusion, which was more prevalent among women who were aged 20-34 years.

Table 3 shows the rates of self-reported MNM according to the pragmatic definition proposed in the survey. The results were adjusted using correction factors derived from the validation study, with minimal variation. The overall rate of MNM was 21.1 per 1,000 LBs, which means that approximately 2 of 100 women delivering will experience a severe maternal complication. Regarding the age groups, a consistent trend of worse results with increasing age was observed. There was an approximately 5-fold increase in the MNM in the women of advanced maternal age compared to the adolescent mothers. Again, the only criterion for MNM predominant among women of the intermediate age group was blood transfusion.

Table 4 lists the estimated risk of maternal complications according to socio-demographic characteristics in each age group. The risks were not calculated for the adolescent mothers because of the low number of MNM cases identified. The only significantly increased risk of MNM among women of advanced maternal age was associated with a low literacy level. No associations were found when considering the marital status, ethnicity, religion, working

Table 2 - Proportion of pregnancies* with complications and related interventions by age group. DHS, Brazil, 2006.

Complications and interventions	Age group			Total
	15-19	20-34	35-49	
Eclampsia				
Had seizures during PDP but not before (a)	0.4	0.4	1.5	0.6
Hemorrhage				
Heavy bleeding that wet clothes, during pregnancy or in the first 3 days postpartum (b)	16.8	18.4	19.6	18.4
Infection				
Had high fever after delivery/abortion with chills and a malodorous vaginal discharge (c)	0.8	0.9	1.5	1.0
Interventions				
Hysterectomy (d)	0.0	0.2	0.2	0.2
ICU admission (e)	0.4	0.5	0.7	0.5
Blood transfusion (f) #	0.1	1.0	0.4	0.8
Inter-hospital transfer (g)	1.7	2.6	1.7	2.3
Mechanical ventilation (h)	0.9	1.6	3.0	1.7
Postpartum stay >1 week (h)	5.6	4.2	2.6	4.0
Any (i)	22.6	23.0	22.7	22.9
Pregnancies in the 5 years before the interview (expanded sample)	1,842,099	14,700,148	3,445,017	19,987,263
Pregnancies (n)	527	5,175	1,131	6,833

*Weighted data.
PDP: pregnancy, delivery and postpartum, ICU: Intensive care unit.
Missing values for (a) 105, (b) 74, (c) 114, (d) 417, (e) 83, (f) 94, (g) 78, (h) 85, and (i) 292 pregnancies.
$p = 0.011$.

Table 3 - Crude, age-specific and adjusted rates of self-reported MNM *. DHS, Brazil, 2006.

Indicator of MNM	Crude MNM rate (per 1,000 LB)	Age-specific crude MNM rate			Adjusted MNM rate (per 1,000 LB)
		15-19	20-34	35-49	
Eclampsia (a)	6.0	4.5	4.2	14.8	6.3
Hysterectomy (b)	2.2	0.0	2.4	2.5	2.2
ICU admission (c)	5.2	3.7	5.1	6.6	5.2
Blood transfusion (d)	8.1	1.2	9.9	4.4	8.9
Any of the 4 above indicators (e)	20.0	5.9	19.9	28.3	21.1

*Weighted data.
Missing values for (a) 105, (b) 417, (c) 83, (d) 94, and (e) 443 pregnancies.

status, place of residence, region, or number of previous live births.

A multiple regression analysis was performed to investigate the possible variables significantly associated with extreme maternal age and maternal complications. However, no significant factors were identified (data not shown).

DISCUSSION

The most important finding of the current study was the increase in the MNM rates with increasing maternal age. There are remarkable advantages in using DHS information, particularly in settings with wide geographical and social disparities and no well-implemented epidemiological surveillance system.

However, there are also disadvantages that must be addressed, particularly when the analyses involve age. The questionnaire used in the survey considered women reporting at least one pregnancy during the previous 5-year period and their age at the moment of the interview. Therefore, it is reasonable to suppose that some of the women reported in the advanced age group could have delivered before the age of 35. Similarly, some women in the 20-34 years group could have delivered at younger ages. However, we believe that the total number of participants is robust enough to overcome this limitation. Additionally, there is another methodological aspect to be considered for

Table 4 - Crude estimated risk of maternal complications by age according to socio-demographic characteristics. DHS, Brazil, 2006.

