



Pregnancy-Associated Mortality Review

Florida Department of Health, Division of Community Health Promotion

Pregnancy-Related Deaths Due to Hypertensive Disorders, Florida 1999–2018

Hypertensive disorders in pregnancy complicate 5% to 10% of all pregnancies in the United States.¹ This heterogeneous group of disorders includes chronic hypertension, gestational hypertension, preeclampsia, and preeclampsia superimposed on chronic hypertension. This brief provides an overview of pregnancy-related deaths (PRDs) due to hypertensive disorders in Florida from 1999 to 2018 and includes evidence-based recommendations intended to reduce the risk of maternal death due to hypertensive disorders.

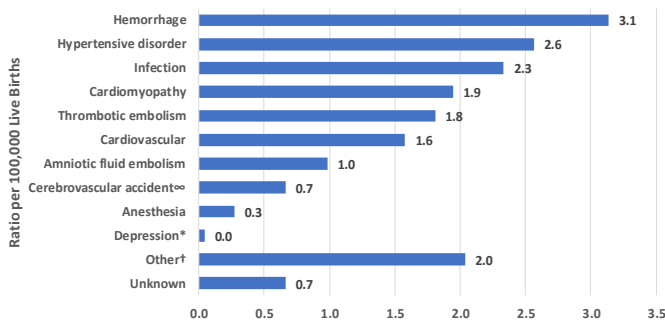
Florida's Pregnancy-Associated Mortality Review (PAMR) is an ongoing system of surveillance that collects and analyzes information related to maternal deaths in order to promote care and system improvements through evidence-based actions intended to lower risks for PRDs.²

From 1999–2018, the Florida PAMR Committee classified 788 cases as PRDs. Figure 1 shows the pregnancy-related mortality ratio (PRMR), PRDs per 100,000 live births by cause of death. During this period, the highest PRMR was for hemorrhage (3.1) followed by hypertensive disorders (2.6).

Figure 2 shows periods of three years of PRMRs for the total of the 788 PRDs and the 112 PRDs due to hypertensive disorders. For the total deaths, a significant increase was observed in 2008–2010 when compared with 2005–2007 and a significant decrease in 2014–2016 when compared with 2011–2013. The three year periods were flat for hypertensive disorders except for a significant decrease in 2014–2016 when compared to 2011–2013.

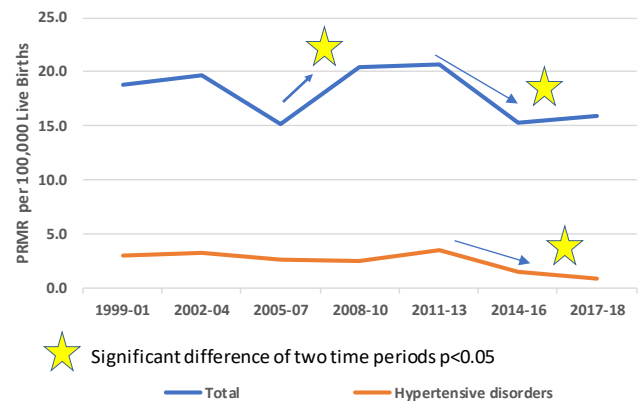
Table 1 shows that differences in PRMR for hypertensive disorders were found for maternal characteristics of age, race and Hispanic ethnicity, delivery type, prenatal care, body mass index (BMI), and gestational age. The ages of the women who died from hypertensive disorders ranged between 14 and 46 years with a median of 32 years. Women 35 years and older had a higher PRMR of 7.5, compared with the PRMR of women 24 years or younger at 1.1 PRDs per 100,000 live births.

Figure 1. Distribution of Pregnancy-Related Mortality Ratios by Causes of Death, Florida, 1999–2018 (n=788)



[∞]Cerebrovascular accident no known hypertensive disorders. †Other is comprised of various causes of deaths not easily captured with sufficient numbers in a homogeneous category. *Depression was included in 2018.

Figure 2. Three-Year Pregnancy-Related Mortality Ratios by Total Causes and Hypertensive Disorders, Florida, 1999–2018



Almost 53% of PRDs who died from hypertensive disorders were non-Hispanic Black, 32% were non-Hispanic White, and 15% were Hispanic. Non-Hispanic Black women had a higher PRMR of 6.2 compared with non-Hispanic White or Hispanic at 1.8 and 1.4 PRDs per 100,000 live births respectively.

The presence of hypertensive disorders in pregnant women may increase the likelihood of delivery by cesarean.³ Sixty-nine percent of women who died from hypertensive disorders had a cesarean delivery. Women who delivered by cesarean had a higher PRMR of 4.0 compared to the PRMR of 0.9 PRDs per 100,000 live births for women who had a vaginal delivery.

Hypertensive women who had late or no prenatal care had a higher PRMR of 4.2 compared with the women who had prenatal care during the first trimester of pregnancy at 1.6 PRDs per 100,000 live births.

