

CLINICAL SCIENCE

MATERNAL MORTALITY DUE TO ARTERIAL HYPERTENSION IN SÃO PAULO CITY (1995-1999)

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Vega CEP, Kahhale S, Zugaib M. Maternal Mortality due to Arterial Hypertension in São Paulo City (1995-1999). Clinics. 2007;62(6):679-84.

AIM: To describe the case profile of maternal death resulting from hypertensive disorders in pregnancy and to propose measures for its reduction.

METHODS: The Committee on Maternal Mortality of São Paulo City has identified 609 cases of obstetric maternal death between 1995 and 1999 with an underreporting rate of 52.2% and a maternal mortality rate of 56.7/100,000 live births. Arterial hypertension was the main cause of maternal death, corresponding to 142 (23.3%) cases.

RESULTS: Ninety-five (66.9%) of the deaths occurred during the puerperal period and 34 (23.9%) occurred during pregnancy. The time of death was not reported in 13 (9.2%) cases. Seizures were observed in 41 cases and magnesium sulfate was used in four of them. The causes of death were ruled to be cerebrovascular accident (44.4%), acute pulmonary edema (24.6%), and coagulopathies (14.1%). Cesarean section was performed in 85 (59.9%) cases and vaginal delivery in 15 (16.0%).

CONCLUSION: Complications of arterial hypertension are responsible for the high rates of pregnancy-related maternal death in São Paulo City. Quality prenatal care and appropriate monitoring of the hypertensive pregnant patient during and after delivery are important measures for better control of this condition and are essential to reduce disorders in pregnancy.

KEYWORDS: Maternal mortality. Arterial hypertension. Risk pregnancy. Chronic arterial hypertension. Preeclampsia/eclampsia. Magnesium sulfate.

INTRODUCTION

Over the last decade, the study of maternal mortality has become of the utmost importance in the evaluation of the quality of healthcare offered to a population.¹ Developed countries, which present very low maternal mortality rates (MMR), use this indicator merely for comparative purposes and self-evaluation. However, developing countries with rates higher than 50 maternal deaths/100,000 live births, as is the case for Brazil, should not only quantify, but also study maternal deaths on a case-by-case basis in an attempt to identify deficiencies in care and to establish appropriate measures to reduce these deaths.

Prenatal care is fundamental for the reduction of maternal death.² Primary care programs that were able to reduce maternal mortality are characterized by structure and coherence, access to adequate medications and materials, detailed therapeutic guidance, and differentiated follow-up.³

The profile of diseases that lead to the death of a pregnant woman or puerpera varies according to the degree and type of difficulty encountered by the communities, with differences from country to country or even within the same country.^{4,5} In most developing countries, arterial hypertension is the main cause of maternal death.⁶

A high frequency of maternal death resulting from hypertension disorders in pregnancy has been reported in the city of São Paulo¹ and throughout Brazil.⁴ Moreover, eclampsia has been indicated as a possible aggravating factor of hypertension. The objective of the present study was to evaluate the profile of these women and to identify possible deficiencies in care that might have contributed to or

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worsened this clinical condition resulting in maternal death, as well as to propose interventions to reduce the incidence of maternal death.

MATERIAL AND METHODS

The data used in the present study were requested from the Committee on Maternal Mortality of São Paulo City (CMMMSP), of which the first author is a member. A retrospective ecological study was conducted comprising maternal deaths with a history of hypertensive disorders in pregnancy [preeclampsia/eclampsia (PE/E) and chronic hypertension (CH)] identified between 1995 and 1999 in São Paulo City.