Patient characteristics	Age							
	15-19 years		20-34 years		@	35-49 years		@
	With complications	Without complications	With complications	Without complications	OR (95% CI)	With complications	Without complications	OR (95% CI)
Schooling, years (b)								
Without/Fundamental	3	291	62	2,007	1.43 (0.67-3.02)	22	516	5.23 (1.40-19.58)
High School	0	116	24	1,553	1.00 (ref.)	8	334	1.00
Currently studying (c)								
No	3	295	75	3,175	0.83 (0.30-2.29)	27	794	2.64 (0.44-15.75)
Yes	0	111	11	426	1.00 (ref.)	3	56	1.00
Marital status (d)								
Without partner	0	111	18	589	1.33 (0.79-2.26)	4	119	0.95 (0.32-2.76)
With partner	3	296	68	2,969	1.00 (ref.)	26	731	1.00
Ethnicity/skin color (e)								
White	0	111	26	1,251	1.00 (ref.)	8	353	1.00
Non white	3	291	58	2,274	1.16 (0.50-2.69)	22	484	1.03 (0.18-5.99)
Religion (f)								
None	2	67	8	307	1.00 (ref.)	1	37	1.00
Some	1	340	78	3,251	1.01 (0.33-3.05)	29	811	8.39 (0.94-74.62)
Working in the last 12 months (g)								
Yes	1	157	55	2,104	1.00 (ref.)	21	538	1.00
No	2	250	31	1,456	1.11 (0.52-2.36)	9	311	0.56 (0.12-2.53)
Residence (h)								
Capital or big cities	1	125	28	1,130	0.90 (0.43-1.88)	11	252	1.06 (0.19-6.00)
Other	2	282	58	2,421	1.00 (ref.)	19	594	1.00
Region								
N, NE, CW	2	278	58	2,197	1.34 (0.66-2.75)	17	405	0.75 (0.18-3.21)
SE, S	1	129	28	1,365	1.00 (ref.)	13	445	1.00
Number of live births								
≥2	1	54	34	1,413	0.59 (0.30-1.14)	3	147	3.56 (0.71-17.96)
<2	2	353	52	2,149	1.00 (ref.)	27	703	1.00
Total women (a)	3	407	86	3,562		30	850	

@Three variables, weight, stratum and cluster (PSU), were considered in the analysis.

DHS regarding this specific topic. According to the international standard definitions used, reproductive age includes women ranging in age from 15 to 49 years (19). Thus, women younger than 15 years were not interviewed and not included in the database. Therefore, their contribution to the occurrence of MNM should be evaluated elsewhere.

The reported lower response rate among adolescent women suggests that they are less committed to the importance of their participation in a DHS, whereas the women older than 35 years had a 92% response rate. These findings would be important for planning future surveys in which special attention should be directed toward the younger age group to increase their participation in the study; sexually active girls younger than 15 years should also potentially be included for the purpose of obtaining reliable information on maternal morbidity and near miss for the entire population.

The proportion of pregnancies with some complications and related interventions was slightly higher among the women in the women aged 35-49 years, including eclampsia, hemorrhage, infection, ICU admission and mechanical ventilation, but these differences were not significant. This finding is also supported by some previous studies (4,18,20,21). In the younger age group, note that there were no reported cases of hysterectomy and there was a trend towards an increased hospital stay, which most likely reflects a special concern during the care of adolescents with postpartum hemorrhage and the intention to preserve their future fertility. The same explanation might apply to the numbers of reported MNM caused by blood transfusion in the group of women aged 20-34 years. The intention to avoid surgery and support a conservative treatment to preserve the fertility of women at a reproductive age under 35 years likely justifies the higher rate of this indicator.

