Global Epidemiology of Human Rabies: Systematic Review and Meta-Analysis

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BACKGROUND & OBJECTIVES

• Rabies is a neglected tropical disease, where virtually all cases result in death
• Human rabies is estimated to cause about 55,000 deaths (90% CI, 24,000–93,000) worldwide per year, mostly through bites from dogs in Africa and Asia1,2
• In Europe and the Americas, human rabies due to dog bites has declined and now persists mostly via other wildlife, notably bats and foxes3,4
• To date, estimates of global burden have been indirect, using probability decision-tree approaches3,4

Study objectives

To synthesize surveillance data and published literature to:

1. Estimate burden of human rabies worldwide
2. Describe epidemiological trends by region

METHODS

Data collection

• Medline and Embase searched in November 2014; and titles, abstracts, and full-text articles subsequently screened by two reviewers using a priori criteria to select papers on human rabies
• Surveillance systems identified through review process and data extracted and collated

Data analysis

• For countries with robust surveillance, data analyzed to estimate annual incidence per country
• For countries without robust surveillance, study incidence estimates (with calculated exact Poisson 95% confidence intervals) summarized by random-effects meta-analysis
• Epidemiological trends by region described in terms of person, place, and time

RESULTS

Summary of data collection

• Of 1,737 titles reviewed, 263 full-text articles were reviewed, of which 108 were included
• Data from 32 papers were analyzed by random-effects meta-analysis
• Data from the following surveillance systems were extracted, collated, and analyzed:
  • WHO Rabies Bulletin Europe (FL)
  • SIRVERA (Pan American Health Organization)
  • Handistatus II (OEIC)
  • WAHID (OIE)
  • South East Africa Rabies Group (WHO)
  • China Centers for Disease Control
  • Thailand Ministry of Public Health

RESULTS (CONT’D)

Regional estimates for 2013:

• Latin America: 11 cases
• Caribbean: 2 cases
• North America: 0 cases
• Europe: 10 cases
• China: 1,172 cases
• Thailand: 7 cases

Meta-analysis for annual incidence rates in areas without robust surveillance

<table>
<thead>
<tr>
<th>Region</th>
<th>No. studies</th>
<th>Rate (95% CI)</th>
<th>P (Cochran’s Q)</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Asia</td>
<td>11</td>
<td>9.2 (4.7–18.1)</td>
<td>99% (p&lt;0.001)</td>
</tr>
<tr>
<td>Sub-Saharan Asia</td>
<td>12</td>
<td>1.4 (0.5–4.0)</td>
<td>99% (p&lt;0.001)</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>2</td>
<td>1.8 (1.1–2.9)</td>
<td>99% (p&lt;0.001)</td>
</tr>
<tr>
<td>Central Asia and Middle East</td>
<td>7</td>
<td>0.2 (0.1–0.5)</td>
<td>98% (p&lt;0.001)</td>
</tr>
</tbody>
</table>

Estimated annual incidence of human rabies in select countries with endemic canine rabies

CONCLUSIONS & NEXT STEPS

• South Asia and Sub-Saharan Africa continue to be the areas of highest incidence for human rabies
• Declines in reported incidence in China and Latin America highlight importance of dog vaccination campaigns for eliminating the continuing burden of human rabies
• Lack of resources, access, and education as well as inadequate surveillance systems continue to hinder elimination of rabies in many developing countries
• Next steps: investigate heterogeneity using meta-regression; collect more data from countries with robust surveillance to estimate global incidence

REFERENCES & ACKNOWLEDGEMENTS


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