



Rotavirus disease burden, Nicaragua 2001–2005: defining the potential impact of a rotavirus vaccination program[☆]

Juan José Amador^a, Joshua Vasquez^b, Maribel Orozco^c, Cristina Pedreira^d, Omar Malespin^c, Lucia Helena De Oliveira^e, Jacqueline Tate^b, Umesh Parashar^b, Manish Patel^{b,*}

^a Program for Appropriate Technology in Health, Managua, Nicaragua

^b Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, GA 30333, USA

^c Ministerio de Salud, Managua, Nicaragua

^d PanAmerican Health Organization, Managua, Nicaragua

^e PanAmerican Health Organization, Washington DC, USA

ARTICLE INFO

Article history:

Received 28 May 2009

Received in revised form 7 August 2009

Accepted 17 August 2009

Corresponding Editor: Jane Zuckerman, London, UK

Keywords:

Rotavirus

Diarrhea

Viral gastroenteritis

Vaccine

Disease burden

SUMMARY

Background: In October 2006, a rotavirus vaccine was introduced in Nicaragua for routine immunization of all children. We document the baseline diarrheal disease burden in Nicaragua prior to the vaccine program to facilitate future studies to measure vaccine impact.

Methods: We analyzed national data for 2001–2005 on total acute gastroenteritis healthcare visits, hospitalizations, and mortality in Nicaraguan children aged <5 years.

Results: Prior to vaccine introduction, by age 5 years, one in four Nicaraguan children required an outpatient consultation, one in 34 were hospitalized, and one in 2487 died from rotavirus-associated diarrhea, representing approximately 41 122 outpatient visits, 4460 hospitalizations, and 60 deaths per year that are preventable through vaccination. Almost half of the total acute gastroenteritis burden was in children <1 year of age. Two distinct seasonal peaks were noted in acute gastroenteritis hospitalizations and deaths.

Conclusions: Existing data sources on all-cause acute gastroenteritis could be useful for establishing diarrhea disease burden and monitoring trends after vaccine introduction. Blunting of winter season peaks in rates of diarrhea, particularly among children aged <1–2 years, would be a useful indicator of impact from rotavirus vaccination.

Published by Elsevier Ltd on behalf of International Society for Infectious Diseases.

1. Introduction

Rotavirus, the most common cause of severe gastroenteritis in children aged <5 years worldwide, accounts for an estimated 2.4 million hospital admissions and 527 000 deaths each year.^{1,2} The tremendous global burden of rotavirus has prompted the prioritization of vaccine development and introduction by several international agencies, including the World Health Organization (WHO) and the Global Alliance for Vaccines and Immunizations (GAVI).³ Two new rotavirus vaccines with good efficacy against severe rotavirus disease – RotaTeq[®] (Merck Vaccines, Whitehouse Station, NJ, USA) and Rotarix[®] (GlaxoSmithKline Biologicals,

Rixensart, Belgium) – have recently been licensed for use in many countries.^{4,5} Low and middle income countries in the Latin American region have been among the first to add new rotavirus vaccines to the routine childhood immunization schedule. As such, monitoring the trends of diarrheal disease before and after vaccine introduction in these regions will be crucial to assess impact and gather the necessary data for decision-makers to use in evaluating and sustaining a vaccination program.

In October 2006, a rotavirus vaccine (RotaTeq) was added to the national vaccination schedule in Nicaragua, after a large nationwide outbreak of rotavirus diarrhea in 2005 led to an unexpected increase in diarrhea mortality, hospitalizations, and outpatient visits and garnered substantial attention from decision-makers and public health authorities in Nicaragua.^{6,7} In response to the recent rotavirus vaccine introductions in many countries worldwide, the WHO has published a generic protocol outlining approaches to monitoring the impact of rotavirus vaccination on disease burden.⁸ Vaccine introduction in Nicaragua provided us an early opportunity to field-test one aspect of this protocol –

[☆] The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention (CDC).

* Corresponding author. Tel.: +1 404 639 2343; fax: +1 404 639 3607.
E-mail address: Aul3@CDC.GOV (M. Patel).

assessing vaccine impact by monitoring trends in diarrhea disease burden. As a first step in preparing to monitor trends of acute gastroenteritis in Nicaragua, we examined national data for acute gastroenteritis hospitalizations and outpatient visits among children aged <5 years to establish baseline incidence of disease prior to vaccine introduction, against which acute gastroenteritis trends can be compared as the vaccine program matures.

