

Zika-prevention Knowledge among Hispanic Women Living in Puerto Rico: A Cross-sectional Study

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Objective: To describe the level of knowledge about Zika virus exposure, symptoms, complications, and transmission prevention in Hispanic women living in Puerto Rico.

Methods: A sample of 168 women aged 21 to 64 at the general community, consented to complete a self-administered questionnaire of 112 questions from October 2016 to July 2017.

Results: A univariate analysis showed that the participating women recognized that the Zika virus was transmitted through mosquito bites (95.2%), sexual intercourse (78.0%), and from a mother to her fetus (41.1%); participants also believed that other, incorrect, routes of transmission were plausible. Regarding their knowledge of Zika infection prevention, the participants' correct answers included the following: using mosquito repellent (94.1%), eliminating standing water (83.9%), and using condoms (83.3%). When asked about fetal risks associated with Zika, they believed that the fetus would not develop normally (75.6%), would be born with a disability (69.6%), or would experience nervous system problems (54.2%). Only 22.6% of the participants had taken precautions to prevent pregnancy during the Zika outbreak, of which 65.8% reported that they had used condoms during all sexual relationships.

Conclusion: There is a need to educate the general population about the Zika virus to reduce the misconceptions about disease prevention and transmission as well as about the complications associated with Zika during pregnancy. Awareness efforts should emphasize the prevention of infections during pregnancy and the use of available contraceptive methods. [*P R Health Sci J* 2018;37(Special Issue):S51-S56]

Key words: Zika virus, Knowledge, Practices, Zika virus infection, Hispanic women

After the first case was reported in Puerto Rico at the end of 2015, the Zika virus (ZIKV) quickly spread throughout the island, resulting in an epidemic that by August 2017 had a total of 40,545 confirmed cases, including 4,008 who were pregnant women (1). In adults, infections are usually asymptomatic or present as a mild self-limiting viral illness. However, ZIKV infection during pregnancy has been linked to severe congenital malformations in developing fetuses, such as microcephaly and other central nervous system abnormalities (2). By February 2016, the rapid international spread of ZIKV and its association with increased cases of microcephaly led the World Health Organization to declare it a Public Health Emergency of International Concern (3). Since then, public health measures have been focused on increasing awareness about the disease and its effects and increasing preventive measures, monitoring, and surveillance among pregnant women and women of reproductive age.

The CDC has described various routes of ZIKV transmission, including the bite of the *Aedes* mosquito, sexual contact, from an infected mother to her unborn child (vertical transmission), and

the use of contaminated blood products (4). ZIKV RNA has been detected in semen for more than 90 days after symptom onset, with the longest period of reported detection being 188 days after symptom onset. In addition, ZIKV RNA has been found in the serum of pregnant women, detectable up to 10 weeks after symptom onset (5). For those reasons, the CDC recommends that a man with recent ZIKV infection should wait at least 6 months from symptom onset before attempting to conceive a child with his partner, and that a woman should wait at least 8 weeks after ZIKV symptom onset before attempting the same with hers (5).

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Attempting to identify recent infections can be problematic because individuals infected with ZIKV often have few, mild or no symptoms. This problem is of special concern for pregnant women and women who may become pregnant because of the potential complications that ZIKV may cause in a fetus or embryo. Of the 4,008 ZIKV-positive pregnant women (reported as of August 2017), only 48% presented symptoms (1). The most common symptoms associated with ZIKV infection are rash, pruritus, arthralgia, conjunctival injection, fatigue, and myalgia (7). Other reported symptoms include low-grade fevers (37.5 to 38.0°C) and nausea or vomiting (7). A more concerning issue is that of congenital malformations in fetuses. A common route of transmission for the ZIKV is vertically, from infected mothers to fetuses. Congenital malformations observed in other studies include microcephaly, cerebral calcifications, and fetal growth restrictions, as well as neurological findings, such as visual and hearing deficits, seizures, hypertonicity, spasticity, contractures, dysphagia, and feeding difficulties (7). ZIKV infection has also been associated with ventriculomegaly, decreased brain volume, and cortical malformations (8). Moreover, there have been reports of decreases in the rate of postnatal head growth in infants, accompanied by such neurological dysfunctions as hypertonia and hemiparesis, dyskinesia/dystonia, dysphagia, epilepsy, and persistence of primitive reflexes (8). A correlation of ZIKV infection with a high risk of miscarriage (9) and hydrops fetalis (10) has been reported in several cases. Studies have shown that the more severe consequences of Zika infection (e.g., microcephaly with brain abnormalities such as intracranial calcifications) were more likely to occur when the fetus was infected during the first trimester of pregnancy (11). As of August 2017, according to the Puerto Rico Arboviral Surveillance Report published by the Puerto Rico Department of Health (PRDH), there have been 47 reported cases of congenital defects related to ZIKV (1). Additionally, ZIKV has also been associated with the development of Guillain-Barré syndrome, which can be fatal. In Puerto Rico there have been 53 reported cases of Guillain-Barré associated with Zika, with 2 reported fatal cases (1).