The approach of using reported complications and related interventions for defining cases of maternal morbidity and near miss from a population-based study was confirmed to be a successful method to investigate maternal morbidity in low and middle income countries (16). The analysis by age groups can further explore the possible interventions targeted towards specific risk factors. The results showed a clear trend of higher MNM rates with an increase in maternal age. However, it was not possible to identify the important and significant risk factors associated with the occurrence of complications, with the exception of low literacy in the older age group. This finding could be interpreted as another limitation of the current study, considering the relatively low number of MNM cases that were identified in each group, particularly in the group of adolescent mothers. The task of assessing these risk factors should then be transferred to other studies with a larger study populations.

The investigation of the determinants of maternal mortality and near miss at the community level using an innovative approach through a DHS is an example that should be duplicated in under-resourced settings. Using a DHS would also be valid for other situations, not only for MNM, with the stipulation that the topic would be properly addressed with a questionnaire developed and validated before being incorporated in the survey. However, the impact on the reduction of maternal mortality and morbidity and the possibility of understanding risk factors will depend on large-scale surveillance studies.

The future general health implications of a previous episode of MNM are not yet completely understood, although higher risks of infertility and recurrence of MNM have already been identified (22). Note that our study reported an increasing trend of higher rates of severe complications with an increase in maternal age. This trend should be taken into account when considering possible explanatory mechanisms and different target interventions based on age. Further studies are necessary to determine the reasons for this trend, such as underlying conditions, previous cesarean sections, and obesity.

■ ACKNOWLEDGMENTS

This study was supported by Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP), process number: 2013/03889-9.

■ AUTHOR CONTRIBUTIONS

Oliveira Jr. FC, Surita FG, and Cecatti JG conceived the idea for the study. Oliveira Jr. FC, Costa ML, Cecatti JG, Pinto e Silva JL, and Surita FG planned all phases of the study and the analysis to be performed and were responsible for the data analysis. All authors interpreted and discussed the results and provided suggestions to be incorporated into the article. Oliveira Jr. FC and Costa ML were responsible for the manuscript drafting. All authors read the first version of the manuscript, provided input, and read and agreeded upon the final version of the manuscript.

■ REFERENCES

1. Tough S, Benzies K, Fraser-Lee N, Newburn-Cook C. Factors influencing childbearing decisions and knowledge of perinatal risks among Canadian men and women. Matern Child Health J. 2007;11(2):189-98, http://dx.doi.org/10.1007/s10995-006-0156-1.
2. Jacobsson B, Ladfors L, Milsom I. Advanced maternal age and adverse perinatal outcome. Obstet Gynecol. 2004;104(4):727-33, http://dx.doi.org/10.1097/01.AOG.0000140682.63746.be.
3. Bayrampour H, Heaman M. Advanced maternal age and the risk of cesarean birth: A systematic review. Birth. 2010;37(3):219-26, http://dx.doi.org/10.1111/j.1523-536X.2010.00409.x.
4. Lamminpää R, Vehviläinen-Julkunen K, Gissler M, Heinonen S. Preeclampsia complicated by advanced maternal age: a registry-based study on primiparous women in Finland 1997-2008. BMC Pregnancy Childbirth. 2012;12:47, http://dx.doi.org/10.1186/1471-2393-12-47.
5. World Health Organization. Making Pregnancy Safer: Maternal, newborn, child and adolescent health. Adolescent Pregnancy. 2011. Updated 2011. Available at http://www.who.int/maternal_child_adolescent/topics/maternal/adolescent_pregnancy/en/index.html [last accessed 13rd Jan 2013].
6. Black AY, Fleming NA, Rome ES. Pregnancy in adolescents. Adolesc Med State Art Rev. 2012;23(1):123-38.
7. Gibbs CM, Wendt A, Peters S, Hogue CJ. The impact of early age at first childbirth on maternal and infant health. Paediatr Perinat Epidemiol. 2012;26 Suppl 1:259-84, http://dx.doi.org/10.1111/j.1365-3016.2012.01290.x.
8. Filippi V, Ronsmans C, Campbell OM, Graham WJ, Mills A, Borghi J, et al. Maternal health in poor countries: the broader context and call for action. Lancet. 2006;368(9546):1535-41, http://dx.doi.org/10.1016/S0140-6736(06)69384-7.
9. Hogan MC, Foreman KJ, Naghavi M, Ahn SY, Wang M, Makela SM, et al. Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5. Lancet. 2010;375(9726):1609-23, http://dx.doi.org/10.1016/S0140-6736(10)60518-1.
10. Lozano R, Wang M, Foreman KJ, Rajaratnam JK, Naghavi M, Marcus JR, et al. Progress towards Millennium Development Goals 4 and 5 on maternal and child mortality: an updated systematic analysis. Lancet. 2011;378(9797):1139-65, http://dx.doi.org/10.1016/S0140-6736(11)61337-8.
11. Brazil. Ministry of Health. [Maternal Mortality in Brazil]. Boletim Epidemiologico. 2012;43(1):1-8.
12. Hardee K, Gay J, Blanc AK. Maternal morbidity: Neglected dimension of safe motherhood in the developing world. Glob Public Health. 2012;7(6):603-17, http://dx.doi.org/10.1080/17441692.2012.668919.
13. Pattinson R, Say L, Souza JP, Broek Nv, Rooney C, WHO Working Group on Maternal Mortality and Morbidity Classifications. WHO maternal

