Prevention Practices among United States Pregnant Women Who Travel to Zika Outbreak Areas

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Abstract. We surveyed pregnant women from the United States to assess the prevention practices they used when traveling to countries with ongoing Zika virus (ZIKV) outbreaks. Of the 749 who agreed to participate, 710 completed the survey's travel questions and 59 of those had traveled to a ZIKV outbreak area in the past 12 months. Only 43% of the women who had traveled to ZIKV outbreak areas reported frequently using mosquito repellent with 32% stating they did not use it at all. They also did not frequently use other recommended methods to prevent mosquito bites. With the established risks to babies born to women who contract the ZIKV during pregnancy, it is a great concern that a large number of women who travel to outbreak areas during pregnancy are not protecting themselves against mosquito bites. Pregnant women need to be educated on the importance of taking precautions.

The mosquito-borne Zika virus (ZIKV) can cause severe fetal anomalies if a woman is infected during her pregnancy. For this reason, the Centers for Disease Control and Prevention (CDC) recommends that pregnant women avoid travel to outbreak areas.¹ Some women, however, are not aware of these recommendations or the risk of being infected while traveling. For example, Whittemore et al.² found that 31% of pregnant women traveling to ZIKV outbreak areas were unaware of the CDC travel advisory and 44% of these women did not know there was ZIKV circulation in the area in which they traveled. Furthermore, in our prior study, we found that only half of the pregnant women we surveyed in southeast Texas were aware of CDC recommendations and few could correctly identify countries with current ZIKV outbreaks.³ Neither of these studies examined whether women who did travel to outbreak areas during their pregnancy took precautions to avoid being infected. The purpose of this study was to examine prevention practices during visits to outbreak areas used by US women who were pregnant or became pregnant soon thereafter.

Between June 14 and July 21, 2016, we conducted a survey on pregnant women ≥ 18 years of age attending prenatal clinics in southeast Texas, which included questions on recent travel and prevention practices used during visits to outbreak areas. Details of the main study have been previously published.³ We defined outbreak areas as any country in which local ZIKV transmission was declared by the Pan American Health Organization as of July 2016 (when the survey was administered). One question asked, "How concerned are you about Zika affecting the health of your baby?" Responses were dichotomized into two categories, combining "extremely" and "very" into one category, defined as "concerned," and responses of "moderately," "slightly," or "not at all" were categorized as "less concerned." Bivariate comparisons between the travel group and the non-travel group for descriptive characteristics were made using T tests for continuous dependent variables and χ^2 analyses for categorical

outcomes. A Fisher's exact test (because of low frequencies in some cells) was used to examine differences between concern level and whether mothers participated regularly in any of the five mosquito bite prevention methods asked about (used: repellent, long-sleeved shirts and long pants, treated clothing and gear with permethrin, stayed in places with air conditioning or with window and door screens, or slept under a mosquito net—all while abroad to avoid mosquito bites). Each of the responses to these five items were dichotomized to compare, "not at all" to responses including, "often," "occasionally," or "used but not because of mosquitoes." Some responses were missing, so numerators and denominators have been indicated in the text. All analyses were completed using SAS software version 9.3 (SAS Institute Inc., Cary, NC). The University of Texas Medical Branch Institutional Review Board approved all procedures and protocols for this study, including a waiver of written consent.

Of the 749 women who agreed to participate, 710 responded to the question about travel during pregnancy, and 701 included their current age. Of those 701 participants, 59 (8%) had traveled to at least one Zika-affected region in the past 12 months. Regions traveled to included Mexico ($N = 50$), Central America ($N = 7$), Brazil ($N = 1$), Colombia ($N = 1$), Puerto Rico ($N = 1$), and other Caribbean Islands ($N = 4$). It should be noted that not all areas in these countries would have an active outbreak of Zika, but we could not ask for more specific information as that information could potentially be used to identify such a small group of women. Women who traveled to more than one destination may have been counted more than one time as 16 (26.6%) traveled to one or more of these destinations more than one time. Five of these women had plans to return to an outbreak area during their pregnancy. Most travelers were Hispanic, whereas a smaller proportion of nontravelers were also Hispanic (Table 1). Travelers and nontravelers reported similar age and gestation (Table 1). Three-fourths spoke Spanish at home compared with half of nontravelers. Most women in both groups were married or cohabitating with their partner. Most women had at least a high school education, although the frequency differed by travel status.