In a study conducted by the CDC, 2,364 post-partum Hispanic women living in Puerto Rico were asked about their understanding of the ZIKV; findings suggested that measures to improve adherence to recommendations about preventing sexual transmission need reinforcement (12). The participants of that study revealed that they were highly concerned about ZIKV infection and desired to be counseled by health care providers. At the same time, only approximately 1 in 5 of these women reported that they had used condoms throughout their pregnancies as a ZIKV-prevention strategy (12). Whittemore and colleagues investigated ZIKV knowledge among women of reproductive age and pregnant women who traveled to areas with active transmission and reported that many women were unaware at the time of their travel that they were pregnant, that Zika was being actively transmitted in the area to which they were

traveling, or that there was a US government travel advisory for their destination (13). Additionally, Mouchtouri and colleagues conducted a study to determine the knowledge and attitudes toward as well as the practices in terms of preventing being bitten by mosquitoes and, thus, being infected by ZIKV. They reported considerable knowledge gaps, including their being unaware that the virus could be transmitted via sexual contact (14).

The results of these questionnaires show that ZIKV prevention faces challenges relating to communication, existing knowledge, and behavior modification. Since there is no available vaccine or treatment for ZIKV, it is important to inform the population of the available methods of prevention, such as avoiding being bitten by mosquitoes and consistently using condoms during sex. The CDC Foundation, with technical assistance from the CDC and in partnership with the PRDH, has launched initiatives promoting the prevention of the transmission (including that propagated by sexual contact) of ZIKV infection during pregnancy through the engagement of social networks and the communities surrounding pregnant women (12). To that end, the CDC Foundation and its partners launched the Zika Contraception Access Network (Z-CAN), with the aim of providing women in Puerto Rico with a full range of contraceptive options, free of charge, that will form part of their preventative care.

This study aims to describe the levels of knowledge about ZIKV exposure and the symptoms associated with such exposure, possible complications, and effective preventive methods in Hispanic women living in Puerto Rico.

Materials and Methods

Institutional Review Board approval was obtained for the study and questionnaire. This study had 2 components: the first was to validate the questionnaire to be used. During said validation, the questionnaire was administered to 30 women who were visiting the SJCH OB/GYN clinics to assess their understanding of the instrument's questions. After completing the survey, the participants were asked for feedback regarding the difficulty or ease of answering the questions as well as their overall clarity and understandability. Based on their feedback and recommendations, a revised questionnaire was created. The revised questionnaire was submitted to the San Juan City Hospital (SJCH) IRB as an amendment and received approval. The revised questionnaire was used in the cross-sectional study carried out at the general community.

Recruitment was performed in waiting room areas and community activities where the study personnel approached potential participants and invited them individually to participate in the study. After agreeing to take part in the study, the (potential) participant was taken into a private area where the research assistant determined her eligibility and explained in detail the purpose of and procedures to be followed by the study. A consent form was read and signed by each participant prior to the administration of the questionnaire to that individual.

To meet the inclusion criteria, the participants needed to be women in the general community, 21 years of age or older, and willing to answer the questionnaire. Women under 21 years of age and women with mental disabilities who had a diminished capacity to consent and answer the questionnaire by themselves were excluded from the study.