The size and complexity of the city of São Paulo does not permit us to completely investigate all the deaths of women of fertile age (10 to 49 years), therefore the CMMMSP used the "mask method" for the selection of known positive or presumed cases of maternal death. This method has been used successfully since 1993¹. The mask method consists of reading the death certificate in order to identify any information in the text that indicates the presence of pregnancy-related events, i.e., events that occurred during or within one year after pregnancy. Any death certificate reporting a disease or disorder that may worsen or interfere with the physiological progression of pregnancy or puerperium, such as cerebrovascular accident, cardiovascular descompensation, events related to arterial hypertension, general infections, and manifestations of acute anemia and its disorders in pregnancy, was also added. After appropriate selection of confirmed or suspected cases of maternal death, a standard questionnaire recommended by the Ministry of Health⁷ was applied, which compiles data collected during home and hospital visits. When a positive case of maternal death was identified, the case was then codified according to the ICD-10 which was based on the information obtained and subsequently classified.

The CMMMSP defines reported maternal deaths as any case in which simple analysis of the death certificate confirms, beyond any doubt, the presence of pregnancy-related events. Underreported maternal death was defined as an event identified during the investigation of the case with no information being present in the death certificate. At the end of the investigation process and classification of positive events, the rate of underreporting was calculated by dividing the number of underreported maternal deaths by the number of declared maternal deaths.

The investigation charts of the 142 cases of maternal deaths due to hypertensive disorders in pregnancy were analyzed by the authors in order to identify social characteristics, age, obstetric history, prenatal care, hospital care

(medications, obstetric management, and resulting disorders in pregnancy), newborn survival, and place and time of maternal death during pregnancy and puerperium.

The present study was conducted according to the ethical guidelines established by the Declaration of Helsinki and according to the norms outlined by the World Medical Association.

RESULTS

During the period from 1995 to 1999, a total of 1,073,917 live births and 609 confirmed cases of maternal death were reported in the city of São Paulo, which corresponds to a MMR of 56.7/100,000 live births during the period. The presence of maternal death was omitted in 209 of these death certificates, resulting in an underreporting rate of 52.2%.

The main cause of maternal death found in the present study was arterial hypertension (Table 1) in 142 (23.3%) cases, hemorrhagic disorders in pregnancy during the 2nd-3rd trimester and puerperal period in 105 (17.2%), and abortions in 66 (10.8%). Among the 142 (23.3%) maternal deaths due to hypertensive disorders in pregnancy, 139 occurred up to puerperal day 42 and three occurred between puerperal day 43 and one year after delivery or abortion (extended puerperium), resulting in a specific MMR due to arterial hypertension of 13.2/100,000 live births. PE/E was the leading cause of death in 99 cases and 43 were due to chronic hypertension disorders in pregnancy. Figure 1 shows the distribution of 142 cases of maternal death resulting from chronic hypertension disorders in pregnancy and PE/E and the respective MMRs calculated according to age.

Table 1 - Distribution of the 609 cases of maternal death according to the main causes of death (São Paulo City, 1995-1999)

Cause of death	N	%
Arterial hypertension	142	23.3
Hemorrhagic disorders	105	17.2
Abortion	66	10.8
Cardiovascular diseases	58	9.5
Puerperal infection	43	7.1
Others	195	32.0
TOTAL	609	100.0

Source: CMMMSP.

Seventy-four (52.1%) of the women were single, 57 (40.1%) were married, six (4.2%) were co-habiting, four (2.8%) were widows, and one case (0.7%) where the marital status was unknown. On the basis of the 103 (72.5%) death certificates reporting ethnic origin/race, 65 (63.1%) women were white, 27 (26.2%) were mulatto, 10 (9.7%) were black, and one (1.0%) was of Asian origin.

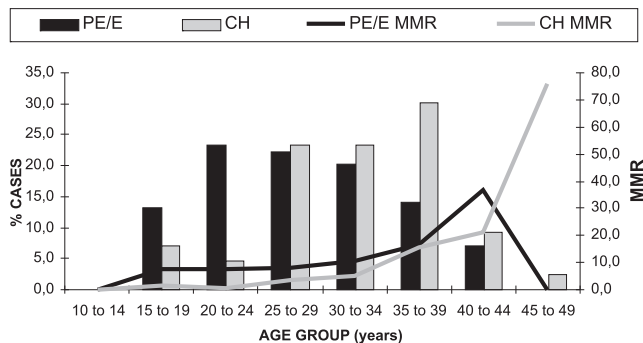


Figure 1 - Percent distribution and the respective maternal mortality rate (MMR) of cases of maternal death resulting from disorders in pregnancy of preeclampsia/eclampsia (PE/E) and chronic hypertension (CH) according to age of the pregnant women or puerpera at the time of death (São Paulo City, 1995-1999).

