

Burden of community acquired and nosocomial rotavirus gastroenteritis in the pediatric population of Western Europe

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Introduction

- Rotavirus affects 95% of all children worldwide by the age of 5 years, and is the leading cause of severe dehydrating diarrhea in that age group.^{1,2} It is estimated that 3.6 million episodes of rotavirus gastroenteritis (RVGE) occur annually, among the 23.6 million children under 5 years of age in the European Union (EU).³
- Within the EU, RVGE is estimated to occur at a rate of 1 symptomatic infection in every 7 children each year, accounting for 231 deaths, more than 87,000 hospitalizations, and almost 700,000 outpatient visits.³
- The most common causes of RVGE in humans are rotavirus carrying either G1, G2, G3, G4, or G9 genotypes combined with P[4] or P[8] genotypes, with G12 being an emergent genotype.

Objective

- To estimate the burden of both nosocomial and community-acquired RVGE in the Western European pediatric population.

Methods

- A systematic literature search was conducted for studies pertaining to the burden of rotavirus infection on the pediatric population in Western Europe (< 5 years, unless otherwise specified).
- The searches were carried out in the National Library of Medicine's Pubmed, the Center for Disease Control (CDC) rotavirus global surveillance, and the World Health Organization (WHO) for articles published between 1st January 1999 and 1st May 2010.
- Search terms used for this systematic review included: rotavirus, outcome, mortality, death, incidence, prevalence, nosocomial, home care, serotype, strain, cost, economic, burden, and resource use.
- Figures are reported as originally described in the source articles, except when several studies were published for a single country. In this case, a pooled average of the proportion of RVGE among cases of acute gastroenteritis was calculated and reported.
- Distribution of genotype combinations is based on the most recently available studies from each country.
- Costs are reported in 2009 US dollars (1 \$US equals 0.721189 € [1st Jan 2009]).⁴

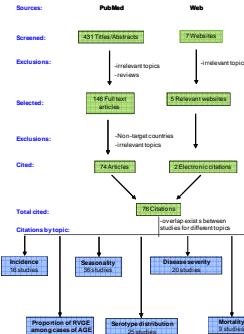
Acknowledgments

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Results

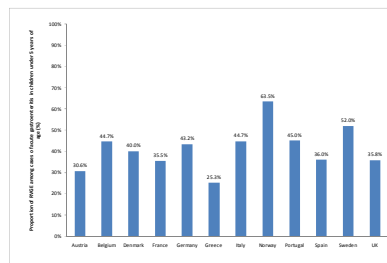
1. Studies included

- 76 studies were identified that contained relevant RVGE data.

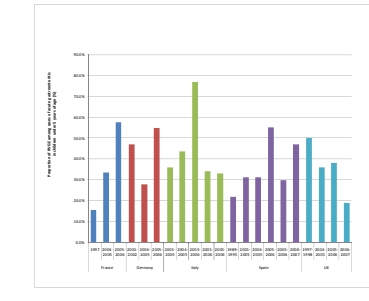


2. RVGE prevalence and seasonality

- The annual incidence of community-acquired RVGE among children under 5 years of age was reported in 7 countries, 5-9 and ranged from 2 cases per 100 person-years (in Austria) to 5 cases per 100 person-years (in France).⁵⁻⁹
- The incidence of nosocomial infection with RVGE for the hospitalized pediatric population (0-69 per 100 person-years in hospital) was higher than the incidence reported in community based studies.¹⁰
- The proportion of RVGE patients receiving no medical care ranged from 25% to 51% of patients.^{3,11,12}
- Rotavirus infection was responsible for 26% (in Greece) to 64% (in Norway) of all community-acquired gastroenteritis cases.
- Nosocomial rotavirus infections accounted for between 47% and 69% of all hospital-acquired acute gastroenteritis among hospitalized children in Austria, Germany, Spain and Switzerland.^{5,13}