death and near-miss classifications. Bull World Health Organ. 2009;87(10):734, http://dx.doi.org/10.2471/BLT.09.071001.

14. Macro International. The Demographic and Health Surveys Program. 2008. Calverton, MD: Macro International. MEASURE DHS; 2008.
15. Souza JP, Cecatti JG, Pacagnella RC, Giavarotti TM, Parpinelli MA, Camargo RS, et al. Development and validation of a questionnaire to identify severe maternal morbidity in epidemiological survey. Reprod Health. 2010;7:16, http://dx.doi.org/10.1186/1742-4755-7-16.
16. Souza JP, Cecatti JG, Parpinelli MA, Sousa MH, Lago TG, Pacagnella RC, et al. Maternal morbidity and near miss in the community: findings from the 2006 Brazilian demographic health survey. BJOG. 2010;117(13):1586-92, http://dx.doi.org/10.1111/j.1471-0528.2010.02746.x.
17. Brazilian Ministry of Health. Brazil: National Research on Demography and Health of Child and Woman PNDS 2006. Brazil, 2008. Available at [http://bvsms.saude.gov.br/bvs/publicacoes/pnds_crianca_mulher.pdf]. Access on 13rd Jan 2013.
18. Souza JP, Cecatti JG, Faundes A, Morais S, Villar J, Carroli G, et al. Maternal near miss and maternal death in the World Health Organization's 2005 global survey on maternal and perinatal health. Bull World Health Organ. 2010;88(2):113-9, http://dx.doi.org/10.2471/BLT.08.057828.
19. WHO - World Health Organization. Reproductive Health and Research. Reproductive health indicators: guidelines for their generation, interpretation and analysis for global monitoring. Geneva: WHO, 2006. Available at [http://apps.who.int/iris/bitstream/10665/43185/1/924156315X_eng.pdf].
20. Gray KE, Wallace ER, Nelson KR, Reed SD, Schiff MA. Population-based study of risk factors for severe maternal morbidity. Paediatr Perinat Epidemiol. 2012;26(6):506-14, http://dx.doi.org/10.1111/ppe.12011.
21. Zwart JJ, Richters JM, Ory F, de Vries JI, Bloemenkamp KW, van Roosmalen J. Severe maternal morbidity during pregnancy, delivery and puerperium in the Netherlands: a nationwide population-based study of 371 000 pregnancies. BJOG. 2008;115(7):842-50, http://dx.doi.org/10.1111/j.1471-0528.2008.01713.x.
22. Camargo RS, Pacagnella RC, Cecatti JG, Parpinelli MA, Souza JP, Sousa MH. Subsequent reproductive outcome in women who have experienced a potentially life-threatening condition or a maternal near-miss during pregnancy. Clinics. 2011;66(8):1367-72, http://dx.doi.org/10.1590/S1807-59322011000800010.