Data regarding parity were investigated in 96 (67.6%) cases. Cases of PE/E included 33 (48.5%) primigravidae, 14 (20.6%) secundigravidae, 13 (19.1%) tertigravidae, and eight (11.8%) multigravidae. Whereas cases of chronic hypertension included five (17.9%) primigravidae, four (14.3%) secundigravidae, seven (25.0%) tertigravidae, and 12 (42.9%) multigravidae.

Data regarding prenatal care were obtained in 56 (39.4%) cases, with 37 (66.1%) of the women receiving prenatal care, whereas 19 (33.9%) did not. The reasons for failure in seeking prenatal follow-up were identified based on the data collected during home visits and included attempts to hide the pregnancy and lack of care concerning the patient's own well-being.

The time of death during pregnancy and puerperium is shown in Table 2.

Table 2 - Distribution of the 99 cases of maternal death due to preeclampsia/eclampsia (PE/E) and of the 43 cases resulting from disorders in pregnancy of chronic hypertension (CH) according to time of death during pregnancy and puerperium (São Paulo City, 1995-1999)

Pregnancy period	PE/E		CH		Total	%
	N	%	N	%		
First trimester	0	0.0	0	0.0	0	0.0
Second trimester	3	3.0	11	25.6	14	9.9
Third trimester	7	7.1	13	30.2	20	14.1
Puerperium	76	76.8	19	44.2	95	66.9
Unknown	13	13.1	0	0.0	13	9.2
TOTAL	99	100.0	43	100.0	142	100.0

Source: CMMMSP.

Delivery was performed in 100 (70.4%) cases, including 85 (85.0%) cesarean sections and 15 (15.0%) vaginal deliveries. Post-mortem cesarean section was performed in six cases, with successful recovery of the neonate in two (33.3%). Time was not sufficient for any intervention in

28 (19.7%) cases and information regarding the type of procedure was unavailable in 14 (9.9%) cases,

The pregnancy disorders that resulted in the death of 142 patients are shown in Table 3. The most frequent cause was cerebrovascular accident (45.1%), acute pulmonary edema (27.5%), and coagulopathies (16.2%), with the HELLP syndrome being responsible for 12 (52.2%) deaths.

Table 3 - Distribution of the 142 cases of obstetric maternal death resulting from hypertensive disorders in pregnancy according to the determining cause of death (São Paulo City, 1995-1999)

Cause of death	N	%
Cerebrovascular accident	64	45.1
Acute pulmonary edema	39	27.5
Coagulopathies	23	16.2
Acute myocardial infarction	5	3.5
Others	10	7.0
Unknown	1	0.7
TOTAL	142	100.0

Source: CMMMSP.

In 17 (12.0%) cases, the pregnant woman or puerpera was admitted to the hospital with cardiorespiratory arrest. Eleven (64.7%) of these patients had chronic hypertension and six (35.3%) presented with pregnancy disorders of PE/E, of which 13 (76.5%) were gravidae and four (23.5%) were puerperae. Eleven (64.7%) patients were older than 30 years and five (83.3%) of the six post-mortem cesarean sections were performed in this group. Puerperae died on average 11 days after delivery, with a mean of 9 days for patients with PE/E and a mean of 20 days for chronic hypertensive patients.

