Impact of changing the stage of pregnancy of maternal pertussis vaccination in England on hospitalised pertussis in full-term and pre-term infants from 2014-2018


INTRODUCTION

In April 2012, a national pertussis outbreak was declared in England and the Department of Health advised that women optimally between 28 and 38 weeks of pregnancy receive a single dose of acellular pertussis vaccine in every pregnancy as an emergency programme. Several countries have implemented maternal immunisation programmes supplementary to routine childhood immunisation as recommended by the WHO. Recommendations on timing of vaccination during pregnancy vary.

In April 2016, the optimal window for vaccination was extended to 20-32 weeks, with vaccination offered from as early as 16 weeks and beyond 32 weeks where required. Offering vaccine earlier provides pregnant women with more immunisation opportunities and increased overall uptake as well as increasing the likelihood of vaccination before pre-term delivery.

Analyses based on hospital admissions before March 2016, demonstrated the impact of the maternal programme on severe disease in infants. However, preterm infants were not benefiting to the same extent as full-term infants.

AIM

To evaluate the impact of the change in timing of maternal pertussis vaccination on the burden of hospitalised pertussis cases in infants aged ≤ 60 days old in England.

METHODS

● Data on hospital admissions for pertussis in England were obtained from the Hospital Episode Statistics (HES) database. Patients ≤60 days old hospitalised with pertussis between 1 September 2014 – 31 March 2016 and 1 September 2016 – 31 March 2017 were included in the study.

● Patients were matched to the laboratory surveillance system. Where cases were not matched to a laboratory-confirmed case, a form was sent to the general practitioner (GP) to request information about the case and mother. Returned forms were independently reviewed by two clinicians to assess whether diagnoses were consistent with pertussis. Cases were also matched to the Second Generation Surveillance System, for information on co-infections.

● Fisher’s exact test pre-policy change and post-policy change were conducted for each of the case characteristics. The proportion of cases preterm and the proportion of white ethnic before the policy change and after the policy were compared to Office for National Statistics (ONS) birth statistics for 2016 using a Fisher’s exact test.

● A competing risk regression analysis (survival on time to discharge), was conducted where the competing event was death of a case. The Hazard Ratio (HR) represents the relative time to final discharge, that is an HR <1 relates to a longer duration of stay with the baseline group. Univariate competing risks models were conducted, and a multivariable model was adjusted for the change in policy.

RESULTS

● 201 cases were classified as positive for pertussis; 108 infants were reported pre-policy change and 93 post-policy change. Pre-term cases decreased by 55% post-policy change (Figure 1).

● There were significantly fewer infant pertussis cases with co-infections and infants with mothers vaccinated after 28 weeks gestation in the post-policy compared to cases in the pre-policy period (Table 1).

● The proportion of preterm cases pre-policy change was significantly overrepresented compared to the 2016 ONS birth statistics (p=0.001). However, after policy change, the proportion of preterm cases was no longer significantly different from the ONS birth statistics (p=0.12).

● The multivariable competing risk regression indicated that the change in policy timing had no impact on the hospital duration. Younger cases (0-4 weeks) had a significantly longer hospital stay than infants aged 5-8 weeks. Cases with a coinfection and premature infants had a significantly longer hospital duration.

DISCUSSION

This study presents the first evaluation of the impact of this policy change on hospitalised pertussis cases in England.

Our study demonstrates that earlier vaccination in pregnancy has reduced hospitalised pertussis cases in preterm infants by more than half. There was a significant reduction in cases with coinfections and the gestational age at vaccination was earlier after the policy change.

Our study showed no further reduction in hospital duration after the policy change. However, previous results found reduced hospital duration among infants whose mothers received the pertussis vaccine compared to mothers that were not immunised.

The results from the two studies suggest that the change in policy has greater effect on reducing pertussis cases and that infants with vaccinated mothers will have a shorter hospital duration compared to infants with an unvaccinated mother.

CONCLUSIONS

● Around the globe there is debate on the timing for maternal pertussis vaccination and country-specific recommendations on the timing of vaccination vary.

● Given the lack of agreed correlates of protection for pertussis, data on impact and effectiveness of these differing programmes are required. The findings from our study are highly relevant for policy makers who are considering introducing maternal programmes and for those with established programmes to optimise protection.

● Results from this study have informed the recent review of the United Kingdom maternal programme which has recently been recommended as a routine programme.

● Countries that currently offer the maternal pertussis vaccine may wish to consider extending the optimal window in order to reduce maternal pertussis cases among preterm infants.

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REFERENCES


