Tetanus, diphtheria (Td) and/or Tetanus-diphtheria-acellular pertussis (Tdap) vaccination among adult pertussis case-patients

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BACKGROUND

Since 1990, the reported incidence of pertussis has increased in the United States with peaks occurring every 3-4 years.[1] Infections among adolescents and adults continue to increase as a result of waning immunity, since neither immunization nor infection induces life-long immunity. Infections among adolescents and adults can be asymptomatic, mildly symptomatic, or classic in presentation. Though adolescents in adults typically have atypical or mild disease, they serves as a source of infection for infants and young children.[1] Most adult cases are not suspected, detected, or reported, and the possibility of a pertussis infection is usually considered only when it occurs in association with classic symptoms in infants and children.

In order to protect infants that are too young for vaccination from severe disease, adults are recommended to receive the tetanus-diphtheria-acellular pertussis (Tdap) vaccine. In 2005, the Advisory Committee on Immunization Practices (ACIP) recommended routine use of a single dose of tetanus, diphtheria and acellular pertussis vaccine (Tdap) for adults 19-64 years of age to replace the next booster dose of tetanus diphtheria toxoids vaccine (Td). [2] In 2012, ACIP expanded this recommendation to include adults aged 65 years and older.[2]

The objective of this study is to characterize pertussis among adult pertussis case-patients in Georgia and assess Td or Tdap receipt prior to cough onset.

METHODS

- Passive pertussis surveillance was conducted in Georgia and information concerning age, clinical signs and symptoms, and vaccination history was entered into the State Electronic Notifiable Disease Surveillance System (SendSS).
- Vaccination history was obtained through case-patient interviews, physician records, and the Georgia Registry of Immunization Transactions and Services (GRITS)
- Cases were classified using the CDC/CSTE case definition and classification (Table 1).
- Using SendSS, persons ≥19 years of age, with cough onset between 01/01/2012 and 12/31/2014 were identified and their signs and symptoms and vaccination history assessed.
- Chi-square analysis was used to determine association and to calculate odds ratios by vaccination status using SAS 9.4.

Table 1. Pertussis Case Definition and Classification

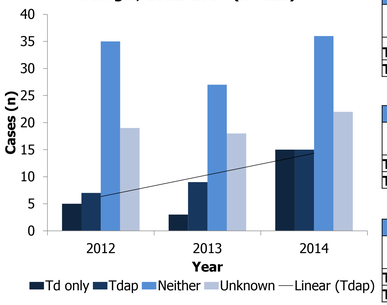
Case Definition	In the absence of a more likely diagnosis, a cough illness lasting ≥ 2 weeks, with a least one of the following: paroxysms of coughing, inspiratory whoop, or post-tussive vomiting
a)Probable	A case that meets the clinical case definition and is not laboratory confirmed or epi-linked
b)Confirmed	Acute cough illness of any duration with isolation of B. pertussis from a clinical specimen OR A case that meets the clinical case definition and is PCR positive OR A case that meets the clinical case definition and is epi-linked to a laboratory confirmed case

RESULTS

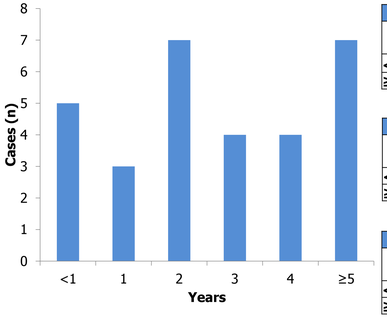
- 211 pertussis case-patients, age ≥ 19 years, with cough onset between 01/01/2012-12/31/2014 were identified
- 30 (14.2%) case-patients received Tdap prior to cough onset; 23 (10.9%) case-patients received Td prior to cough onset.

Descriptive Statistics of Adult Pertussis Cases – Georgia, 2012-2014 (n=211)	n(%)
Case Classification	
Probable	127 (60.2)
Confirmed	84 (39.8)
Gender	
Male	76(36.0)
Female	135 (64.0)
Age	
19-29	32(15.2)
30-44	82(38.9)
45-65	69(32.7)
≥65	28(13.3)
Race/Ethnicity	
White, non-Hispanic	156(73.9)
Black, non-Hispanic	24(11.4)
Hispanic	13(6.2)
Other	5(2.4)
Unknown	13(6.2)
Hospital Admission	
Yes	15(7.1)
No	196(92.9)
Clinical Signs and Symptoms	
Cough	211(100.0)
Mean cough duration	*39 days*
Paroxysms	202(95.7)
Whoop	59(28.0)
Post-tussive vomiting	98(46.5)
Complications	
Positive Chest X-ray	13(6.2)
Encephalitis	6(2.8)
Seizures	2(.95)
Laboratory Diagnosis	
Culture	3(1.4)
PCR	34(16.11)
DFA	3(1.4)
Serology	102(48.3)
Epi Linked	
Yes	56(26.5)
No	155(73.5)
Vaccinated with Tdap	
Yes*	30(14.2)
No	122(57.8)
Unknown	59(28.0)
Vaccinated with Td	
Yes	23 (10.9)

