



Pregnancy-Associated Mortality Review

Florida Department of Health, Division of Community Health Promotion

Pregnancy-Related Deaths Due to Hypertensive Disorders 1999-2012

Hypertensive disorders in pregnancy complicate 5% to 10% of all pregnancies in the United States.¹ A pre-eclampsia condition represents one in three cases of severe morbidity and is a major cause of poor outcomes including the mother's death.² This brief provides an overview of pregnancy-related deaths (PRDs) due to hypertensive disorders in Florida from 1999 to 2012, and includes evidence-based recommendations intended to reduce the risk of maternal death due to hypertensive disorders.

Florida's Pregnancy-Associated Mortality Review (PAMR) is an ongoing system of surveillance that collects and analyzes information related to maternal deaths in order to promote care and system improvements through evidence-based actions intended to lower risks for PRDs.³

From 1999-2012, the Florida PAMR Team classified 560 cases as PRDs. Figure 1 shows the distribution of these 560 deaths by cause of death. During this period (1999-2012), the top two leading causes of PRDs were hypertensive disorders (15.5%) and hemorrhage (15.2%).

Of the 560 PRDs, 87 were due to hypertensive disorders. The pregnancy-related mortality ratio due to hypertensive disorders (PRMRH) fluctuated from a rolling three-year average of 3.0 hypertensive disorders deaths per 100,000 live births during the 1999-2001 period to 2.7 deaths during 2010-2012 period (see Figure 2). The steady trend for single-year data was not statistically significant for the 1999-2012 period.

Differences in PRMRH were found for maternal characteristics of age, race and Hispanic ethnicity, delivery type, prenatal care, body mass index (BMI), and gestational age. The ages of the women who died from hypertensive disorders ranged between 14 and 46 years with a median of 33 years. Women 35 years and older had a higher PRMRH of 8.8, compared with the PRMRH of women 24 years or younger at 1.4 PRDs per 100,000 live births.

Figure 1. Distribution of Pregnancy-Related Causes of Death, Florida, 1999-2012 (n=560)

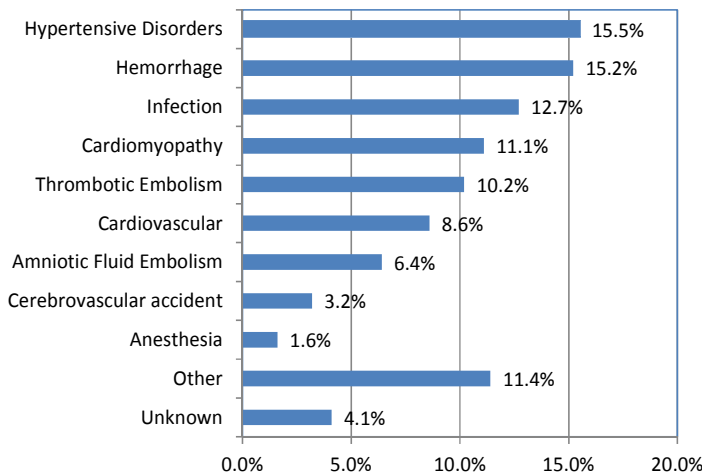
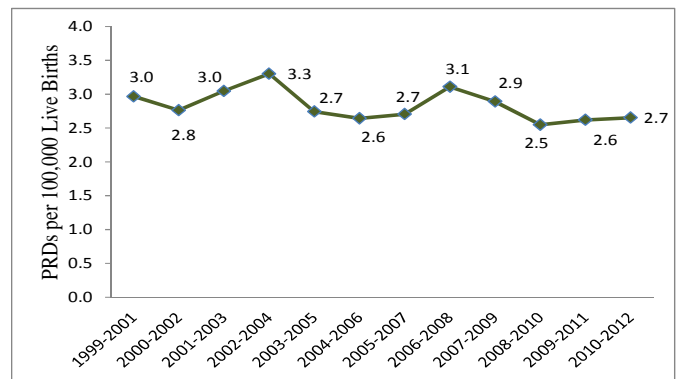


Figure 2. Pregnancy-Related Mortality Ratios due to Hypertensive Disorders (PRMRH), Three Year Rolling Average, Florida, 1999-2012



Almost 53% of women who died from hypertensive disorders were non-Hispanic Black, 31% were non-Hispanic White, and 16% were Hispanic or other races. Non-Hispanic Black women had a higher PRMRH of 6.9 compared with non-Hispanic White or Hispanic and non-Hispanic other races at 1.9 and 1.7 PRDs per 100,000 live births.

The presence of hypertensive disorders in pregnant women may increase the likelihood of delivery by cesarean.⁴ Sixty-eight percent of women who died from hypertensive disorders had a cesarean delivery. Women who delivered by cesarean had a higher PRMRH of 4.8 compared to the PRMRH of 1.1 PRDs per 100,000 live births for women who had a vaginal delivery.

Women who had late or no prenatal care had a higher PRMRH of 5.7 compared with the women who had prenatal care during the first trimester of pregnancy at 1.7 PRDs per 100,000 live births.

Most of the women who died from hypertensive disorders (78%) were overweight or obese. Obese (BMI ≥ 30.0) women had a higher PRMRH of 8.1 compared with 1.1 PRDs per 100,000 live births for women with normal BMI (20-24.9).

Hypertensive women may have a higher risk of preterm births.⁵ Women who had a gestational age of 28 weeks or less or between 29 and 36 weeks had a higher PRMRH of 47.0 and 10.2 PRDs per 100,000 live births compared with women who had a gestational age of 37 weeks or more (see Table 1).

