2636. Distinguishing Pertussis from Viral Mimickers: Development and Validation of a Clinical Prediction Score

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**Background:** Pertussis is often confused with respiratory viral infections, leading to misdiagnosis and overuse of antibiotics. Distinguishing the two entities more accurately can help optimize care.

**Methods:** We reviewed the charts of children under 18 years of age who presented to Sultan Qaboos University Hospital in Muscat, Oman and were tested for *Bordetella pertussis* by PCR between 2013 and 2018 (discovery cohort). Clinical and laboratory data were collected from the electronic patient record and analyzed. Backward conditional logistic regression was used to identify independent predictors of laboratory-confirmed pertussis cases. The Muscat Pertussis Index (MPI) score was developed based on the logistic regression model. The MPI score was retrospectively validated on a separate cohort of pediatric patients who presented to the Royal Hospital- Oman’s largest pediatric center- between 2017 and 2018, and were similarly tested for pertussis (validation cohort). Ethical approval of the study was obtained formally for both sites.

**Results:** 354 patients were enrolled in the discovery cohort. 196 (55%) were male, and the median age was 10 weeks (IQR, 6–16). 57 (16%) patients tested positive for *B. pertussis* by PCR, while 266 (75%) tested positive for respiratory viruses. 32 (9%) patients had both pertussis and a viral coinfection and 63 (18%) were negative for both. 255 (72%) patients received macrolide antibiotics. Younger age, fewer vaccine doses, contact with a sick adult, longer symptom duration, paroxysmal cough, cyanosis, post-tussive emesis, apnea, lymphocytosis and thrombocytosis were significantly associated with pertussis (see Table 1). After logistic regression, independent predictors of pertussis were longer symptom duration, lymphocytosis, paroxysmal cough, lack of fever, cyanosis and age under 8 weeks. This formed the basis for creating the MPI score (Table 2). The MPI score was validated on a cohort of 122 patients. Higher MPI scores correlated significantly with confirmed pertussis cases (area under the receiver operating characteristics curve = 0.899, P < 0.001, Figure 1 and Table 3).

**Conclusion:** The majority of suspected pertussis cases were actually due to viral mimickers. The MPI score can predict likely cases of pertussis before laboratory confirmation. Future validation in more diverse settings would help expand its applicability.

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### Table 2: Calculating the MPI score

| Criteria | Assigned score |
|----------|---------------|
| Age | +2 |
| Duration of Symptoms | +1 |
| Coughing paroxysms | +1 |
| Cyanosis | +1 |
| Fever | +1 |
| Absolute lymphocyte count | +10 |
| Maximum score | 10 |

### Table 3: Sensitivity, specificity, positive and negative likelihood ratios, and positive and negative predictive values for the MPI score in the validation study (assuming a 36% prevalence rate among patients tested for pertussis).

| Criterion | Sensitivity (%) | Specificity (%) | +LR | -LR | +PLV | -PLV | +PV | -PV |
|----------|----------------|----------------|-----|-----|------|------|-----|-----|
| ≤ 8 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| 9 – 16 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 16 days | 100 | 1 | 100 | 1 | 100 | 1 |
| ≤ 7 days | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 8 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 9 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 10 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 11 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 12 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 13 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 14 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 15 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 16 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 17 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 18 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 19 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 20 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 21 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 22 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 23 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 24 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 25 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 26 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 27 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 28 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 29 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 30 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 31 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 32 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 33 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 34 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 35 weeks | 100 | 1 | 100 | 1 | 100 | 1 |
| ≥ 36 weeks | 100 | 1 | 100 | 1 | 100 | 1 |

**Figure 1 - Receiver operating characteristic curve for the MPI in the validation study.** AUC = 0.899 (95% CI: 0.822 to 0.980, P < 0.001).

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2637. Third Trimester Immunization with an Respiratory Syncytial Virus F Protein Vaccine for the Prevention of RSV Lower Respiratory Tract Infection in Infants

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**Background:** Respiratory syncytial virus (RSV) is the leading viral cause of severe lower respiratory tract infection (LRTI) in infants worldwide, with severe disease...
occurring in the first months of life. We assessed the efficacy of maternal immunization with an RSV F protein vaccine against RSV LRTI over the first 180 days of life.

**Methods:** We enrolled 4,636 women with low-risk third trimester singleton pregnancies in 11 countries to receive RSV F vaccine or placebo in a randomized, observer-blind trial. Women were followed for 6 months post-delivery, and infants for ~1 year. Surveillance for RSV LRTI in infants, identified by RT-PCR detection of RSV physical examination, and pulse oximetry, was carried out for 180 days from delivery.

