



U.S. pregnant women's knowledge and attitudes about behavioral strategies and vaccines to prevent Zika acquisition



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ABSTRACT

Introduction: Zika virus infection during pregnancy can cause significant infant morbidity. Little is known about pregnant women's attitudes regarding behavioral strategies and hypothetical vaccination to prevent Zika infections and sequelae.

Methods: Pregnant women across the United States (N = 362) completed an online questionnaire regarding attitudes about Zika, including six behavioral prevention strategies (i.e., abstaining from sex, using condoms, not traveling to an area with Zika, their partner not traveling into an area with Zika, using mosquito repellent, wearing long pants and sleeves) and vaccination.

Results: Most women (91%) were married/living with the baby's father, 65% were non-Hispanic White, and 71% had been pregnant. Seventy-four percent were worried about Zika, while 30% thought they were knowledgeable about Zika. The mean knowledge score was 5.0 out of 8 (SD = 2.09), and the mean behavioral strategies score was 4.9 out of 12 (SD = 3.7) with a range of 0 (none would be hard to do) to 12 (all would be hard to do). In a multivariable model, having had a sexually transmitted infection, living/traveling in an area with Zika, and worrying about Zika were significantly related to reporting behavioral strategies as hard to do. Seventy-two percent would be willing to be vaccinated. In the multivariable model, living/traveling in an area with Zika, believing they knew a lot about Zika, worrying about Zika, and considering Zika vaccine development as important were significantly associated with willingness to get vaccinated.

Conclusions: Pregnant women were worried about Zika, yet had gaps in their factual knowledge. Most women reported they would get vaccinated if a vaccine was available. Pregnant women who reported themselves as vulnerable (being worried, having lived in or traveled to a Zika area) were more likely to view behavioral strategies as hard to do and to accept vaccination.

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1. Introduction

Zika virus is part of the virus family *Flaviviridae* that can be carried by *Aedes* mosquitoes [1–3]. Since 2015, the virus has spread quickly in the tropical regions of the Americas [4–6]. Transmission of Zika virus can occur through serum, prenatally, or sexually

[7–9]. The majority of infected adults are asymptomatic [10,11]. If they do present symptoms, the symptoms commonly are mild and include joint pain, conjunctivitis, and rash or a fever that lasts two to seven days [12,13]. However, the infection can have severe consequences when transmitted perinatally [5,9,14]. In March 2016, the World Health Organization (WHO) reported that Zika virus infections during pregnancy can cause neonatal microcephaly and other congenital birth disorders [15]. Thus, prevention of Zika infection during pregnancy is of high importance. As of July 5th 2017, the Centers for Disease Control and Prevention (CDC) had documented a total of 663 symptomatic Zika cases in the United States (U.S.) and territories [16].

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The WHO has listed developing a Zika vaccine as a top research priority [17]. Vaccination is among the most successful public health strategies, and is a priority for prevention of congenital Zika, given the severity of the disease and that mosquito-borne infections are hard to prevent through other interventions [18]. Until a vaccine is available, women will need to rely on other methods to prevent sexual or mosquito transmission [19].

Given the severity of neonatal infection and the promise of a vaccine, it is timely to assess pregnant women's attitudes about Zika prevention. Previous research has found gaps in knowledge about transmission, including sexual transmission, and vaccine acceptability ranged from 21% of pregnant women in Greece to 56% of female college students in Virginia [20,21]. We extended this research by drawing on a national sample of pregnant women in the U.S. to understand: (1) pregnant women's attitudes and knowledge about Zika virus, (2) factors associated with perceptions of their ability to implement behavioral strategies to prevent Zika acquisition during pregnancy, and 3) factors associated with their willingness to receive a Zika vaccine if one were developed and available.

2. Materials and methods

A U.S. national sample of pregnant women ($N = 362$) completed an online survey addressing attitudes about health during pregnancy. Responses were collected from November 8th to November 16th, 2016. Eligibility criteria included being pregnant and over the age of 18 years, living in the U.S., and speaking Spanish or English. Participants were enrolled through Survey Sampling International (SSI) [22] a survey research company that maintains a national panel of over four million individuals in the United States. Respondents were compensated \$10.00 worth of SSI panel account incentives. A study information sheet was presented and participants indicated informed consent to participate by initiating survey responses. All recruitment and study procedures were approved by the Columbia University Medical Center Institutional Review Board.