The maternal death was explicitly stated in the death certificate of 82 cases among the 99 cases of PE/E, (underreporting rate of 20.7%) and of 26 patients among the 43 with chronic hypertension (underreporting rate of 65.4%). The overall underreporting rate among the 142 cases was 31.5%. The fields on the death certificate inquiring about the presence of pregnancy or puerperium were correctly filled out in 28 (19.7%) cases.

With respect to the place of death, 139 (97.9%) women died at the hospital and three (2.1%) died at home. Public hospitals attended to 112 (80.6%) cases and private hospitals attended to 22 (15.8%). Five (3.6%) patients died at hospitals outside São Paulo City. Among the 95 (73.6%) puerperae, 74 (77.9%) died at the same hospital where they gave birth either during the immediate postpartum period or days later when returning to the hospital.

Eleven (7.7%) patients were transferred to referral hospitals, nine (81.8%) of them after delivery and two (18.2%) during pregnancy. Most of the institutions receiving the cases were tertiary hospitals.

Eclampsia, i.e., the presence of seizures, was identified in 41 (28.9%) cases, with four (9.8%) of them using magnesium sulfate. However, analysis of the 142 records revealed the use of magnesium sulfate in 10 (7.0%) cases, including nine (90.0%) with PE/E and one (10.0%) with chronic hypertension. Other drugs used for the treatment of seizures and for the control of hypertensive peaks were benzodiazepines, phenobarbital, pindolol, hydralazine, alpha-methyldopa, sodium nitroprussiate, propranolol, nifedipine, and diuretics.

Information regarding the health condition of the newborns was available in 96 (66.2%) cases, including 58 (61.7%) newborns who had died and 36 (38.3%) who survived. Among the 85 (59.9%) women that underwent a cesarean section (including the six post mortem cesarean sections), neonatal death was reported in 22 (25.9%) cases and 31 (36.5%) newborns were alive. No information about the conceptus was available in the remaining 32 (37.6%) cases.

DISCUSSION

The study of trends in maternal death is of great importance, both for the evaluation of a community health system and for the elaboration of concrete proposals to reduce this event. Compared to most developed countries and their cities, São Paulo City has a much higher MMR⁸ with an underreporting rate of 52.2%, which is within the range observed in Europe and in the United States.⁹

Hypertensive disorders in pregnancy, delivery, and puerperium represented the main cause of maternal death in São Paulo City, resulting in 23.3% of deaths. In contrast, arterial hypertension occupies third place (15.9%) after thromboembolism (19.9%) and hemorrhage (18.2%) in the United States.¹⁰

Arterial hypertension can affect the pregnant woman in various manners¹¹ which, if not controlled adequately, may pose a risk to the mother and conceptus. Unfortunately, our study is based on the analysis of medical records and of data present in the death certificate, a fact that may lead to errors in the correct classification of the type of arterial hypertension. Aggravation of the clinical manifestations through association with preeclampsia (preeclampsia superimposed upon chronic hypertension), which leads to convulsions, is observed in many chronic hypertensive women. One of the criteria used for the classification of groups is based on the presence of myocardial hypertrophy, which is generally absent in cases of pure preeclampsia, a fact that does not exclude the presence of mixed manifestations. Similarly, primigravidae with chronic hypertension without previous follow-up may present hypertensive peaks that lead the physician to the diagnosis of pure preeclampsia.

Although the prenatal care structure of São Paulo City provides ample coverage, 33.9% of patients for whom data were available did not receive prenatal care.

The fact that most maternal deaths due to arterial hypertension occurred in the public sector (80.6% of the cases selected), the presence of pregnancy within an unstable marital situation (52.1% of the patients were single) and the lack of prenatal care in 33.9% of cases, suggested that the group of women were of low socioeconomic standing. In contrast to the United States,¹⁰ the present study showed that maternal death due to hypertensive disorders in pregnancy mainly affected white women (63.1%), reflecting the different nuances of this disorder between population groups.