The study consisted of a self-administered questionnaire with a total of 112 questions. Thirty-one questions were open-ended and the other 81, closed-ended. Questions were divided into 5 sections, which included sociodemographic characteristics (8); medical history (11); STDs (7); sexual history (9); reproductive history (9); knowledge of, attitudes about, and practices in terms of the use of contraceptive methods (42); and knowledge concerning the ZIKV (25). Statistical analysis and output for tables were done using STATA 11.2 and 12.0 (StataCorp, Texas, USA).

Results

Sociodemographics

A total of 168 women were recruited from October 2016 to July 2017. The participants ranged in age from 21 to 64 years, with a mean age of 34 years (See Table 1). Out of 168 participants, 120 (71.4%) reported that they resided in the San Juan metropolitan area. Most of the participants (132, 78.6%) had been born in Puerto Rico, followed by 14.3% who had been born in the Dominican Republic. Among the participants, 96 (57.5%) had education levels above a high school education and 71 (42.5%) had a high school education or less. Only 32.7% reported being married and living with their partners; 59.5% were single, and 7.7% were divorced. Most of the participants (51.2%) reported that they earned less than \$15,000 per year; the rest reported that they earned \$15,000 or more. Of the 168 participants in the study, 89.2% reported that they had medical insurance and 10.8% reported that they were uninsured. In this

Table 1. Sociodemographic characteristics (n = 168)

	n	%
Place of birth (%)		
Puerto Rico	132	(78.6%)
Dominican Republic	24	(14.3%)
United States of America	12	(7.1%)
Relationship status		
Married/cohabitating	55	(32.7%)
Single	100	(59.5%)
Separated/divorced/widowed	13	(7.7%)
Annual income		
<\$15,000	86	(51.2%)
\$15,000 or more	82	(48.8%)
Medical insurance		
Yes	150	(89.2%)
No	18	(10.8%)
Participant education level		
More than high school	96	(57.5%)
High school or less	71	(42.5%)

Mean age: 34.2 years (range: 21 to 64 years)

cohort of participants, 41.7% were pregnant at the time of their participation in the study.

Zika knowledge

Of the 168 participants, 152 (90.5%) stated that any person could be infected with the ZIKV (See Table 2). Moreover, when

Table 2. Knowledge of Zika virus transmission routes, its clinical presentation, and its prevention methods

	n	%
Who is at risk for Zika virus infection?		
Everyone exposed is at risk	152	(90.5%)
How can Zika be transmitted?		
Mosquito bite	160	(95.2%)
Sexual contact	131	(78.0%)
Intrauterine exposure	69	(41.1%)
Blood transfusion	35	(20.8%)
Coughs and sneezes	26	(15.5%)
Contaminated water	24	(14.3%)
Breast milk	23	(13.7%)
What are the signs and symptoms of Zika virus infection?		
Fever	152	(90.5%)
Joint pain	130	(77.6%)
Rash	129	(76.8%)
General malaise	129	(75.9%)
Nausea	65	(38.7%)
Conjunctivitis	58	(34.5%)
Diarrhea	53	(31.5%)
Hemorrhages	23	(13.7%)
Does Zika virus infection always present with signs and symptoms?*		
Yes	91	54.2%
No	74	44.1%
How can Zika infection be prevented?		
Using mosquito repellent	158	(94.1%)
Eliminating standing water	141	(83.9%)
Using condoms	140	(83.3%)
Using insecticide indoors	132	(78.6%)
Wearing long pants and long-sleeve shirts	125	(74.4%)
Using mosquito nets	119	(70.8%)
Using mosquito repellent outdoors (incense, candles)	95	(56.6%)
Abstaining from sex	90	(53.6%)
What are the fetal risks associated with Zika infection during pregnancy?		
Abnormal fetal development	127	(75.6%)
Long-term disability after birth	117	(69.6%)
Nervous system complications	91	(54.2%)
Premature birth	85	(50.6%)
Spontaneous abortion	72	(42.9%)
Stillbirth	51	(30.4%)
Is there an association between the Zika virus and microcephaly?		
Yes	123	(73.2%)
No	44	(26.2%)
Is there an association between Zika virus and the Guillain-Barré Syndrome?		
Yes	54	(32.1%)
No	113	(67.3%)