2.1. Questionnaire

Socio-demographic information included age category, race-ethnicity, relationship status, pregnancy and sexually transmitted infection (STI) history. Each woman was asked if she had lived in or traveled to a place where she could acquire a Zika infection. We also asked participants to indicate their general perceived level of Zika knowledge on a four-point scale, and worry about Zika on a three-point Likert-type scale.

Race-ethnicity was coded as Hispanic, non-Hispanic White, non-Hispanic African-American, non-Hispanic Other, and non-Hispanic multi-racial. For purposes of predictive analyses, the five women who were non-Hispanic multi-racial were excluded. Relationship with the father of the baby (FOB) was collapsed as follows: being married or living together, being together but not living together, and not being together.

We assessed factual knowledge of Zika with eight statements for which the response options were “yes”, “no”, or “I don't know”. Six statements asked about the route of transmission of the virus (i.e., mosquito bites, sharing drinks, perinatal acquisition, shaking hands, sexual transmission, and sneezing). One statement assessed the severity of the virus for adults (i.e., having mild symptoms) and one additional question relating to sexual transmission (i.e., men can have it remain in semen for an unknown period). “I don't know” responses were scored as incorrect.

After completion of the knowledge portion, the following brief informational paragraph was provided: If a pregnant woman gets Zika either through a mosquito bite or from sex, the baby can have serious developmental problems including a small head, and brain and eye abnormalities. At the moment, there is no treatment for Zika for a pregnant women and no vaccine to prevent infection.

Six subsequent items measured how difficult it would be (not at all hard, somewhat hard, very hard) for participants to prevent Zika during pregnancy using behavioral strategies (i.e., abstaining from sex, using condoms, not traveling to an area with Zika, their partner not traveling into an area with Zika, using mosquito repellent, wearing long pants and sleeves). In order to evaluate the difficulty of implementing the six behavioral strategies, the strategies were summed.

Three items assessed attitudes about vaccines for Zika (i.e., importance, vaccine strategy, vaccine acceptability). For predictive models, we dichotomized vaccine importance into very important and somewhat important versus not at all important.

2.2. Statistical analysis

All statistical analyses were conducted using SAS 9.4 (SAS Institute Inc. Cary, NC, U.S.A). Using linear models, we evaluated each predictor in bivariate models for associations with perceptions that the behavioral strategies were hard to do. Those that were significant at $p < .10$ were retained for a multivariable linear model with backwards elimination, for which the p was set at $<.05$. In order to evaluate vaccine acceptability, we compared yes to no/not sure. Using logistic regression models, we evaluated the association of each predictor with vaccine acceptability in bivariate models. Those that were significant at $p < .10$ were retained for a multivariable logistic regression with backwards elimination, for which the p was set at $<.05$.

As always with self-completed surveys, there was occasionally missing data. The number of missing responses did not exceed eight for all items; thus, the sample size of missing responses is not reported for each item in the results.

3. Results

3.1. Sample

The majority of women (91%) were married or living with the father of the baby, 67% were 25–35 years, and 65% were non-Hispanic Caucasian. (Table 1) The respondents represented 43 states and Puerto Rico. Seventy-two percent reported that they either had not lived/traveled or were not sure whether they had lived/traveled in an area with Zika, and 28% reported they had. Eight percent had “never heard about it”, 20% had “heard about it but didn't know much about it”, 43% thought they knew “a little bit”, and 30% thought they “knew a lot”. Perceived knowledge was dichotomized into knowing less (i.e. “having never heard about it”/“having heard about it but not knowing much about it”/“knowing a little bit about it”) (70%), versus knowing a lot (30%). Overall, 26% reported not being worried about Zika, and 74% reported being very or somewhat worried.

The mean factual knowledge score was 5.0 out of 8 ($SD = 2.09$). Most answered correctly that mosquitos transmit Zika (87% correct), and most did not know that the virus could remain in the semen for an unknown period of time (49% correct) (Table 2). Participants' perceived knowledge was associated with their factual knowledge ($F(1, 352) = 29.40$; $p < .01$); more factual knowledge was associated with greater perceived knowledge.

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