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ISDS 2016 Conference Abstracts

ISDS INTERNATIONAL SOCIETY FOR DISEASE SURVEILLANCE

Influenza-Associated Pediatric Deaths in the United States, 2010–2015

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Objective

To characterize and describe influenza-associated pediatric deaths in the United States over five influenza seasons, 2010–11 through 2014–15.

Introduction

Community influenza infection rates are highest among children. In children, influenza can cause severe illness and complications including, respiratory failure and death. Annual influenza vaccination is recommended for all persons aged ≥ 6 months. In 2004, influenza-associated deaths in children became a notifiable condition.

Methods

Deaths that occurred in children aged <18 years with laboratory-confirmed influenza virus infection were reported from states and territories to the Centers for Disease Control and Prevention on a standard case report form. We used population estimates from the U.S. Census Bureau, 2011 to 2015, to calculate age group-adjusted incidence. We used Wilcoxon-rank-sum test to compare medians and chi-square and Mantel-Haenszel chi-square to compare differences between proportions of two groups.

Results

From October 2010 through September 2015, 590 influenza-associated pediatric deaths were reported. The median age at time of death was 6 years (interquartile range, 1–12 years). Half of the children (285/572) had at least one underlying medical condition. Neurologic conditions (26%) and development delay (21%) were most commonly reported. The average annual incidence rate was 0.16 per 100,000 children (95% confidence interval [CI]: 0.15–0.17) and was highest among children aged <6 months (0.75, 95% CI, 0.60–0.94 per 100,000 children), followed by children aged 6–23 months (0.34, 95% CI, 0.28–0.41 per 100,000 children). Only 21% (87/409) of pediatric deaths in children ≥6 months had evidence of full influenza vaccination. Vaccination coverage was lower in children aged 6–23 months (15%) and 5–8 years (17%) than with those aged 2–4 years and 9–17 years (25%, p<0.01). The majority of children aged <2 years who died had no underlying medical conditions (63%, 105/167); this proportion was significantly higher than that in children aged ≥2 years (45%, 182/405, p<0.01).

Overall 65% (383) of pediatric deaths had influenza A virus detected, and 33% had influenza B virus detected. Children infected with influenza B virus had a higher frequency of sepsis/shock (41%, 72/174), acute respiratory distress syndrome (ARDS, 33%, 58/174), and hemorrhagic pneumonia/pneumonitis (8%, 14/174) than children infected with either influenza A(H1N1) pdm09 or influenza A(H3N2) virus (p=0.01, 0.03, 0.03, respectively).

Overall 81% (421/521) of children had an influenza-associated complication; the most commonly reported were pneumonia (40%), sepsis/shock (31%) and ARDS (29%). Among those with testing reported, invasive bacteria coinfections were identified in 43% (139/322); β-hemolytic *Streptococcus* (20%) and *Staphylococcus aureus* (17%) were reported most frequently.

Most children (39%, 212/548) died within 3 days of symptom onset, 28% died 4–7 days after onset, and 34% died ≥8 days after onset. The median days from illness onset to death for children with an underlying condition was significantly longer than the time for previously healthy children (7 versus 4 days, p<0.01).

Conclusions

Each year, a substantial number of influenza-associated deaths occur among U.S. children, with rates highest among those aged <2 years. While half of the deaths were among children with underlying conditions, the majority of children <2 years who died were previously healthy. Vaccination coverage was very low. Influenza vaccination among pregnant women, young children and children with high-risk underlying conditions should be encouraged and could reduce influenza-associated mortality among children.

Keywords

influenza; pediatric; deaths; surveillance

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