



The impact of parental postpartum pertussis vaccination on infection in infants: A population-based study of cocooning in Western Australia



Dale Carcione^{a,*}, Annette K. Regan^{a,b}, Lauren Tracey^a, Donna B. Mak^{a,c}, Robyn Gibbs^a, Gary K. Dowse^a, Max Bulsara^d, Paul V. Effler^{a,b}

^a Communicable Disease Control Directorate, Department of Health, Perth, WA, Australia

^b School of Pathology and Laboratory Medicine, University of Western Australia, Perth, WA, Australia

^c School of Medicine, University of Notre Dame Australia, Fremantle, WA, Australia

^d Institute for Health Research, University of Notre Dame Australia, Fremantle, WA, Australia

ARTICLE INFO

Article history:

Received 7 May 2015

Received in revised form 10 July 2015

Accepted 19 August 2015

Available online 29 August 2015

Keywords:

Bordetella pertussis

Pertussis vaccine

Immunisation

Whooping cough

Cocooning

Public health

ABSTRACT

During a pertussis epidemic in 2011–2012 the Western Australian (WA) Department of Health implemented a ‘cocooning’ programme, offering free pertussis-containing vaccine (dTpa) to new parents. We assessed the impact of vaccinating parents with dTpa on the incidence of pertussis infection in newborns.

Births in WA during 2011–2012 were linked to a register of parental pertussis vaccinations and to notified reports of laboratory-proven pertussis in children <6 months of age. Parents who received dTpa during the four weeks after their child’s birth were defined as ‘vaccinated postpartum.’ Cox proportional-hazards methods were used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs) for the risk of pertussis infection among infants born to parents vaccinated postpartum vs. unvaccinated parents, adjusted for maternal age, geographic region, timing of birth, and number of siblings.

Of 64,364 live-births, 43,480 (68%) infants had at least one vaccinated parent (60% of mothers and 36% of fathers). After excluding records where parent(s) were either vaccinated prior to the birth, vaccinated >28 days after the birth, the vaccination date was uncertain, or the child died at birth ($n = 42$), the final cohort contained 53,149 children, 118 of whom developed pertussis. There was no difference in the incidence of pertussis among infants whose parents were both vaccinated postpartum compared to those with unvaccinated parents (1.9 vs 2.2 infections per 1000 infants; adjusted HR 0.91; 95%CI 0.55–1.53). Similarly, when assessed independently, maternal postpartum vaccination was not protective (adjusted HR 1.19; 95%CI 0.82–1.72). Supplemental sensitivity analyses which varied the time period for parental vaccination and accounted for under-reporting of vaccination status did not significantly alter these findings.

In our setting, vaccinating parents with dTpa during the four weeks following delivery did not reduce pertussis diagnoses in infants. WA now provides dTpa vaccine to pregnant women during the third trimester.

© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

Pertussis infection is a highly contagious respiratory illness and, second to influenza, has been the most commonly reported vaccine preventable disease in Australia over the past 2 decades [1–3]. Epidemics of pertussis typically occur in 3–5 year cycles despite

extensive vaccination programmes [1,3]. Infants less than 6 months of age have the highest incidence of pertussis and are the most vulnerable to severe pertussis infection [1].

Several reports indicate that pertussis in infants is usually acquired from close contacts, with one review identifying the primary source as mothers (39%, 95%CI 33–45%) followed by fathers (16%, 95% CI 12–21%) and siblings (ranging from 16% to 43%) [4]. In an effort to reduce pertussis transmission to infants, the Global Pertussis Initiative (2005) and the United States Advisory Committee on Immunisation Practice (ACIP, 2006) recommended vaccinating the carers of newborns, including postpartum mothers who had not been vaccinated prior to conception [5,6]. This approach,

Abbreviations: dTpa, diphtheria, tetanus and acellular pertussis containing vaccine.

* Corresponding author. Tel.: +61 8 9388 4816.

E-mail address: paul.effler@health.wa.gov.au (D. Carcione).

often referred to as the “cocoon strategy”, is thought to provide indirect protection to the infant by preventing pertussis infection among important contacts of the infant, reducing opportunities for transmission. Computer simulations which assume that 90% of household contacts are vaccinated and that immunity lasts 5 years estimate that cocooning strategies could reduce pertussis infections by >70% in infants less than 3 months old [7,8].

In response to a dramatic increase in reported pertussis beginning in 2009, most states and territories in Australia implemented postpartum parental pertussis vaccination programmes. The Western Australian (WA) Department of Health introduced a free state-wide pertussis vaccination programme for parents, grandparents and other household carers of newborns, commencing 01 January 2011 and finishing on 31 December 2012, coinciding with the highest annual incidence of pertussis ever reported for WA. This programme provided an opportunity to evaluate the effectiveness of vaccinating new parents against pertussis in preventing infection among infants less than 6 months of age in a population-based cohort.