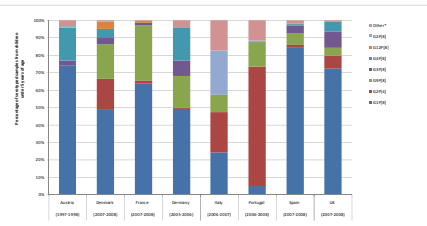


- Peak RVGE season for both community-acquired and nosocomial infections was in the winter (December to April/May).^{5,10,13-23} A slightly later rotavirus season was noted in Ireland (February to June), Greece (January to April), and Denmark (January to June).¹⁴⁻¹⁶ Over time, the proportion of RVGE among acute gastroenteritis cases increased in France (1997 to 2005-2006),^{10,24,25} Italy (2001 to 2006),^{10,26,27} and 2003 to 2006²⁸, and Spain (1989-1995²⁹ to 2005-2006³⁰), and decreased in the UK (1997-1998 and 2006-2007).^{10,24,31-33}
- No studies examined changes in nosocomial rotavirus infection rates over time.



3. Rotavirus genotype combinations

- Most commonly isolated genotype combinations in the Western European region were G1P[8], G2P[4], and G9P[8].^{5,10,34,35,36,36}
- G2P[8],^{5,34,36} G3P[8],^{5,10,34-36} G4P[8], and G12P[8]^{5,10,34-36} were also frequently detected in many countries.
- The new G9 rotavirus serotype emerged in Western Europe in 1999-2000,41 so did G1P[4], G3P[4], and 2 new G5 strains.⁴⁰



- The distribution of rotavirus genotype combinations among patients with nosocomial RVGE was very similar to the distribution among patients with community acquired disease.^{5,10,13,37}
- Serotype distribution over time (data available for 5 countries) appeared to change on a season to season basis within each country, and even from region to region within the same country.^{10,13,26,35,36,38-40,31,32}
- No studies examined the distribution of genotype combinations among patients with nosocomial RVGE over time.

4. Morbidity and mortality associated with RVGE

- 29% and 55% of children presenting to hospitals had severe acute community-acquired RVGE (Vesikari score > 11);^{5,10} this proportion varied between 25% and 43% for patients with nosocomial infections.^{5,10}
- Compared to non-RVGE, rotavirus disease reported significantly higher Vesikari scores, indicative of higher disease severity (Austria⁴²: 11 vs 7 non-RVGE, P < .001; France⁴³: 12 vs 7 non-RVGE, P < .0001).
- The proportion of children with dehydration due to acute RVGE varied between 12% and 72% and, in most countries, was considerably higher than for those with non-RVGE.²⁴
- Rotavirus fatalities were rare, with less than 10 deaths per year in most countries.⁴⁴

5. Resource use and costs associated with RVGE

- Among children presenting at primary care, 13% to 58% were referred to a hospital, and 7% to 46% were referred to emergency.²⁴
- Overall, the duration of hospital stay ranged from 2.5 to 5.0 days for patients with community-acquired RVGE; nosocomial RVGE infection prolonged hospital stay by 4.4 days.⁴⁵
- Direct medical costs due to RVGE ranged from \$543,775 to \$53.6 million. Per patient, direct costs were \$1,942-\$2,389 in the hospital setting,⁴⁵ and \$10-\$27 in the home care setting.^{12,47,48,49}
- Indirect costs incurred an additional \$1.7 million to \$22.4 million, annually.^{23,46,47} Per patient, indirect costs were \$260-\$1061 in the hospital setting,⁴⁵ and \$194-\$623 for the primary care setting.⁴⁵
- Parents reported a loss of 3-7 work days per hospitalization episode (hospital setting), and 4-8 work days in a primary care setting.⁴⁵

Conclusions

- RVGE is a common disease in Western Europe affecting the pediatric population.
- While 95% of RVGE cases were due to the main 5 genotypes, analysis of the evolution of different serotypes indicates variation over time and across countries.
- A vaccine with broad and consistent serotype coverage would represent an important avenue to help decrease the burden of RVGE in Western Europe.
- Data comparability across countries was restricted due to limited availability of recent serotype information in some countries, variations in study settings and design, and the lack of available information on the burden of RVGE in terms of mortality, nosocomial diseases and home care.

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