With respect to age (Figure 1), maternal mortality due to PE/E affected younger women (58.6% of women up to 29 years of age), whereas maternal death resulting from chronic hypertension was frequent in older multiparous pregnant women or puerperae (65.1% of women aged 30 to 49 years), in agreement with the literature.¹¹

As shown in Table 2, most deaths occurred during the puerperal period (66.9%), which is in accordance with a worldwide trend.¹² However, comparisons between deaths due to PE/E and disorders in pregnancy of chronic hypertension showed that 55.8% of chronic hypertensive patients died during pregnancy, in contrast to those who developed PE/E (10.1%). This finding might be explained by the fact that pregnant women with PE/E are healthier when they develop hypertension compared to chronic hypertensive patients who already present variable degrees of organic and/or functional lesions of the cardiocirculatory and renal systems even before becoming pregnant.¹³

Multiparity is generally accompanied by a certain amount of carelessness on the part of both the patient and the attending physician because there are symptoms and situations that may pose a health risk that are often neglected. However, hypertensive pregnant women should be guided and prepared for pregnancy and its manifestations, which, although physiological, impose an overload on the maternal organism. In this respect, hypertensive women should be rigorously monitored in order to ensure a safer pregnancy. The underlying disease should be treated adequately before the beginning of pregnancy to stabilize the pre-existing hypertensive condition so that women will be healthier when they become pregnant.¹⁴ The introduction of anti-hypertensive medication (methyldopa, beta-blockers, and calcium channel antagonists) improves maternal-fetal prognosis, prevents hypertension-induced organic deterioration, reduces the incidence of disseminated intravascular coagulation, pulmonary edema, hepatic and renal failure, protects the mother against hyper- or hypotensive episodes during anesthesia, guarantees a healthy uterine-placental blood flow, prolongs the duration

of gestation, and reduces the length of hospitalization.¹⁵

As shown in Table 3, the three main determining causes of maternal death due to arterial hypertension were neurological disorders in pregnancy (54.1%), acute pulmonary edema (27.5%), and hemorrhagic events, especially HELLP syndrome (16.2%). Neurological disorders in pregnancy (cerebrovascular accident) have been attributed to difficulties in the control and reduction of arterial hypertension.¹⁶ Hydralazine, one of the best drugs for the control of hypertensive episodes,¹⁷ provides adequate reduction of the hypertensive peak, minimizing the risks of intracranial bleeding and hypertensive encephalopathy.

In the case of imminent eclampsia or eclampsia, magnesium sulfate should be adequately administered in order to minimize the morbidity and mortality associated with disorders in pregnancy resulting from convulsive episodes.¹⁸ In the present study, this medication was only used in 7.0% of all cases and in 10% of cases with a record of the occurrence of seizures. Magnesium sulfate is certainly the best currently available anti-convulsant drug whose efficacy has been confirmed over a century of uninterrupted use. However, 43% of hospitals in the State of São Paulo do not possess the basic emergency care kit containing this drug.¹⁹ Thus, it is essential that emergency care services have access to low cost drugs with proven efficacy, such as magnesium sulfate and hydralazine, whose adequate administration can reduce the disorders in pregnancy of arterial hypertension.

With respect to acute pulmonary edema, this condition has been attributed to various factors which, alone or together, trigger alterations that culminate in a dramatic and often irreversible state. The main causes of pulmonary edema include a reduced colloid osmotic pressure caused by urinary loss of proteins, inadequate infusion of crystalloids, blood loss during delivery, and increased capillary permeability due to endothelial damage associated or not with renal and cardiac insufficiency.²⁰ Another important factor is systolic dysfunction or impaired myocardial contraction resulting from hypertrophy of the left ventricle in patients with chronic hypertension. The ventricular wall is thick and rigid and requires a high filling pressure, a fact that predisposes pregnant women to pulmonary edema when they retain excess sodium and water during the final phase of gestation or in the case of iatrogenic fluid overload.²¹

