



# Knowledge and attitudes of pregnant women and their providers towards recommendations for immunization during pregnancy



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## ABSTRACT

**Objectives:** Tetanus, diphtheria and acellular pertussis (Tdap) and influenza vaccination is recommended during each pregnancy but uptake is suboptimal. We evaluated knowledge and acceptance of vaccination recommendations among pregnant women.

**Methods:** Prospective, convenience survey of pregnant women presenting for antenatal care at the Pavilion for Women, Texas Children's Hospital, Houston, and their healthcare providers.

**Results:** 796 of 825 (96.5%) of women and 63 of 87 (72.4%) providers completed surveys. Mean age of pregnant women was 30.2 (18–45) years. Self-identified race/ethnicity was 45% white, 26% Hispanic, 13% black, 12% Asian and 4% other. Most women had college degrees (84%) and private health insurance (83%). Mean gestation was 28.5 weeks with 4.8%, 37.8% and 57.4%, in the 1st, 2nd and 3rd trimesters, respectively. Women used various sources for pregnancy information (personal contacts, providers, print, audiovisual and online media) but 89.1% cited a provider as their most trusted source, predominantly (85.8%) their physician. 668 (84%) knew vaccines are recommended during pregnancy, specifically influenza (77%) and Tdap (61%) vaccines. 659 (83%) were willing to receive vaccines if recommended by their physician. Factors impacting vaccination decisions included safety for baby, safety for mother and sufficient information, scoring 4.7, 4.5 and 4.2, respectively, on a 5-point scale; less important were additional visit time (2.6), cost (1.9) or needle phobia (1). Women surveyed in the 3rd trimester showed greater acceptance than those earlier in gestation (87% vs 78%;  $P=0.003$ ). Maternal education, ethnicity, insurance, multiple gestation or history of serious illness in a prior infant did not affect willingness to receive vaccines.

**Conclusions:** Pregnant women are willing to accept vaccination in pregnancy if recommended by their physician and if sufficient discussion of safety and rationale occurs. Strong physician recommendation, as reported for pediatric vaccination, is essential to optimizing uptake of vaccines during pregnancy.

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## 1. Introduction

Maternal immunization is a prevention strategy potentially benefitting two persons (mother and baby) with a single intervention. The relative immunosuppression of pregnancy and early infancy renders mothers and infants vulnerable to infections. The

increased influenza-related morbidity and mortality in pregnant women compared with their non-pregnant counterparts is established [1,2]. Infants less than six months of age are over-represented in rates of hospitalization and mortality attributable to influenza and pertussis and the majority of pertussis-related deaths occur in infants less than three months of age [3–7]. Maternal immunization may protect pregnant women and young infants through the induction of antibodies that protect the mother and also can be transported across the placenta to protect infants from birth until the primary immunization series is initiated [8].

Maternal immunization has eliminated maternal and neonatal tetanus from many resource-poor countries [9]. There are increasing data that maternal immunization with influenza vaccine is safe and effectively reduces influenza and influenza-like illness in mothers and infants [10–12]. Studies demonstrate that tetanus, diphtheria and acellular pertussis vaccine (Tdap) given in the third

**Abbreviations:** BCM, Baylor College of Medicine; BCM-MFM, Baylor College of Medicine Maternal-Fetal Medicine Clinic; BCM-OB, Baylor College of Medicine General Obstetric Clinic; MA, medical assistant; PFW, Pavilion for Women; Tdap, tetanus, diphtheria and acellular pertussis vaccine; UK, United Kingdom; US, United States; WSH, Women's Specialists of Houston.

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trimester of pregnancy is safe and induces maternal antibodies that are efficiently transported across the placenta without interfering with the infant immune response to their primary immunization series [13]. Furthermore, in the United Kingdom (UK) this strategy was 91% effective in preventing pertussis in infants less than three months of age [14]. In the United States (US), influenza and Tdap vaccines are recommended for pregnant women during every pregnancy, influenza at any gestation and Tdap preferably during the third trimester [15,16]. Despite proven benefits, national uptake of both vaccines is disappointing (53% for influenza during the 2012–2013 season; approximately 16% for Tdap in 2013) [17–19]. While reasons for poor uptake are varied, there is perceived reluctance of pregnant women to accept vaccines during pregnancy and of obstetrical care providers to immunize them. We determined the knowledge and attitudes of pregnant women and their providers towards immunization in pregnancy in a large metropolitan hospital in Houston, Texas, and identified factors that impact a pregnant woman's ultimate immunization decision.

