Characteristics of hospitalizations attributed to herpetic gingivostomatitis: analysis of nationwide inpatient sample

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Objective. Herpetic gingivostomatitis (HGS) is a prevalent oral condition of viral origin. Some patients with HGS visit emergency departments for treatment. This study is aimed at determining the nationwide estimates of hospitalizations due to HGS in the United States.

Study Design. The Nationwide Inpatient Sample of the Agency for Healthcare Research and Quality was used for the years 2004 to 2010. Hospital admissions with a primary diagnosis of HGS were identified using International Classification of Diseases (ICD)-9-CM code 054.2.

Results. During the study period, a total of 12 536 hospitalizations were attributed to HGS, and the number of hospitalizations per year (mean, 1791) remained fairly constant during the years examined. The median age was 3.2 years. The mean age (15.6 years for the overall period) ranged from a low of 15.2 in 2010 to a high of 16.8 in 2007. The total charges that resulted from these hospitalizations were $229.4 million.

Conclusions. This study further confirms that substantial resources are spent in treating oral conditions in hospital settings.
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The prevalence of orofacial infections caused by herpes simplex virus (HSV) in humans is widespread throughout the world.[1,2] Oral, facial, and ocular infections are caused by HSV type 1, whereas HSV type 2 typically causes genital lesions but is also implicated in some cases of oral infections.[3] The primary form of HSV-1 oral infection is herpetic gingivostomatitis (HGS), which usually affects patients aged 6 months to 5 years or patients in their early twenties.[4] Patients with HGS usually present with pain, fever, lymphadenopathy, malaise, irritability, and headache. HSV-1 has also been implicated in viral encephalitis, lymphadenitis, and severe ocular lesions.[5] Only a small percentage (about 1%) of patients with HGS exhibit clinical manifestations, despite widespread exposure to this viral agent.[6]

Several studies in the past have investigated the seroprevalence of HSV-1 in various populations, but to our knowledge, little is known about the prevalence of hospitalizations of patients diagnosed primarily with HGS.[7] In our previous study, using the Nationwide Emergency Department Sample (NEDS), which is one of the databases of the Healthcare Cost and Utilization Project (HCUP) sponsored by the Agency for Healthcare Research and Quality (AHRQ), we identified that close to 23 124 emergency department (ED) visits were attributed to HGS in 2007.[8] Of these visits, close to 69.5% occurred in those aged 19 years or younger, and female patients accounted for 55.7% of all ED visits.[8] In line with our previous investigation, the objectives of this assessment are 2-fold: (1) to provide nationwide estimates of hospitalizations in the United States due to HGS using the Nationwide Inpatient Sample (NIS) (another HCUP-AHRQ database)[9] for the years 2004 to 2010 and (2) to examine the sociodemographic characteristics and hospital-related outcomes associated with these hospitalizations.

MATERIALS AND METHODS

Database

The NIS for 2004 to 2010 was used for the present study. The NIS is a 20% stratified probability sample of all acute-care hospitals in the United States. The sample is drawn based on stratification factors including hospital size (by bed count), location, region, ownership, and teaching status.[9] Each hospital selected into the sample provides information on all hospitalizations occurring in the selected years. Each hospitalization in the NIS database is assigned a sampling weight, which can be used to project all estimates and outcomes to

Statement of Clinical Relevance

This study found that a substantial number of patients with herpetic gingivostomatitis are hospitalized in the United States each year, and it identified high-risk cohorts who are likely to be hospitalized.

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nationally representative levels of all hospitalizations occurring in the United States annually. The NIS databases are publically available for purchase from HCUP-AHRQ.

Institutional review board approval

One of the authors completed the data user agreement with HCUP-AHRQ and obtained the NIS databases. According to the data user agreement, individual cell counts ≤10 cannot be presented to preclude us from identifying patients uniquely. In accordance with this data user agreement, such low cell counts are not presented in the present study. The present study was exempt from institutional review board approval.