Coagulation disorders and HELLP syndrome, identified in 16.2% of the present cases, are disorders in the pregnancy of PE/E and may occur in severe cases or when pregnant patients with arterial hypertension are managed conservatively. Mortality due to these disorders in pregnancy

is attributed to a late diagnosis or to a delay in the institution of appropriate therapeutic measures such as blood pressure reduction. The main coagulopathies resulting from increased blood pressure are premature detachment of the placenta, HELLP syndrome, and liver rupture. In the present study, HELLP syndrome was the leading cause, corresponding to 52.2% of all coagulation disorders, in contrast to the United States where premature detachment of the placenta occupies the first place.^{10,22}

In conclusion, analysis of the 142 cases of maternal death due to hypertensive disorders in pregnancy showed that the care provided to hypertensive pregnant women is not adequate. There is a lack of previous preparation for women with systemic arterial hypertension who wish to become pregnant, adequate prenatal care coverage for women with a history of some disease or for those who develop a condition during pregnancy, and adequate guidance or procedures and medications to be adopted. This fact is confirmed by the finding that 13 pregnant women and four puerperae arrived at the hospital in cardiorespiratory arrest. In fact, as long as the government does not improve the socioeconomic conditions of the population and does not create units clearly and directly affiliated with tertiary care hospitals providing differentiated care for risk pregnancies, pregnant patients will arrive at the emergency room of hospitals in even more descompensated and difficult-to-control conditions. It is of fundamental importance to standardize management and protocols for risk pregnancies based on scientific evidence, and to provide specific medications with a higher resolution power. The importance of a family planning system adapted to the needs of this population of hypertensive and older women, including adequate procedures for each case, should be emphasized. Stress, which is generally present in women with an undesired pregnancy, has been indicated as one of the main causes contributing to preeclampsia and its consequences.²³

Finally, as long as no worthy basic care service is provided to the Brazilian population that includes well-structured family planning, quality and differentiated care for pregnant women with arterial hypertension, and professionals qualified to diagnosis and appropriately treat obstetric disorders in pregnancy, lives will be placed unnecessarily at risk.

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RESUMO

Vega CEP, Kahhale S, Zugaib M. A mortalidade materna devido a hipertensão arterial na cidade de São Paulo (1995-1999). *Clinics*. 2007;62(6):679-84.

OBJETIVO: Descrever o perfil dos casos de morte materna decorrente de complicações da hipertensão arterial e propor medidas para sua redução.

MÉTODOS: De 1995 a 1999 o Comitê de Mortalidade Materna da Cidade de São Paulo identificou 609 casos de morte materna obstétrica, com uma subnotificação de 52,2% e um CMM=56,7/100.000 Nascidos Vivos. A hipertensão arterial foi a principal causa de óbito materno, correspondendo a 142 (23,3%) casos.

RESULTADOS: Ocorreram 95 (66,9%) de óbitos no puerpério e 34 (23,9%) durante a gestação. Em 13 (9,2%) casos não se teve referência ao momento do óbito. Houve relato de crises convulsivas em 41 casos com a utilização de sulfato de magnésio em quatro deles. As principais

causas determinantes do óbito foram: o acidente vascular cerebral (44,4%), o edema agudo de pulmão (24,6%) e as coagulopatias (14,1%). A cesárea foi realizada em 85 (59,9%) casos e o parto vaginal em 15 (16,0%). Em 28 (19,7%) casos não foi realizada nenhuma conduta para interromper a gravidez e em 14 (9,8%) não se obteve relato do procedimento.

CONCLUSÃO: As complicações da hipertensão arterial no ciclo gravídico-puerperal determinam altos índices de mortalidade materna na cidade de São Paulo. A realização de um pré-natal de qualidade e o atendimento apropriado da gestante hipertensa no parto e no pós-parto são medidas de fundamental importância para um melhor controle desse evento, sendo primordial para a redução dessas ocorrências.

UNITERMOS: Mortalidade materna. Hipertensão arterial. Gestação de risco. Hipertensão arterial crônica. Pré-eclâmpsia/eclâmpsia. Sulfato de magnésio.

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