## 2. Methods

### 2.1. Study population

The study population comprised pregnant women attending the Pavilion for Women (PFW) at Texas Children's Hospital, Houston, Texas and their providers. The PFW is a facility that delivers obstetric care to women with low and high-risk pregnancies, and serves as a tertiary referral center for pregnant women who require fetal surgery or whose infants will require care at the Level IV neonatal intensive care unit at the adjoining pediatric hospital. Women who deliver at the PFW receive care from obstetricians affiliated with Baylor College of Medicine (BCM) or obstetricians in private practice. We prospectively surveyed a convenience sample of pregnant women receiving antenatal care at three clinics; BCM-affiliated general obstetric (BCM-OB) and maternal-fetal medicine (BCM-MFM) clinics and one private clinic (Women's Specialists of Houston (WSH)). Study personnel identified pregnant women age  $\geq 18$  years who had prenatal clinic appointments by reviewing the daily schedule. Eligible women were approached by study personnel in the order they checked in for their appointment, and invited to read a cover letter explaining the study and asking them to participate. Women who agreed to participate then completed an anonymous, written survey in English or Spanish. Women returned the survey to study personnel when leaving the clinic. There was no attempt to stratify women by demographic or clinical characteristics. Names and dates of birth of all women approached, participants and non-participants, were recorded in a separate log (not linked to the anonymous survey) and cross-checked with subsequent daily appointment schedules to ensure that women were invited to participate only once.

Providers (physicians, nurses, medical assistants (MA), pharmacists) who were certified to administer vaccines in each clinic were also invited to complete an anonymous survey. The study was explained by study personnel at scheduled staff meetings (two physician, one pharmacist, and four nursing/MA). Providers read a cover letter and if interested completed the survey. Providers who took surveys were recorded in a separate log to insure participants completed surveys only once. Two email reminders were sent to physicians and to nursing/MA supervisors to encourage providers and staff to return surveys in a drop-off location to ensure anonymity.

This study was approved by the Institutional Review Board at BCM.

### 2.2. Data collected

Surveys used a variety of check boxes, Likert scales and free text answers. Data were collected from pregnant women regarding demographics, current and previous obstetric history, prenatal care and lifestyle changes (e.g. smoking, alcohol, diet) during the current pregnancy, sources for pregnancy information, knowledge of current vaccine recommendations, intention regarding vaccination for themselves, their family members and newborn baby, and the impact of various factors on their decision to receive a vaccine (either currently recommended or a hypothetical future vaccine) during pregnancy. Providers were asked about their personal experience with vaccine-related discussions with pregnant women, their perception of barriers to their ability to vaccinate pregnant women, and estimation of the response of pregnant women to questions about pregnancy, their knowledge and intentions about vaccination, and what factors would impact patient decisions to receive a currently recommended or hypothetical new vaccine during pregnancy. Demographic data collected for providers included professional role, age, race/ethnicity and number of patients seen each week. Questions addressing opinions on barriers to vaccination on both surveys were scored 0 when the factor had no impact and then on a 5-point scale where 1 indicated "not strongly" and 5 "very strongly".

### 2.3. Statistical analysis

Statistical analysis was performed using SPSS version 22.0 (SPSS, Chicago, IL). Descriptive characteristics were assessed for pregnant women and providers. Where appropriate, outcomes were compared by clinic attended and gestation at the time of the survey. Statistical significance for dichotomous outcomes was determined by chi-square and Fisher exact tests. Normally distributed data were assessed by means and the Student's *t* test; for non-parametric data, significance was assessed by medians and the Mann-Whitney *U* test. The proportion of women willing to receive any vaccine during pregnancy when accompanied by provider recommendation, and those intending to or who had already received influenza and Tdap vaccines at the time of survey, was compared by clinic attended, whether pregnancy was high or low risk, and by trimester at the time of survey. Multiple logistic regression analysis accounted for potential demographic confounders of these variables and outcomes were expressed as odds ratios (OR) with 95% confidence intervals (C.I.).

## 3. Results

### 3.1. Participants

Eight hundred and twenty-five pregnant women were invited to participate in the study between May 28, 2013 and February 13, 2014; 796 (96.5%) completed surveys, (602 [75.6%] from BCM-OB, 43 [5.4%] from BCM-MFM [academic practices] and 151 (19%) from WSH [private practice]). Demographic and clinical characteristics of pregnant women are summarized in Table 1. The median gravida was 2 (range 1–10) and parity was 1 (0–7); 277 (34.8%) were primigravida. Ninety-eight women (12.3%) had a previous infant admitted to a neonatal intensive care unit. Most women received regular obstetric care and followed advice to ensure they had a healthy pregnancy (Table 1)

Sixty-three of 87 (72.4%) providers returned surveys (Table 2); 32 of 51 physicians (68.6%), 2 of 2 nurse practitioners (100%), 8 of 22 nurses (36.4%), 15 of 32 medical assistants (46.9%), 5 of 5 pharmacists (100%) and 0 of 6 midwives. Sixty-one providers (96.8%) reported being fully up to date with recommended adult vaccines including Tdap. Forty-eight (76.2%) had received seasonal influenza

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