The Landscape of Maternal Alloimmunization in Saskatchewan: Results of an 18 Month Audit

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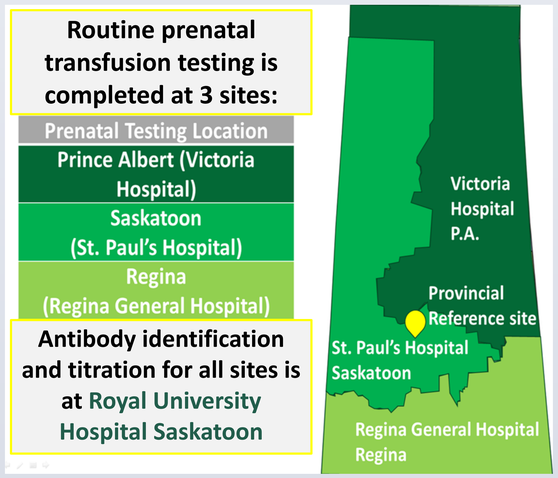
BACKGROUND

- Red cell alloimmunization during pregnancy can lead to hemolytic disease of the fetus and newborn (HDFN) with adverse outcomes due to fetal anemia and hyperbilirubinemia.
- To mitigate this risk, all prenatal patients undergo ABO/Rh blood group determination and antibody (AB) screen testing performed by the transfusion medicine laboratory (TML).
- RhD negative patients receive Rh Immune globulin (RhIg) prophylaxis to prevent anti-D formation.
- Alloimmunized patients require close surveillance with titration of red cell antibody levels throughout pregnancy as a means of HDFN risk stratification.
- In February 2020, testing of TML-based prenatal samples was repatriated from Canadian Blood Services laboratories into Saskatchewan hospitals within of the Prevention of Alloimmunization in Mothers of Saskatchewan (PRAMS) Program.
- This retrospective quality assurance audit summarizes the results of TML-based prenatal testing performed in Saskatchewan between February 1, 2020 and August 31, 2021.

DESIGN AND METHODS

- Automated gel method technology was utilized to perform antibody titrations after cross validation with CBS.
- Computer test code builds within the Soft Bank (SCC Soft Computer, Florida, USA) lab information system were utilized for data extraction.
- The PRAMS program test results and alloimmunization patterns were explored with the following variables:
  - Numbers and types of prenatal tests performed
  - Average turn-around times (TAT) in comparison to Canadian Blood Services
  - RhD status
  - Type and frequency of antibodies identified

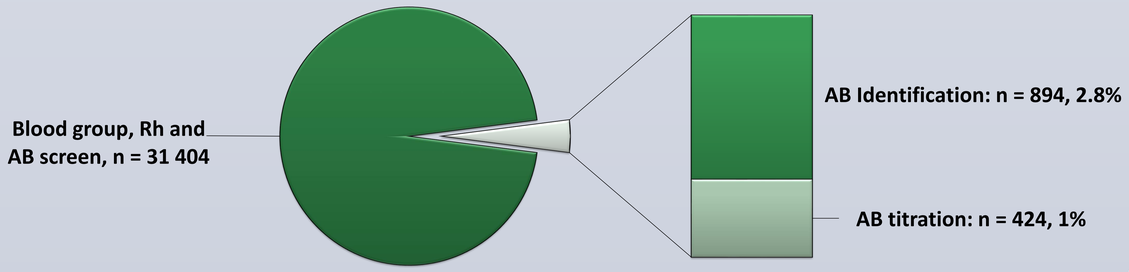
Figure 1: PRAMS prenatal testing map



RESULTS

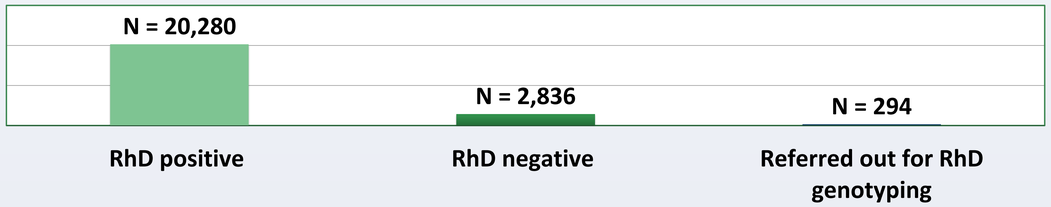
- A total of 31,404 routine TML-based prenatal samples were tested from 23,116 patients.
- All patients underwent ABO/Rh blood group and AB screen testing, with AB identification performed on all patients with a positive screen; clinically significant AB were titrated.
- The average turnaround time was 1.1 day for negative AB screens and 4.2 days for positive AB screens requiring AB identification and titration

Figure 2: Types of prenatal tests performed in Saskatchewan over 18 months



- Patients with inconclusive serologic testing for D antigen were sent for D genotyping. The figure below outlines the results of serologic RhD antigen testing in study period.

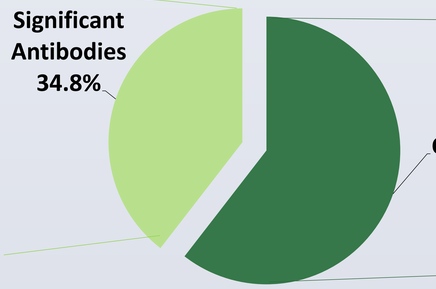
Figure 3. Results of RhD antigen testing in study period



- Antibody screen was positive in 894 (2.8%) prenatal samples with 651 antibodies identified.
- There were 227/651 (34.8%) clinically significant antibodies with anti-E being the most common (53; 23.3%), followed by anti-Kell (40; 17.6%) and anti-D (26; 11.5%)
- 115 (50.7%) were considered critical (titer ≥1:64 by gel or anti-Kell regardless of titer)
- New antibodies at the time of delivery were identified in 11 patients, most commonly anti-e

Figure 4: Maternal antibodies identified during the study period

Anti-E	53
Anti-Kell	40
Anti-D	27
Anti-M	26
Anti-c	18
Anti-C	17
Anti-S	12
Anti-JKA	11
Other Antibodies	33



WinRho D	285
Non-Specific	107
Lewis-A and B	28
Others (anti-A1, JMH)	4

DISCUSSION

- In-province TML based prenatal testing allows for time-sensitive reporting of blood group and AB screen results, which are now accessible to all healthcare providers through the EHealth Viewer.
- The PRAMS Program enables efficient identification of RhD negative women requiring RhIg prophylaxis, facilitates immediate communication of results in alloimmunized pregnancies, and promotes close collaboration between the laboratory and clinical physicians leading to optimal provision of care for prenatal patients.
- Localized TML based prenatal testing, tracking of alloimmunization rates, and coordinated care will assist in the prevention of anti-D formation through recognition and management of discontinuity in health care delivery systems for RhIg administration.
- Identification of knowledge gaps will help to ensure appropriate educational and healthcare resources are available to provide comprehensive care for alloimmunized women and their babies.
- Future areas of study include an assessment of healthcare provider adherence with RhIg prophylaxis administration best practice guidelines and review of clinical outcomes of babies born to alloimmunized mothers.

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