

The Risk of Pregnancy-Induced Hypertension: Black and White Differences in a Military Population

ABSTRACT

The relationship between race and risk of pregnancy-induced hypertension was investigated in a cohort of active-duty military women who gave birth during the period 1987 through 1989. Cases were identified through hospital discharge diagnoses and included transient gestational hypertension, pre-eclampsia, eclampsia, and unspecified hypertension complicating pregnancy. Multivariate analysis showed nulliparous Black women to be at a slightly increased risk for all pregnancy-induced hypertension (risk ratio [RR] = 1.2) and for pre-eclampsia (RR = 1.3) compared with nulliparous White women. Black parous women were found to have a slightly reduced risk of all pregnancy-induced hypertension (RR = 0.77) and pre-eclampsia (RR = 0.38) compared with White parous women. (*Am J Public Health*. 1994;84:1508-1510)

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Introduction

Fetal death, low birthweight, and neonatal mortality rates for Blacks are about twice as high as those for Whites,¹ owing in part to inadequate access to gynecological and prenatal services and to life-style factors associated with low socioeconomic status.¹ Some studies report a higher incidence of pregnancy-induced hypertension among Black women than among White women,²⁻⁴ possibly owing to a predominance of socioeconomic and life-style factors potentially related to the disease and to a higher prevalence of undiagnosed preexisting hypertension. Other studies have not found an increased risk among Blacks.⁵⁻⁸ The present cohort study examines the relationship between race and risk for pregnancy-induced hypertension among active-duty women in the US Navy and Marine Corps, among whom the health, education, and socioeconomic differences between Black and White populations are significantly reduced and the barriers to medical care have been minimized.

Methods

All active-duty US Navy and Marine Corps personnel who were admitted to all military hospitals for a singleton infant delivery between October 1, 1987, and September 30, 1989, were initially included in the cohort (n = 8375). After those with preexisting hypertension recorded at hospital discharge (82 Whites, 24 Blacks, 10 of other races) were excluded, a total of 8259 women were eligible for the study.

Individual hospital discharge records were obtained from the Retrospective Case-Mix Analysis System, a component database of the Defense Medical Information System, which contains hospital discharge summary data for all hospitalizations from Department of Defense-operated hospitals. Women identified in the cohort were linked on social security number to demographic database files at the Defense Manpower Data Center.

More than 89% (n = 7364) of the women who were admitted for infant delivery between the stipulated dates were successfully linked. Women who were and were not linked did not differ with respect to age, rank, branch of service, parity, type of delivery, and pregnancy-induced hypertension status. The 377 women who were neither Black nor White were excluded, leaving 6987 women in the analysis.

Women were classified as having pregnancy-induced hypertension if one of their hospital discharge diagnoses was for that disease as defined by the *International Classification of Diseases*, ninth revision (ICD-9)⁹: transient gestational hypertension (code 642.3), pre-eclampsia (642.4 and 642.5), and all pregnancy-induced hypertension (included codes for transient gestational hypertension, pre-eclampsia, eclampsia [642.6], and unspecified hypertension complicating pregnancy [642.9]). Women whose discharge diagnosis indicated infant delivery but did not indicate any of the above pregnancy-induced hypertension diagnoses were considered nondiseased. Crude risks and risk ratios (RRs) were calculated, and adjusted odds ratios (ORs) were obtained by multivariate logistic regression.¹⁰

Results

Comparison of the sociodemographic and reproductive characteristics of Blacks and Whites in this study indicates that White women were notably more likely than Black women to be married (75% vs 56%) and slightly more likely to be among the officer ranks (9% vs 2%), to be over age 35 (3.4% vs 1.6%), and to have

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education past high school (21% vs 17%). Equal proportions of Whites and Blacks were nulliparas, and the proportions diagnosed with pregnancy-induced hypertension were similar. Nulliparas were at increased risk of all pregnancy-induced hypertension (RR = 2.2; 95% confidence interval [CI] = 1.8, 2.7), transient gestational hypertension (RR = 2.0; 95% CI = 1.5, 2.7), and pre-eclampsia (RR = 2.8; 95% CI = 2.0, 3.9) compared with parous women, but there was little association between age, race, marital status, or educational level and risk of these three conditions.