Most of the women who died from hypertensive disorders (77%) were overweight or obese. Obese (BMI ≥ 30.0) women had a higher PRMR of 5.9 compared with 1.0 PRDs per 100,000 live births for women with normal BMI (20–24.9).

Hypertensive women may have a higher risk of preterm birth.⁴ Women who had a gestational age of 28 weeks or less or between 29 and 36 weeks had a higher PRMR of 37.1 and 11.5, PRDs per 100,000 live births, respectively, 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, 1999–2018 (n=112)

Characteristics	Deaths	PRMR	RR (95% CI)
Age			
<25	16	1.1	Ref.
25-34	46	2.0	1.8 (1.0-3.3)*
35 +	50	7.5	6.8 (3.8-11.9)*
Race/Ethnicity			
Non-Hispanic White	36	1.8	Ref.
Non-Hispanic Black	59	6.2	3.5 (2.3-5.2)*
Hispanic	17	1.4	0.8 (0.4-1.7)
Marital Status			
Married	66	2.7	Ref.
Not married	46	2.4	0.9 (0.6-1.3)
Mode of Delivery			
Vaginal	27	0.9	Ref.
Cesarean ¹	60	4.0	4.1 (2.7-6.6)*
Prenatal Care Initiation			
First Trimester	52	1.6	Ref.
Second-Third or None ²	34	4.2	3.4 (2.1-6.6)*
Body Mass Index Categories³			
Underweight (BMI <20)	**	1.4	1.4 (0.3-6.0)
Normal (BMI 20-24.9)	15	1.0	Ref.
Overweight (BMI 25-29.9)	16	2.0	2.0 (1.0-4.1)
Obese (BMI 30 or +)	40	5.9	5.9 (3.3-10.7)*
Gestational Age (Wks)			
28 or less	16	37.1	34.5 (19.4-61.4)*
29-36	48	11.5	10.7 (7.1-16.2)*
37 or more	42	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). **Cases less than 5 were not included.

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 a PRD if they had :

- Cesarean deliveries
- Preterm births

Seventy one percent of PRDs due to hypertensive disorders were classified as preeclampsia or eclampsia and 29.0% were due to other/no other specified cause of death. Cerebrovascular hemorrhage (44.6%), other causes including encephalopathy (24.1%), and HELLP syndrome (15.2%) accounted for 83.9% of all deaths due to hypertensive disorders (Table 2).

References:

- Sutton, A., Harper, L., Tita, A. (2018). Hypertensive Disorders in Pregnancy. J Obstet Gynecol Clin. N Am (45): 333-347.
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- 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 31(3):165-75.
- 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.

Florida PAMR Team Hypertensive Disorders Recommendations for Actions:

In 2014, the Florida PAMR Committee initiated assessment of the preventability of PRDs. During the period 2013–2018, 72.0% of PRDs due to hypertensive disorders were deemed to be preventable. During the same period, the committee identified 68 contributing factors among 25 PRDs due to hypertensive disorders; on average three contributing factors were identified for each PRD. The largest proportion of factors were provider factors, followed by patient/family factors, and system of care factors. The most common themes and recommendations were:

Enforce policies and procedures:

- Providers should adopt and adhere to the Florida Perinatal Quality Collaborative hypertension in pregnancy (HIP) guidelines for hypertension crisis management and treatment.
- Facilities should develop protocols and policies that follow the American College of Obstetricians and Gynecologists guidelines for the management of hypertension in pregnancy.

Improve procedures related to communication and coordination between providers:

- Patients with chronic hypertension and superimposed preeclampsia should have a maternal fetal medicine specialist referral or referral to a high-level facility.

Improve standards regarding assessment, diagnosis, and treatment decisions:

- Aspirin should be utilized for preeclampsia prophylaxis during prenatal care.
- Providers should follow ACOG guidelines for management of hypertension in pregnancy, i.e., inpatient observation and management until delivery once preeclampsia diagnosed.
- An echocardiogram is recommended for pregnant women who are morbidly obese and have chronic hypertension.
- A cesarean delivery at 37 weeks gestation is recommended for morbidly obese patients who have chronic hypertension, to reduce the work load on the heart.

Table 2. Pregnancy-Related Deaths Due to Hypertensive Disorders by Causes, Florida, 1999–2018 (n=112)

Causes	Preeclampsia	Eclampsia	Other/NOS* Hypertension in	Total Deaths (%)
Cerebral embolism				2.7%
Cerebrovascular hemorrhage	22	15	13	50 (44.6%)
DIC-Disseminated intravascular coagulation				1.8%
HELLP syndrome	14			17 (15.2%)
Other (includes encephalopathy)	11		12	27 (24.1%)
Unknown/NOS		5	6	13 (11.6%)
Total Deaths Due to Hypertensive Disorders	51	28	33	112

*NOS: Not otherwise specified. Note: Cases less than 5 were not included.