2. Methods

Nicaragua is a low income country in Central America with a gross national income of 980 US dollars per capita and an annual birth cohort of approximately 150 000 and an infant mortality rate of 21.5 per 1000 live births.⁹ In Nicaragua, 21.0% of the population lives without access to an improved water source and 10.0% of the children aged <5 years are considered underweight for age.⁹ A majority (85.0%) of the population utilize healthcare facilities operated by the Ministry of Health, which includes 1059 healthcare facilities, including 32 hospitals providing inpatient services to the population, and 172 health centers and 855 health posts that provide primary care services. On a weekly basis, each of the public health centers and hospitals organized into local health units, report to the Ministry the number of outpatient visits, hospitalizations, and deaths due to diarrhea. At the Ministry, the data are compiled in an electronic database. To estimate the national burden of diarrheal disease leading to outpatient visits, hospitalization, and death in children <5 years old, we reviewed the Ministry of Health’s computerized records on total country-wide reports of acute gastroenteritis from January 2001 to December 2005. Limited data exist in Nicaragua on the proportion of severe diarrhea cases attributable to rotavirus disease. Therefore, we utilized surveillance data from neighboring Honduras^{10,11} and El Salvador^{12,13} and a review of rotavirus disease burden in Latin America¹⁴ to estimate the proportion of all-cause acute gastroenteritis among children <5 years of age attributable to rotavirus. In the review of studies from Latin America,¹⁴ some

studies included children <3 and others <5 years of age, however, the authors did not find a difference in detection rates between the two age groups. In El Salvador and Honduras, active surveillance indicates rotavirus detection rates of approximately 43% (range in Latin America:¹⁴ 16–52%) in the hospital setting, approximately 30% (range 18–42%) in the outpatient setting, and approximately 70% in any setting during the rotavirus season (typically weeks 1–20). To estimate the annual rotavirus disease burden, we multiplied the annual number of acute gastroenteritis visits among children aged <5 years by setting with these rotavirus detection rates of 43% (hospitalized children) and 30% (outpatient visits). Subsequently, we calculated the cumulative risk that a child would experience these events (outpatient visit, hospitalization, or death) before reaching the age of 5 years. Cumulative risks were expressed as the inverse of the annual birth cohort ($n \approx 150\ 000$) divided by the respective median number of events among children <5 years of age from 2001 through 2005. Finally, to illustrate temporal and seasonal trends in diarrheal visits, we plotted the 2001–2005 weekly mean of total gastroenteritis for children <5 years of age. Data for the year 2006 were not available because of a nationwide healthcare worker strike during the first six months of the year.

3. Results

Among children <5 years old, the Ministry computerized records for public health facilities identified an annual median of 137 074 non-hospital consultations (range 129 418–147 878), 10 373 hospitalizations (range 8623–13 083), and 140 in-hospital deaths (range 78–178) for diarrhea (Figure 1). Thus, prior to rotavirus vaccine introduction in Nicaragua, by age 5 every child required an outpatient consultation, one in 14 were hospitalized, and one in 1069 died as a result of diarrhea.

In neighboring countries, active surveillance indicates rotavirus detection rates of approximately 43% in the hospitalized setting and approximately 30% in the outpatient setting.^{6,10,11,13,14}

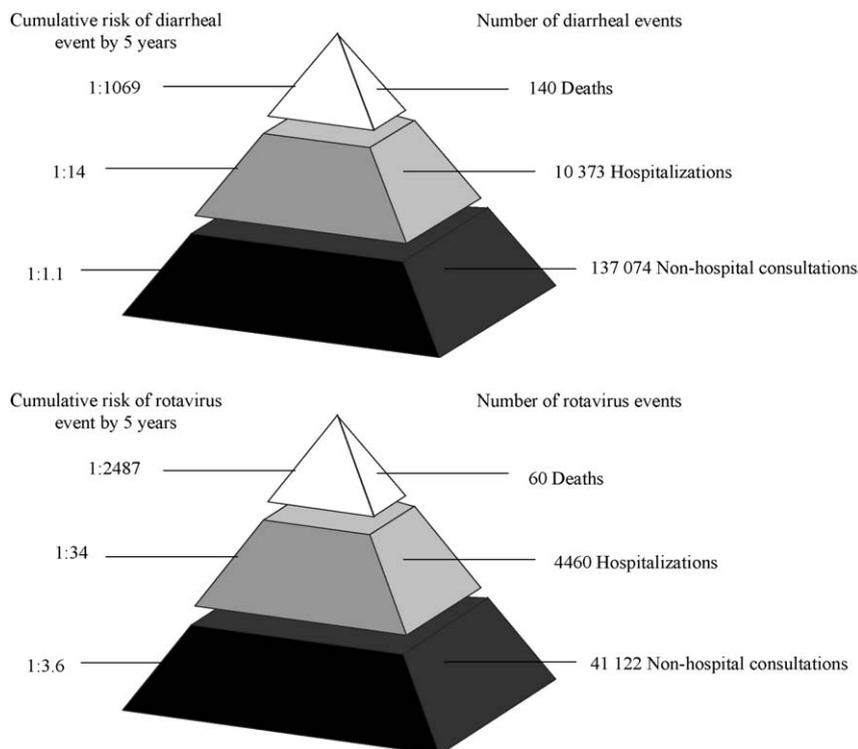


Figure 1. Cumulative risk of diarrheal- and rotavirus-associated events for all children aged <5 years–Nicaragua, 2001–2005^a.

Download English Version:

<https://daneshyari.com/en/article/3363417>

Download Persian Version:

<https://daneshyari.com/article/3363417>

[Daneshyari.com](https://daneshyari.com)