Nulliparous Black women had modestly increased risk ratios for all pregnancy-induced hypertension and pre-eclampsia but not for transient gestational hypertension (Table 1). Among parous women, Blacks were at reduced risk for pre-eclampsia compared with Whites, although both races appear to be at equal risk for the development of all pregnancy-induced hypertension and transient gestational hypertension (Table 2).

Discussion

The current study found a slightly increased risk for pre-eclampsia among nulliparous Black women compared with nulliparous White women in contrast to a fairly strong inverse association for pre-eclampsia among parous Black women compared with parous White women. Eskenazi et al.² found nulliparous Blacks to have a dramatically increased risk for pre-eclampsia compared with their White counterparts (OR = 12.3; 95% CI = 1.6, 100.8), whereas parous Blacks were found to have a reduced risk for pre-eclampsia compared with parous Whites (OR = 0.68; 95% CI = 0.13, 3.5). The current study's findings for nulliparous and parous Black women are in the same direction but of different magnitude than Eskenazi et al.'s² results. Other studies have reported conflicting findings.⁷

Evaluation of these data requires consideration of the accuracy of the diagnoses recorded in the database. As a regular part of the hospital quality assurance process, the military services have instituted the Civilian External Peer Review program, in which nonmilitary physicians evaluate the accuracy of patient care and diagnoses. This survey showed that inpatient hospital care for pre-eclampsia was found to be more than 97% compliant with diagnostic and case management criteria,¹¹ limited to evidence concerning

TABLE 1—Multivariate^a Analysis of Demographic Characteristics and Risks for Pregnancy-Induced Hypertension, Transient Gestational Hypertension, and Pre-Eclampsia among Nulliparous Women

	All Pregnancy-Induced Hypertension			Transient Gestational Hypertension			Pre-Eclampsia		
	Crude Risk	OR ^a	95% CI	Crude Risk	OR ^a	95% CI	Crude Risk	OR ^a	95% CI
Race									
White	10.0	1.0	...	5.2	1.0	...	4.4	1.0	...
Black	11.7	1.2	0.97, 1.5	4.8	0.96	0.68, 1.4	5.7	1.3	0.97, 1.7
Service									
Navy	9.5	1.0	...	3.7	1.0	...	5.2	1.0	...
Marines	11.0	1.2	0.92, 1.5	5.4	1.5	0.99, 2.2	4.8	0.95	0.67, 1.4
Military rank									
Officer	12.6	1.0	...	6.7	1.0	...	4.7	1.0	...
Enlisted	10.6	0.82	0.56, 1.2	5.0	0.79	0.49, 1.3	4.9	1.1	0.58, 1.9
Age, y									
17-34	10.6	1.0	...	5.0	1.0	...	4.9	1.0	...
≥35	13.8	1.2	0.62, 2.4	10.3	2.0	0.95, 2.2	3.5	0.54	0.13, 2.3

Note. OR = odds ratio; CI = confidence interval.

^aMultiple logistic regression model controlling for the effects of race, age, military rank, and military service.

TABLE 2—Multivariate^a Analysis of Demographic Characteristics and Risks for Pregnancy-Induced Hypertension, Transient Gestational Hypertension, and Pre-Eclampsia among Parous Women

	All Pregnancy-Induced Hypertension			Transient Gestational Hypertension			Pre-Eclampsia		
	Crude Risk	OR ^a	95% CI	Crude Risk	OR ^a	95% CI	Crude Risk	OR ^a	95% CI
Race									
White	5.0	1.0	...	2.5	1.0	...	2.1	1.0	...
Black	4.0	0.82	0.51, 1.3	2.7	1.1	0.66, 2.1	0.8	0.37	0.15, 0.95
Service									
Navy	4.0	1.0	...	1.5	1.0	...	2.0	1.0	...
Marines	4.9	1.2	0.67, 2.1	2.8	2.1	0.83, 5.2	1.8	0.73	0.33, 1.6
Military rank									
Officer	6.1	1.0	...	4.0	1.0	...	2.0	1.0	...
Enlisted	4.6	0.89	0.45, 1.8	2.4	0.63	0.27, 1.5	1.8	1.2	0.36, 3.6
Age, y									
17-34	4.5	1.0	...	2.4	1.0	...	1.7	1.0	...
≥35	9.1	1.7	0.80, 3.6	5.3	1.3	0.33, 3.5	3.0	2.0	0.13, 2.3

Note. OR = odds ratio; CI = confidence interval.