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TABLE 1

Comparison of descriptive statistics of pregnant women who had not traveled to ZIKV outbreak region in the past 12 months compared with pregnant travelers who had traveled to ZIKV outbreak region in the past 12 months ($N = 701$)

		No travel to ZIKV outbreak region ($N = 642$)	Travel to ZIKV outbreak region, ≤ 12 months ago ($N = 59$)	P value
	Total	Mean (range)	Mean (range)	T-test
Age of respondent	701	27.9 (18–43) years	27.2 (18–40)	0.44
Gestation of respondent	693	25.4 (2–40) weeks	24.8 (7–39.3) weeks	0.68
		n (%)	n (%)	Chi-square
Hispanic ethnicity	695	445 (69.8%)	51 (89.5%)	0.002
Speak Spanish at home	700	324 (50.6%)	44 (74.6%)	0.002
Married or cohabiting with partner	691	453 (71.0%)	43 (75.4%)	0.48
$\geq$ High school education	691	458 (72.2%)	50 (84.7%)	0.01

ZIKV = Zika virus.

Only 55% of those who traveled to ZIKV outbreak areas were aware of the CDC recommendations to avoid travel there. Of the 50 women who traveled to Mexico, 41% (20/50) either did not know or did not believe ZIKV was being transmitted there. Seventy-two percent of the women who traveled and responded to questions about their ZIKV concerns (41/57) stated they were “concerned” that ZIKV could affect their baby’s health. However, only 43% (23/53) of the women who traveled to an outbreak area reported frequently using mosquito repellent during their stay. Overall, 32% (17/53) reported they did not use mosquito repellent at all and 55% (31/56) were “concerned” about using repellent while pregnant. They also did not frequently use other recommended methods to prevent mosquito bites, such as treating clothing with permethrin (12% used often, 6/49) or sleeping under mosquito nets (18% used often, 9/50). About half reported wearing long-sleeved shirts or pants (45% used often, 23/51) or staying in places with air conditioning or window screens (54% used often, 27/50). Fisher’s exact tests revealed there were no significant differences between mothers’ use of any of the five mosquito bite prevention methods and concern regarding their baby’s health with regard to ZIKV ($P > 0.05$).

This study demonstrates that many women in this study who travel to ZIKV outbreak areas during their pregnancy or shortly before they become pregnant do not adequately protect themselves against mosquito bites. A previous analysis of this data found that pregnant women who were born in countries with ZIKV outbreak reported less frequent use of repellent compared with pregnant women born in the US, although they had more knowledge than the US born about symptoms of ZIKV and pregnancy-related outcomes.³ Another survey conducted in Greece found 53.6% of pregnant women used repellent and 17% used “covering clothes” to prevent mosquito bites, although frequency of these activities were not given, and few women or their partners traveled to ZIKV outbreak countries.⁴

This study has some limitations. It was based on a small sample of southeastern Texans shortly after the CDC declared that there was a causal association between infection with the ZIKV during pregnancy and birth defects, and 6 months after the CDC issued guidelines about ZIKV transmission and health effects.⁵ However, many of the ZIKV outbreak countries also host mosquitoes that carry dengue, another serious disease that should be protected against by using the same precautions, and recommendations have been published by the CDC for a longer time, and pamphlets are freely available.^{6,7} This study included a small sample of women from southeastern Texas, and the findings are not generalizable

to the US. However, this data does indicate that more information may be needed by pregnant women who plan to travel to countries with mosquito-borne diseases that are not endemic to the US. This study did not address the preventive practices of sexual partners, which is an important consideration, as this is an important prevention method addressed by CDC-updated recommendations for Zika prevention.⁸ More research about condom use and mosquito-bite prevention practices of pregnant women’s partners is needed, especially for those who travel between the US and Zika outbreak countries.

The low frequency of protection against mosquito bites among women who travel to outbreak countries is of grave concern given the established risks to babies born to women who contract ZIKV during their pregnancy. If infected, these women could also transmit the virus to others after their return to the US through sexual intercourse or by initiating mosquito-borne transmission, such as the occurrence in Miami, Florida.^{9,10} With no specific treatment or vaccine currently available for ZIKV, prevention methods are of paramount importance. Pregnant women need to be educated on where current ZIKV outbreaks are occurring, current CDC travel recommendations, and the critical importance of taking precautionary measures to avoid mosquito bites if travel cannot be avoided. Information and pamphlets on the safe use of repellent and other mosquito prevention methods, as well as sexual precautions, are available from the CDC, and includes information about Zika and dengue prevention during pregnancy.^{6,7} The CDC regards commercially available repellents as safe for pregnant women, and recommends repellent with the following active ingredients: DEET, Picaridin, oil of lemon eucalyptus, or IR3535.¹¹

Received July 25, 2017. Accepted for publication September 8, 2017.

Published online October 23, 2017.

Acknowledgments: We thank Keitha Moseley-Dendy, MA of UTMB for her assistance with manuscript preparation.

Financial support: Drs. Fuchs and Guo are supported by an institutional research career development award (K12HD052023: Building Interdisciplinary Research Careers in Women’s Health Program-BIRCWH; Berenson, PI) from the Office of Research on Women’s Health (ORWH) and the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) at the National Institutes of Health (NIH). Dr. Fuchs also worked on the project as a postdoctoral fellow supported by an institutional training grant (National Research Service Award T32HD055163, Berenson, PI) from NIH/NICHD. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

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