*Percentages do not add up to 100% because some answers in the questionnaire are not included in the table, specifically "maybe," "do not know," and "refuse to answer."

the participants were asked about routes of transmission, 95.2% of the participants answered that ZIKV could be transmitted through mosquito bites, while 78.0% answered that it could be transmitted sexually. Concerning signs and symptoms of a Zika infection, of the 168 participants, 152 (90.5%) identified fever, 130 (77.6%), arthralgia, 129 (76.8%), rash, and 129 (75.9%), malaise as being common symptoms experienced by those who are infected. Of the 168 participants, 74 (44.1%) answered that not all people infected by the ZIKV show signs or symptoms. Nonetheless, 91 (54.2%) answered yes and maybe to this question. Asked to talk about preventive methods for ZIKV infection, of the 168 participants, 158 (94.1%) mentioned applying mosquito repellent, 141 (83.9%), eliminating standing water, 140 (83.3%), using condoms in all sexual relationships, 132 (78.6%), fumigating one's home, 125 (74.4%), using clothes that cover most of the body, and 119 (70.8%), placing mosquito screens in windows and doors. When participants were asked about the risks of the Zika infection to a fetus, 127 (75.6%) answered that there was a risk that a fetus would not grow or develop normally, followed by 117 (69.6%) who answered that there was a risk that a fetus would be born with a disability. Of the 168 participants, 123 (73.2%) answered that there was a relationship between ZIKV infection and microcephaly in the fetus. When the participants were asked if there was a relationship between ZIKV and Guillain-Barré, 54 (32.1%) participants answered yes, while 113 (67.3%) answered no or were unsure. Among the 112 participants that reported having a partner, when asked whether they or their partners had adopted any methods of pregnancy prevention after learning about ZIKV, 74 (66.1%) disclosed they had not. Of the 38 participants who revealed that they or their partners had adopted methods of pregnancy prevention since learning about ZIKV, 25 (65.8%) reported that the method adopted was the use of condoms during all sexual relationships, followed by oral contraceptive pills (10 participants, 26.3%). Lastly, 127 (74.4%) of the participants reported that they wished to have more information about the ZIKV.

When asked about their sources of information with regard to ZIKV, 125 (74.4%) participants stated that they had received information about the ZIKV from the radio, the press, or television (or a combination of any 2 or all 3), followed by 72 (42.8%) participants who related that they

had received information from the internet and social media. Meanwhile 69 (41.1%) participants indicated that they had received information about the ZIKV from their primary physicians.

Discussion and Conclusion

The results from our questionnaire show that although most of the participants were well informed about the ZIKV's routes of infection, prevention methods, and possible complications, there are still some fundamental areas in which knowledge is lacking. Satisfactory knowledge and awareness about Zika infection may have multiple sources, including CDC, PRHD, private, and third-sector awareness campaigns in effect since August, 2016, when the Zika outbreak was declared. When compared to the CDC report about Zika knowledge in postpartum patients, the participants in our sample, which included non-pregnant patients, showed a lower level of knowledge about the ZIKV.

In order to determine where their knowledge was obtained, participants were asked about their sources. As can be seen in Table 3, the majority of the participants (74.4%) were informed about the ZIKV through the radio, the press, or television (or a combination of any 2 or all 3), followed by the internet and social media (42.8%). These results reflect the direct impact that social media has on education among our (and presumably other) patients. Only 41.1% ($n = 69$) of the participants replied that they had obtained information about the ZIKV through their primary physicians. These results suggest that the incorporation of social media into health education campaigns may be of use, especially to increase the chances of patients receiving accurate, expert-validated information. Informational campaigns diffused through the mass media can reach a wide audience, but these campaigns require rigorous quality standards, trusted sources, and the presentation of the scientific data accomplished in a captivating way in order to fulfill their purpose and successfully inform the public.