^aMultiple logistic regression model controlling for the effects of race, age, military rank, and military service.

false-positive diagnosis but not false-negative diagnosis.

The unique nature of the active-duty military population reduces some of the differences in nutrition, physical activity, and quality of health care that may have affected racial comparisons in previous studies. The preenlistment experiences of Black and White women undoubtedly

differ, but at least for their time in the military, racial groups are constrained to be more similar than they would be as civilians: eligibility requirements for enlistment include a high school education or its equivalent; physical standards for initial enlistment prevent individuals with any significant chronic illness or disability from entering on active duty; all candi-

dates for active duty are tested for evidence of illicit drug use on induction into the military and periodically thereafter; and twice each year, individuals must successfully pass a physical fitness test that includes a test of aerobic capacity, flexibility, strength, and body fat content. These standards produce a relatively homogeneous active-duty population that is moderately well educated, physically fit, and essentially disease free. Medical care for preventive and therapeutic services is free of charge and readily available to active-duty personnel. Time for prenatal medical examinations is provided as part of normal working hours, and women are strongly encouraged to obtain early and consistent prenatal care. The selectivity of this population is evident in its lower rates of low birthweight risk (Blacks 6%, Whites 4%) and reduced racial differences in low birthweight risk compared with the general US population (Blacks 13%, Whites 6%).¹

It is possible that the similar rates of pregnancy-induced hypertension between the racial subgroups and the decreased risks of pre-eclampsia for multiparous Black women found in this study are due to unmeasured confounders. For example, smoking is a strong protective factor for pregnancy-induced hypertension that was not available for analysis and thus was not controlled. A similar study among pregnant women in the military found minimal differences in smoking rates between Blacks and Whites (18% vs

20% smokers) (unpublished data). An alternative explanation for the results found for multiparous women may be differences in the characteristics of Blacks and Whites who stay in the military after giving birth to their first child.

This study suggests that previously reported elevated risks of pregnancy-induced hypertension in Black as compared with White women may be partially explained by poor access to medical care or by a higher prevalence of chronic disease and generally poorer physical fitness. The apparent interaction between race and parity in the etiology of pre-eclampsia warrants further evaluation. Although the stringent selection criteria for entry into the military limits the generalizability of these results, active-duty military personnel serve as a useful population for examining the risks of adverse pregnancy outcome without the potential biasing effects of differential access to medical care. □

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References

1. *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*. Washington, DC: US Dept of Health and

Human Services; 1991. DHHS publication PHS 91-50212.

2. Eskenazi B, Fenster L, Sidney S. A multivariate analysis of risk factors for pre-eclampsia. *JAMA*. 1991;266:237-241.
3. Hendricks CH. Delivery patterns and reproductive efficiency among groups of differing socioeconomic status and ethnic origin. *Am J Obstet Gynecol*. 1967;97:608-624.
4. Hulsey TC, Levkoff AH, Alexander GR, Thomas M. Differences in Black and White infant birth weights: the role of maternal demographic factors and medical complications of pregnancy. *South Med J*. 1991;84:443-446.
5. Chesley LC. History and epidemiology of preeclampsia-eclampsia. *Clin Obstet Gynecol*. 1984;27:801-820.
6. Niswander KR, Gordon M. *The Collaborative Perinatal Study of the National Institute of Neurological Diseases and Stroke: The Women and Their Pregnancies*. Philadelphia, Pa: WB Saunders Co; 1972.
7. Savitz DA, Zhang J. Pregnancy-induced hypertension in North Carolina, 1988 and 1989. *Am J Public Health*. 1992;82:675-679.
8. Saftlas AF, Olson DR, Franks AL, Atrash HK, Pokras R. Epidemiology of pre-eclampsia and eclampsia in the United States, 1979-1986. *Am J Obstet Gynecol*. 1990;163:460-465.
9. *International Classification of Diseases*. 9th Revision, Clinical Modification. 3rd ed. Hyattsville, Md: National Center for Health Statistics; 1989. DHHS publication PHS 89-1260.
10. Kleinbaum DG, Kupper LL, Morgenstern H. *Epidemiologic Research Principles and Quantitative Methods*. New York, NY: Van Nostrand Reinhold Co; 1982:419-491.
11. Buck AS, Martin ED, Mazzuchi JF, Merry M, Mendez E. The Department of Defense Civilian External Peer Review Program: an interim report. *Milit Med*. 1992; 157:40-46.

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