Kidney Disease and Race in America

Provost’s Symposium on the Social Determinants of Health

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May 8, 2012
OUTLINE

• Background
  – Why kidney disease?
  – Why social determinants?
• What is end-stage renal disease (ESRD)?
• Trends in kidney disease in the population
• Pathways mediating the relationship between race and kidney disease
• Summary

**Men**
- Systolic blood pressure
- Diastolic blood pressure

**Women**
- Systolic blood pressure
- Diastolic blood pressure

- Non-Hispanic black
- Non-Hispanic white
- Mexican American
MEAN DIASTOLIC BLOOD PRESSURE BY SKIN COLOR AND LEVEL OF EDUCATION IN 457 U.S. BLACK MEN AND WOMEN

Klag et al, JAMA, 1991
END-STAGE RENAL DISEASE (ESRD)

• Loss of kidney function below the level required to sustain life
• Most common “causes” are diabetes mellitus and high blood pressure (hypertension)
• 88% patients treated with hemodialysis
INCIDENCE AND PREVALENCE OF TREATED ESRD, U.S., 1974-1983

Rate/Million Persons

Calendar Year


Incidence:
- 1974: 16
- 1975: 23
- 1976: 29
- 1977: 35
- 1978: 43
- 1979: 51
- 1980: 57
- 1981: 64
- 1982: 71
- 1983: 78

Prevalence:
- 1974: (16)
- 1975: (23)
- 1976: (29)
- 1977: (35)
- 1978: (43)
- 1979: (51)
- 1980: (57)
- 1981: (64)
- 1982: (71)
- 1983: (78)

Whelton and Klag, *Hypertension* 1989
ADJUSTED ALL-CAUSE MORTALITY RATES (FROM DAY 90), BY MODALITY & YEAR OF TREATMENT

INCIDENCE OF TREATED ESRD IN SOUTH-CENTRAL LOS ANGELES, BY RACE, 1980-85

POSSIBLE PATHWAYS BETWEEN RACE AND RISK OF KIDNEY DISEASE

Minority Race

Low Socioeconomic Status

Genetic Tendency to Renal Disease, Behaviors

Exposure to Heavy Metals, Solvents, Viruses, Drugs, etc.

Uncontrolled Diabetes and Hypertension, Urinary Tract Infections, etc.

End-Stage Renal Disease

Perneger, Whelton, Klag Arch Int Med 1995
ODDS RATIO OF ESRD ASSOCIATED WITH INCOME IN 716 ESRD CASES AND 361 CONTROLS IN MD, VA, WV AND DC, 1991

<table>
<thead>
<tr>
<th>Annual Household Income, $</th>
<th>Overall</th>
<th>White</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10K</td>
<td>7.7</td>
<td>5.1</td>
<td>4.3</td>
</tr>
<tr>
<td>10K - &lt;20K</td>
<td>4.5</td>
<td>3.5</td>
<td>3.7</td>
</tr>
<tr>
<td>20K - &lt;40K</td>
<td>1.7</td>
<td>1.4</td>
<td>2.3</td>
</tr>
<tr>
<td>40K+</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Perneger, Whelton, Klag Arch Int Med 1995
ADJUSTED+ ODDS RATIO OF ESRD ASSOCIATED WITH MISSING TEETH IN 716 ESRD CASES AND 361 CONTROLS IN MD, VA, WV AND DC, 1991

<table>
<thead>
<tr>
<th>Number of Missing Teeth</th>
<th>Overall</th>
<th>White</th>
<th>Black</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1.5</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>1-16</td>
<td>2.0</td>
<td>1.6</td>
<td>3.0</td>
</tr>
<tr>
<td>17-31</td>
<td>2.8</td>
<td>1.6</td>
<td>3.3</td>
</tr>
<tr>
<td>All</td>
<td>8.1</td>
<td>3.3</td>
<td>1.6</td>
</tr>
</tbody>
</table>

+Adjusted for race, income, health insurance status
ODDS RATIO OF ESRD ASSOCIATED WITH RACE IN 716 ESRD CASES AND 361 CONTROLS IN MD, VA, WV AND DC, 1991

Perneger, Whelton, Klag  *Arch Intern Med*, 1995
INCIDENCE OF ALL-CAUSE ESRD IN 322,000 MRFIT MEN

Klag et al, NEJM, 1991
AGE-ADJUSTED INCIDENCE OF ALL-CAUSE ESRD IN 322,000 MEN OVER 16 YEARS OF FOLLOW UP, BY RACE, MRFIT

Klag et al, JAMA, 1997
RELATIVE RISK OF ESRD IN AFRICAN-AMERICAN COMPARED WITH WHITE MEN OVER 16 YEARS OF FOLLOW UP, MRFIT

<table>
<thead>
<tr>
<th>Adjusted for:</th>
<th>All-Cause ESRD (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age only</td>
<td>3.20 (2.62-3.91)</td>
</tr>
<tr>
<td>Age, systolic blood pressure</td>
<td>2.56 (2.09-3.13)</td>
</tr>
<tr>
<td>Age, serum cholesterol</td>
<td>3.25 (2.66-3.98)</td>
</tr>
<tr>
<td>Age, cigarettes/d</td>
<td>3.26 (2.67-3.98)</td>
</tr>
<tr>
<td>Age, median income</td>
<td>2.32 (1.82-2.95)</td>
</tr>
<tr>
<td>Age, diabetes</td>
<td>2.73 (2.23-3.34)</td>
</tr>
<tr>
<td>Age, previous MI</td>
<td>3.20 (2.62-3.91)</td>
</tr>
<tr>
<td>All of the above</td>
<td>1.87 (1.47-2.39)</td>
</tr>
</tbody>
</table>
RELATIVE RISK OF ESRD INCIDENCE: LOWEST VS. HIGHEST QUARTILE OF SOCIOECONOMIC STATUS

Ward, AJKD, 2008

Note: Figure for lupus nephritis for Asian/Pacific Islander men because of small number of these patients.
Family Investigation of Nephropathy and Diabetes
A genome-wide admixture scan identifies a locus associated with non-diabetic hypertriglyceridemia in African Americans

WH Linda Kao, MHS, PhD\(^1,2,5\), Michael J. David Reich, PhD\(^6,7\), Yvette Berthier-Schaar, PhD\(^1,2,3,5\), Nick Patterson, PhD\(^7\), Arti Tanwani, MPH\(^1,2,5\), John H. Sadler, MD\(^8\), Matthew R. MD\(^10\), Jasmin Divers, PhD\(^11\), Sudha K Iyer, MD\(^13\), William C. Knowler, MD, DrPH\(^12\), David J. Leehey, MD\(^16\), Susanne Nicole R Schelling, MD\(^19\), John R. Sedor, MD\(^11,15\), Winkler, Ph.D\(^22\), Michael W. Smith, Ph.D\(^2\) on behalf of the Family Investigation of New Evident Risk Factors for Diabetes (FINE) Study Group.
SUMMARY

- African-Americans have a much higher risk of kidney disease than whites
- Lower income in African-Americans is a major contributor to the higher risk
  - Higher blood pressure and higher prevalence of diabetes also contribute but do not explain the majority of risk
- Low socioeconomic status has a much stronger influence on risk of kidney disease due to diabetes (i.e., preventable) than kidney disease with a strong genetic component
- A locus on chromosome 22, perhaps MYH9, explains 60% of the excess risk of nondiabetic kidney disease in African-Americans compared to whites
  - Gene X environment interactions important
THANK YOU!