Selection of hospitalizations and outcomes

The NIS database has 25 diagnoses fields (15 from years 2004 to 2008 and 25 from 2009 onward). According to the NIS database documentation, the primary diagnosis field presents information on the reason for hospitalization. For the present study, all hospitalizations with a primary diagnosis of HGS were selected for analysis. Selection was based on International Classification of Diseases (ICD)-9-CM code 054.2. The patient-related characteristics that were examined included age distribution, sex, race, disposition status, comorbid burden (as estimated from the secondary diagnoses fields using the NIS severity index files),[9] insurance status, hospitalization charges, length of stay, and hospital characteristics (including hospital size [by bed count], geographic region, and teaching status). For age distribution, the American Academy of Pediatrics guidelines were used to stratify those aged ≤21 years into groups including infants (<1 year), toddlers (1 to 3 years), preschool (4 to 5 years), school age (6 to 10 years), early adolescents (11 to 14 years), middle adolescents (15 to 17 years), and late adolescents (18 to 21 years). For those aged >21 years, the age was grouped as 22 to 30 years, 31 to 40 years, 41 to 50 years, and >50 years. Costs were reported in US dollars, and all hospitalization charges were inflation-adjusted to 2010 dollars using the Bureau of Labor Statistics hospital inpatient care inflation rates.

Each individual hospitalization was the unit of analysis. For projecting all estimates to nationally representative levels, the discharge weight variable assigned to each hospitalization was used. The complex stratification sample design was accounted for, and the NIS stratum variable was used as the stratification unit. SAS version 9.3 (SAS Institute Inc, Cary, NC, USA) was used to provide descriptive statistics.

Table I. Characteristics of hospitalizations due to herpetic gingivostomatitis (2004 to 2010)

Characteristic	*Response*	*N (%)*
Year of hospitalization	2004	1933 (15.4)
	2005	1847 (14.7)
	2006	1677 (13.4)
	2007	1629 (13)
	2008	1952 (15.6)
	2009	1647 (13.1)
	2010	1851 (14.8)
Sex	Male	5767 (46.4)
	Female	6651 (53.6)
Primary payer	Medicare	1105 (8.8)
	Medicaid	5645 (45.1)
	Private insurance	4691 (37.5)
	Uninsured	727 (5.8)
	Other insurance plans	342 (2.7)
Race	White	4949 (51)
	Black	1316 (13.6)
	Hispanic	2522 (26)
	Asian/Pacific Islander	371 (3.8)
	Native Americans	32 (0.3)
	Other races	514 (5.3)
Type of admission	Emergency/urgent	10661 (85.4)
	Elective	1823 (14.6)
Age distribution	<1 year (infants)	2699 (21.6)
	1 to 3 years (toddlers)	3484 (27.9)
	4 to 5 years (preschool)	647 (5.2)
	6 to 10 years (school age)	1276 (10.3)
	11 to 14 years (early adolescents)	490 (3.9)
	15 to 17 years (middle adolescents)	550 (4.4)
	18 to 21 years (late adolescents)	489 (3.9)
	22 to 30 years	578 (4.6)
	31 to 40 years	428 (3.4)
	41 to 50 years	390 (3.1)
	>50 years	1451 (11.6)
Age (y)	Mean	15.6
	Standard error	0.62

Individual cell counts will not add up to the global totals because of missing values.

RESULTS

During the study period (2004 to 2010), a total of 12 536 hospitalizations were primarily due to HGS. The number of hospitalizations occurring each year was consistent, ranging from a low of 1629 in 2006 to a high of 1952 in 2007. The characteristics of hospitalizations are summarized in Table I. The mean age was 15.6 years (median, 3.2 years). The mean age ranged from a low of 15.2 in 2010 to a high of 16.8 in 2007. Infants (aged <1 year) and toddlers (aged 1 to 3 years) accounted for 21.6% and 27.9% of all hospitalizations, respectively. Female patients comprised 53.6% of all hospitalizations. The primary payers included Medicare (8.8%), Medicaid (45.1%), private insurance plans (37.5%), and other insurance plans (2.7%). A total of