Table 1. Pregnancy-Related Mortality Ratios due to Hypertensive Disorders: Rates per 100,000 Live Births (PRMRH) and Unadjusted Relative Ratios (RR), Florida, 1999-2012 (n=87)

Characteristics	Deaths	PRMRH	RR (95%CI)
Age			
<25	15	1.4	Ref.
25-34	33	2.2	1.6 (0.9-3.0)
35 +	39	8.8	6.5* (3.6-11.7)
Race			
Non-Hispanic White	27	1.9	Ref.
Non-Hispanic Black	46	6.9	3.7* (2.3-5.9)
Hispanic and other	14	1.7	0.9 (0.5-1.7)
Marital Status			
Married	51	3.0	Ref.
Not married	36	2.7	0.9 (0.6-1.4)
Mode of Delivery			
Vaginal	23	1.1	Ref.
Cesarean ¹	49	4.8	4.2* (2.6-6.9)
Prenatal Care Initiation			
First trimester	38	1.7	Ref.
Second-third or none	31	5.7	3.4* (2.1-5.5)
Body Mass Index Categories²			
Underweight (BMI <20)	2	2.4	2.2 (0.5-10.1)
Normal (BMI 20-24.9)	9	1.1	Ref.
Overweight (BMI 25-29.9)	11	2.7	2.5* (1.0-6.1)
Obese (BMI ≥ 30)	27	8.1	7.5* (3.5-15.9)
Gestational Age (Wks)			
28 or less	15	47.0	41.1* (22.1-76.3)
29-36	39	10.2	8.9* (5.5-14.3)
37 or more	30	1.1	Ref.

1/ Excluded eight emergency cesarean deliveries. 2/ Excluded women who died during first or second trimester. 3/ Included years 2004-2012. *Statistically significant (p<0.05).

Overall characteristics of women at increased risk of PRDs due to hypertensive disorders were (see Table 1):

- 35-years or older
- Non-Hispanic Black
- Second, third, or no prenatal care
- Obese (BMI ≥ 30)

Hypertensive women were at a higher risk of having:

- Cesarean deliveries
- Preterm births

References:

1. Wagner, S., Barac, S. (2007). Hypertensive Pregnancy Disorders: Current Concepts. J Clinical Hypertension. Vol(9) 560-6.
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3. Burch, D., Noell, D., Washington, H., Delke, I. (2012). Pregnancy-Associated Mortality Review. The Florida Experience. Seminars in Perinatology. 36(1): 31-36.
4. Linton, A., Peterson, M. (2004). Effect of preexisting chronic disease on primary cesarean delivery rates by race for births in U.S. military hospitals, 1999-2002. Births Sep, 31(3):165-75.
5. Samadi, A. et al. (1996). Maternal hypertension and associated pregnancy complications among African-American and other women in the United States. Obstetrics and Gynecology 87(4):557-63.
6. Berg, C. et al. (2005). Preventability of Pregnancy-Related Deaths. Results of a State-Wide Review. Obstetrics and Gynecology 106 (6): 1128-1234.
7. The California pregnancy-related mortality review. April 2011. From: <http://www.cdph.ca.gov>

Seventy percent of PRDs were classified as preeclampsia or eclampsia and 30% were due to other/no other specified cause of death. Cerebrovascular hemorrhage (43.7%), other causes including encephalopathy (23%), and HELLP syndrome (17.2%) accounted for 83.9% of all deaths due to hypertensive disorders (Table 2).

Florida PAMR Team Hypertensive Disorders Recommendations for Actions:

Maternal mortality review reports from North Carolina and California found that maternal deaths due to hypertensive disorders had significant prevention opportunities.^{6,7} Similarly, the Florida PAMR Team identified the following recommendations as opportunities to reduce the risk of hypertensive disorders PRDs.

Clinical Factors - Recommendations for Clinicians:

- Screen all women for previous history of preeclampsia, high blood pressure, pre-existing diabetes mellitus, obesity, and advanced maternal age to recognize a patient at risk for hypertensive disorder
- Maintain vigilance in monitoring for pulmonary edema in patients with preeclampsia and treat these patients aggressively
- Ensure that patients placed on antihypertensive medication(s) during a hospitalization demonstrate a stable blood pressure prior to discharge and have access to those medications if needed after discharge

System Factors - Health care practitioners and birthing facilities should ensure policies, procedures, and standards of care are met in the care and treatment of a woman at risk of or with an existing hypertensive disorder.

Individual and Community Factors -

- All medical practitioners should review medical conditions that may have an impact on a pregnancy with all women of childbearing age
- Health care practitioners should increase patient awareness about the significance of shortness of breath by including this as a warning sign in postpartum discharge instructions

Table 2. Pregnancy-Related Deaths Due to Hypertensive Disorders by Causes, Florida, 1999-2012 (n=87)

Causes	Preeclampsia	Eclampsia	Other/NOS* Hypertension in Pregnancy	Total Deaths (%)
Cerebral embolism	1	0	1	2 (2.3%)
Cerebrovascular hemorrhage	13	14	11	38 (43.7%)
DIC-Disseminated intravascular coagulation	1	1	0	2 (2.3%)
HELLP syndrome	12	3	0	15 (17.2%)
Other (includes encephalopathy)	7	4	9	20 (23.0%)
Unknown/NOS	1	4	5	10 (11.5%)
Total Deaths Due to Hypertensive Disorders	35	26	26	87

*No other way specified.