Pertussis cases by year of cough onset and vaccination status* – Georgia, 2012-2014 (n=211)



Time from Tdap vaccination to cough onset – Georgia, 2012-2014 (n=29)†



*Includes one self-reported Tdap vaccinations not documented in Georgia's Immunization Registry (GRITS).
† Does not include one self-reported Tdap for which no date of receipt was given

Symptom by vaccine type – Georgia, 2012-2014

Paroxysms			
Vaccination	**N (%)**	**Odds Ratio (95% CI)**	**P-value**
Td	22 (93.6)	1.5172 (0.1292-17.8229)	0.1114
Tdap	29 (95.6)		

Post-tussive vomiting			
Vaccination	**N (%)**	**Odds Ratio (95% CI)**	**P-value**
Td	9 (40.9)	1.0385 (0.3386-3.1848)	0.9474
Tdap	12 (40.0)		

Whoop			
Vaccination	**N (%)**	**Odds Ratio (95% CI)**	**P-value**
Td	5 (23.8)	2.9161 (0.6144-13.8464)	1.9207
Tdap	3 (9.7)		

Symptom by time since Tdap vaccination– Georgia, 2012-2014

Paroxysms			
No. of years	**N (%)**	**Odds Ratio (95% CI)**	**P-value**
< 5	22 (95.7)	3.6667 (0.1987-67.6520)	0.356
≥ 5	6 (85.7)		

Whoop			
No. of years	**N (%)**	**Odds Ratio (95% CI)**	**P-value**
< 5	1 (4.4)	0.1136 (0.0085-1.5139)	0.0614
≥ 5	2 (28.6)		

Post-tussive vomiting			
No. of years	**N (%)**	**Odds Ratio (95% CI)**	**P-value**
< 5	7 (31.8)	0.3500 (0.0611-2.0045)	0.2291
≥ 5	4 (57.1)		

DISCUSSION

The burden of disease is highest among white, non-Hispanic adults (73.9%). A majority of the cases were middle-aged adults (ages 30-44 years) (38.9%) and older adults (45-65 years) (32.7%). Seventeen percent (17.5%) were laboratory confirmed and one fourth (26.5%) were epi-linked to a laboratory confirmed case.

Most case-patients (57.8.0%) had not received the recommended dose of Tdap prior to disease onset with only 30 (14.2%) case-patients receiving a Tdap prior to disease. Twenty-three (23) (10.39%) case-patients received a Td prior to disease onset – representing a missed opportunity to vaccinate with Tdap and protect against pertussis. However, 28 (13.3%) case-patients did receive a Tdap after their illness resolved.

There was no significant difference in disease presentation between those who received Td prior to disease onset and those who received Tdap prior to disease onset. Similarly there was no significant difference in disease presentation between those who had received no vaccination and those who received Tdap.

Additionally, there was no significant difference in disease presentation between case-patients who received their Tdap < 5 yrs. before disease onset and those who received their Tdap ≥ 5 yrs. before disease onset.

Future efforts should focus on increasing Tdap vaccination among adults.

LIMITATIONS

- Many adult pertussis case-patients had a missing or unknown vaccination history
- We were unable to confirm the accuracy of vaccine information in GRITS. Adult case-patients may have received a Td or Tdap vaccine that was not documented in GRITS.
- When asked, most adult case-patients were not able to recall whether they received a Td or Tdap, therefore misinformation could be introduced due to responder bias.
- The ACIP did not expand the Tdap recommendation to include adults ≥65 years of age until February 2012. All adult pertussis case-patients, ≥ 65 years of age, were included in the analysis, though the recommendation may not have applied to them during the time of their cough onset.
- For passive case-based surveillance, Georgia relies on healthcare providers, laboratories, schools and hospitals to report cases of pertussis. The total number of cases reported could be an underestimation of the actual burden of disease among adults.
- Since data is based on self report from the healthcare provider and the case-patient, misinformation could be introduced due to responder bias.

REFERENCES

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