2. Methods

2.1. Study design and subjects

All live births recorded on the WA Birth Register between 01 January 2011 and 31 December 2012 were initially eligible for inclusion in the cohort. The WA Data Linkage System used probabilistic matching methods to link demographic information from the Birth Register to three other data collections: the Western Australian Notifiable Infectious Disease Database (WANIDD), the Mortality Register, and a register of pertussis vaccinations administered under the WA new parent pertussis vaccination programme (described below). The linkage was performed using multiple passes over the demographic fields in order to assign weights to the record pairs to indicate the likelihood they belonged to the same person. Accurate links were accepted and loaded, and non-links discarded, with some links reviewed by specialised linkage officers to judge the accuracy of the links. The WA Data Linkage System has been validated and used extensively for health research [9].

2.2. Data on pertussis incidence

Pertussis is a notifiable condition in WA (population ~2.5 million) and cases were identified by searching a statewide database maintained by the WA Department of Health (WANIDD). Only laboratory confirmed cases of *Bordetella pertussis* diagnosed by polymerase chain reaction (PCR), culture or serology were included, as per national surveillance case definitions (www.health.gov.au/casedefinitions#n). An infant infection was defined as pertussis in a child aged less than 6 months, born in 2011 or 2012, and with a date of illness onset between 01 January 2011 and 30 April 2013. Extending follow-up to 30 April 2013 allowed all members of the cohort to contribute at least four months person-time of observation to the analysis unless censoring occurred through prior pertussis illness onset or death.

2.3. Mortality data

The Mortality Register includes all deaths occurring in WA; children who died on the day of birth were excluded from the analysis.

2.4. Vaccination data

Beginning 01 January 2011, parents, grandparents and other household carers of newborn babies were eligible to receive free pertussis vaccine for up to six months following the birth of the

baby. Mothers could access pertussis containing vaccine (dTpa) postpartum prior to hospital discharge, or after discharge from General Practitioners (GP) and government community health clinics. Fathers were given similar access to dTpa at the time of the child's birth in hospital and subsequently at GP clinics. All providers administering vaccine under this programme were asked to return programme-specific consent forms completed at the time of vaccination to the WA Department of Health. Vaccination details from consent forms completed between 01 January 2011 and 31 December 2012 were recorded in a database.

We attempted to link each parent identified in the pertussis vaccination register with a live birth on the WA Birth Register. The first name, surname, and date of birth of the parent were used for the data linkage. Because information regarding grandparents and other carers is not available on the Birth Register our efforts to link vaccination records to the Birth Register were restricted to parents. For evaluating the WA cocooning programme, mothers and fathers were defined as ‘vaccinated postpartum’ if they received a single dose of pertussis vaccine within 28 days following the birth of their baby and, if their baby was ultimately diagnosed with pertussis, at least 14 days prior to the illness onset. Infants linked to one or more parents in the vaccination register that did not meet the criteria for ‘vaccinated postpartum’ were excluded from the primary analysis; this typically occurred if the parent was vaccinated prior to, or >28 days after, the child's birth. Parents for whom there was no record of vaccination in the dTpa vaccination register were considered unvaccinated. Any missing or invalid entry on the vaccination database was cross-checked with the hard copies and public hospital outpatient records, where available.

State-wide quarterly coverage estimates for three doses of acellular pertussis vaccine among the cohort of children two years of age (i.e. 24–27 months) during the study period were obtained from the Australian Childhood Immunisation Register.

2.5. Statistical analysis

De-identified data provided for this analysis included the following infant details: sex, date of birth, mother's year of birth, father's year of birth, geographic region where the birth was registered, age in years of any siblings, date of death (if applicable), date of pertussis illness onset, and mother's and father's vaccination status.

Data analyses were performed using SAS version 9.3 (SAS Institute, Sydney NSW). Baseline characteristics of the birth cohort and the parent cohort were assessed using chi-square tests. Log binomial regression models were used to calculate relative risks (RRs) and corresponding 95% confidence intervals (CIs) of pertussis infection. For the primary analysis, Cox proportional-hazard methods were used to calculate hazard ratios (HRs) and 95% CIs for the risk of pertussis infection in infants born to mothers and fathers who were both ‘vaccinated postpartum’ vs. those born to parents who were both unvaccinated. The time metric was defined as infant-days contributed (with the end point being death, pertussis infection, or attainment of six months of age). Hazard ratios (HRs) and 95% CIs which adjusted for maternal age, geographic region where the birth was registered, timing of birth (broken down into four six-month intervals), and number of siblings were used to compare the risk of pertussis infection in infants born to vaccinated and unvaccinated parents ($\alpha = 0.05$). All variables met the assumption of proportional hazards using Schoenfeld residuals ($p = 0.84$).

2.6. Sensitivity analyses

Underreporting of vaccination status and the definition of an appropriately vaccinated parent under a cocoon strategy were identified as key parameters that could affect the validity of our

Download English Version:

<https://daneshyari.com/en/article/10963967>

Download Persian Version:

<https://daneshyari.com/article/10963967>

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