**Results:** The RSV F vaccine induced modest reactogenicity and no excess fever. Live births resulted from 98.7% of pregnancies, with no difference between treatment groups in prematurity (< 37 weeks) or mean interval from treatment to delivery. There were no apparent negative impacts on pregnancy, delivery, or infant well-being. Vaccine immunogenicity resembled that in non-pregnant women. Transplacental transfer of vaccine-induced antibodies was markedly more efficient when the interval from immunization to delivery was ≥20 days, 85 to 95% of primary and secondary endpoints RSV LRTI events in the placebo group occurred in the first 90 days of life (see Figure 1). Overall, through 180 days of infant life, RSV was associated with 11.3% of all acute respiratory illnesses and 16.7% of all LRTI, but 49.1% of LRTI with SpO2 < 95% or tachypnea, and 60.3% of all LRTI with SpO2 < 92% in the placebo group. Vaccine efficacy was greatest in the first 75 days of life but clearly persisted to the primary, per-protocol analysis at 90 days, and was supported by the ITT analysis, per Table 1. Efficacy against all-case LRTI with severe hypoxemia (46.0%) or hospitalization (27.8%) was observed in the per-protocol population, as well as an apparent impact on the clinical diagnosis of pneumonia through both 180 and 364 days.

**Conclusion:** RSV F vaccine in the third trimester was safe and had clinically-meaningful impacts on RSV and all-case LRTI over the first 6 months of life.

**Table 1:** Efficacy of Maternal Immunization with RSV F Vaccine against LRTI/Endpoints in Infants

| Endpoint | Per-protocol population | Intent-to-Treat population |
|----------|-------------------------|--------------------------|
| RSV LRTI | 35.4% | 5.3, 61.2% | 10.5, 67.9% | 32.2 | -4.2, 55.9% |
| RSV LRTI with severe hypoxemia (SpO2 < 90%) | 46.2% | -8.3, 75.1% | ND | 44.4% | -18.9, 73.1% |
| RSV LRTI with hospitalization | 44.4% | 10.6, 61.5% | ND | 48.1% | 26.1, 63.5% |

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26.39. Respiratory Syncytial Virus Hospitalizations (RSVH) and All-Cause Bronchiolitis Hospitalizations (BH) Among 29–34 Weeks Gestational Age (wGA) Preterm Infants Before and After the 2014 American Academy of Pediatrics (AAP) Immunoprophylaxis Policy Change Using the Children's Hospital Association's Pediatric Health Information System (PHIS)

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**Background:** In 2014, the AAP stopped recommended RSV immunoprophylaxis for otherwise healthy 29–34 wGA preterm infants. This study examined the risk of RSVH and BH among 29–34 wGA infants before the AAP policy change (November 1, 2010–March 31, 2014) and after (November 1, 2014–March 31, 2017) using PHIS hospital-level encounter data from 51 US children's hospitals.

**Methods:** The study population included the first November to March RSVH and BH among 29–34 wGA infants before the AAP policy change (November 1, 2010–March 31, 2014) and after (November 1, 2014–March 31, 2017) using PHIS. Preterm infants (<37 weeks) were included in this study. The AAP policy change in 2014 with a critical decision date of April 1, 2014 was compared using χ² test and Wilcoxon rank sum test, as appropriate.

**Results:** Including 67,250 infants with RSVH, were studied. Among infants with known gestational age, the proportions of hospitalizations for RSVH and BH increased after the AAP policy change for all wGA categories, except for term infants (Table). Infants 29–34 wGA represented 8.7% of all RSVH before the policy change and 14.2% of all RSVH after the policy change (P < 0.0001). No significant differences were found by gender or co-morbidity for infants 29–34 wGA. Among infants 29–34 wGA, the intensive care unit admission rate increased significantly for RSVH (from 54.5% to 64.2%, P < 0.0001) and BH (from 46.7% to 54.5%, P < 0.0001) after the policy change. The median RSVH length of stay (from 6 to 7.2 days, P = 0.047) and median adjusted estimated cost (from $14,077 to $16,058, P = 0.038) increased significantly after the policy change.

**Conclusion:** RSV and all-cause bronchiolitis hospitalizations and their severity increased among preterm infants 29–34 wGA in the 3-year period following the 2014 AAP policy change on RSV immunoprophylaxis.

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