Sex Differences in the Effect of Hypertension on Stroke Risk in the REasons for Geographic and Racial Differences in Stroke Study

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Disclosures

I have no disclosures.

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# Table 1

Sex Differences in Risk Factor Prevalence, Associations, and Treatment Disparities, Women Compared with Men

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Prevalence</th>
<th>Association with IS</th>
<th>Treatment Disparity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>Lower in women (vs. men) in younger age groups, higher in older age groups</td>
<td>Similar in women (vs. men) in younger age groups, higher in older age groups</td>
<td>In younger age groups, women more likely to have BP controlled; in older age groups, women less likely to have BP controlled.</td>
</tr>
<tr>
<td>Dyslipidemia</td>
<td>Data conflict; either similar between sexes or lower in women</td>
<td>Lower in women</td>
<td>Women less likely to be on statins and have LDL controlled.</td>
</tr>
<tr>
<td>Atrial Fibrillation</td>
<td>Higher in women</td>
<td>Higher in women</td>
<td>Women less likely to be prescribed oral anticoagulants, less likely to have cardiac ablation, and receive lower doses of NOACs.</td>
</tr>
<tr>
<td>Migraine</td>
<td>Higher in women</td>
<td>Higher in women</td>
<td>Unknown if migraine treatment reduces stroke risk.</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Similar women vs. men</td>
<td>Higher in women</td>
<td>Data conflict regarding sex differences in meeting HbA1c goal</td>
</tr>
<tr>
<td>Cognitive Impairment</td>
<td>Higher in women</td>
<td>Unknown whether there is a sex difference</td>
<td>Women less likely to be treated with anti-dementia drugs</td>
</tr>
</tbody>
</table>

Sex and Gender Differences

Prevalence
Association with Stroke Risk
Treatment/ Control

Age
Race
Ethnicity

Sex-specific Treatment goals?
Objective

• We sought to determine if there are sex differences in the association of severity of hypertension (HTN) or treatment of HTN with the risk of ischemic stroke.
Methods

- We used data from the REGARDS study, a national longitudinal cohort of 30,239 adults at least 45 years old, recruited between 2003 and 2007.
Methods

• Only participants free of stroke at baseline were included

• Baseline data were collected using a combination of computer assisted telephone interview (age, race, anti-hypertensive medications) and in-home measurements (systolic blood pressure)

• Physician-adjudicated ischemic stroke events ascertained at 6-month intervals
Methods

• Proportional hazards regression used to assess sex-specific association of SBP and the number of anti-hypertensives with ischemic stroke

• Hypertension analyzed as both categorical (Pre-HTN, Stage 1 HTN, Stage 2 HTN) and continuous

• Analyses conducted in full sample, then stratified by race
Results

• 1084 ischemic stroke events among 26,461 participants
• Average follow-up 8.7 years
• 55.4% women, 40.2% black
Sex-specific Associations Between Systolic Blood Pressure and Ischemic Stroke

Increased risk per level of HTN:
Women: 1.32, 95% CI 1.19 - 1.46
Men: 1.16, 95% CI 1.04 - 1.29

Increased risk per 10 mm Hg increase in SBP:
Women: 1.15 95% CI 1.10 - 1.20
Men: 1.08 95% CI 1.03 - 1.14

P=0.087

*Adjusted for age, race, age-by-race product term, anti-hypertensives
Sex-specific Associations Between Systolic Blood Pressure and Ischemic Stroke, White Participants

Increased risk per level of HTN:
Women: 1.32, 95% CI 1.14 - 1.52
Men: 1.12, 95% CI 0.99 - 1.28

Increased risk per 10 mm Hg increase in SBP:
Women: 1.14 95% CI 1.07 - 1.22
Men: 1.06 95% CI 0.99 - 1.13

P=0.093
Sex-specific Associations Between Systolic Blood Pressure and Ischemic Stroke, Black Participants

Increased risk per level of HTN:
Women: 1.31, 95% CI 1.14 - 1.50
Men: 1.24, 95% CI 1.04 - 1.48

Increased risk per 10 mm Hg increase in SBP:
Women: 1.15, 95% CI 1.04 - 1.24
Men: 1.13, 95% CI 1.04 - 1.24

P=0.79
Association Between Anti-hypertensive Medications and Incident Ischemic Stroke

![Graph showing the association between the number of classes of anti-hypertensive medications and hazard ratio for incident ischemic stroke. The graph plots hazard ratio against the number of classes of medications. At 1 class, the hazard ratio is 1.31; at 2 classes, it is 1.48; and at 3 classes, it is 1.89.]}
Discussion

• The risk of ischemic stroke with increasing severity of hypertension appears to be about twice as great in women compared with men
• Though medication use is an important additional risk factor, it does not explain the sex differences in risk associated with HTN severity
• Sex differences are more apparent among white participants than black participants
Future Directions

• Confirm whether there are similar sex differences in the association between ischemic stroke and hypertension using new ACC/AHA guidelines

• Further investigations on the biological mechanisms for sex differences in HTN
  – Closer investigation of age, hormones

• Are sex-specific clinical guidelines for HTN warranted?
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• Karen L. Furie, MD, MPH
• Simin Liu, MD, ScD
• Suzanne Oparil, MD
• Virginia Howard, PhD
THANK YOU
Comparison to Previous Data

<table>
<thead>
<tr>
<th>Study Description</th>
<th>Authors</th>
<th>Finding</th>
</tr>
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<tbody>
<tr>
<td>1) Meta-analysis</td>
<td>Peters et al., Stroke, 2013</td>
<td>Similar impact of hypertension on stroke risk in women and men</td>
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<tr>
<td>2) Data analysis from CALIBER (electronic health record dataset from UK)</td>
<td>Rapsomaniki et al., Lancet 2014</td>
<td>Similar impact of hypertension on stroke risk in women and men</td>
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