One hundred fifty-two (90.5%) participants were aware that anyone is at risk of being infected with the ZIKV. While a large percentage of the population is aware of the most common methods of transmission, there are still participants who believe it is transmissible through other, nonviable, routes, such as through coughs or sneezes (15.5%), through contaminated water (14.3%), through vaccines (2.4%), or through insecticides or the chemicals used in fumigation (1.8%). Nonetheless, most of the participants were aware that it can be transmitted through mosquito bites and through sexual contact.

Most of the participants in our sample demonstrated knowledge of the most common symptoms present during the ZIKV infection, allowing them to be aware of those symptoms and able to seek medical attention if they presented. However, less than half of them (44.1%) were aware that ZIKV infection is usually asymptomatic. This is of concern because unawareness of the often asymptomatic course of ZIKV

Table 3. Sources of information about Zika ($n = 168$)

	n	(%)
Radio, press, television	125	74.4%
Internet and social media	72	42.8%
Private physician	69	41.1%
Health workers or community volunteers	57	33.9%
Government-sponsored publicity	54	32.1%
Family	40	23.8%
Friends/neighbors	31	18.5%
Pharmacy	17	10.1%
International/national health organization	14	8.3%

infection could lead to the decreased use of preventive methods and to poor surveillance. For example, pregnant women who are unaware of infection may be unaware of potential fetal complications. Given the participants' responses on the methods of prevention, we can presume that our participants are aware of the major routes of transmission, since they picked methods which protected them from mosquito bites and sexual transmission.

The Guillain–Barré syndrome is a rare sequela of Zika infection, but it is still present in PR: We have 53 reported cases, including 2 mortalities. Given the potential mortal nature of the syndrome, we asked our population if they were aware of the risk, and the majority (67.3%) of our participants answered that they weren't or that they believed that there was no association between them. This is of concern due to the fact that adults infected by the ZIKV may not be aware of the consequences other than the mild viral symptoms.

Despite 74.4% of our participants having reported that they didn't have enough information about the ZIKV and would like to receive more, they still presented adequate knowledge of the Zika infection, the risks with which it is associated, and the methods by which it can be transmitted. However, it is important to emphasize areas in which knowledge is lacking, such as symptomatology and the disease's correlation to Guillain–Barré, so that future educational campaigns can address these gaps.

The limitations of this study include the small population number, and the fact that the study is reproducible only if the postulated study's population consists of Hispanic women living in Puerto Rico.

In conclusion, the contents of future public awareness campaigns and the advice given by health care providers must both be carefully evaluated to ensure not only that the barriers to communication are minimized but that the proper education regarding ZIKV is furnished. Moreover, special attention should be given to prevention methods, such as using condoms during pregnancy and mosquito repellents as a general rule.

Resumen

Objetivos: Describir el nivel de conocimiento sobre el virus de Zika (ZIKV), sus rutas de transmisión, síntomas, complicaciones y métodos preventivos en mujeres hispanas viviendo en Puerto Rico. **Métodos:** Una muestra de 168 mujeres entre 21-64 años de edad de la comunidad en general, consintieron a autoadministrarse un cuestionario compuesto por 112 preguntas entre octubre de 2016 hasta julio de 2017. **Resultados:** Las participantes contestaron correctamente que ZIKV es transmitido por picaduras de mosquito (95.2%), sexualmente (78.0%) y por vía materno-fetal (41.1%); pero también identificaron rutas falsas como posibles. Las participantes correctamente identificaron: uso de repelente de mosquito (94.1%), eliminando aguas estancadas

(83.9%) y uso de condones (83.3%) como métodos para prevenir transmisión. Cuando se les preguntó sobre riesgos asociados a ZIKV en fetos, respondieron que el feto no se iba a desarrollar normalmente (75.6%), que podía nacer con discapacidades (69.6%) y que tendría problemas del sistema nervioso (54.2%). Entre las pacientes solo 22.6% contestaron haber tomado medidas preventivas para evitar embarazo, de las cuales 65.79% reportó el uso condones durante sus relaciones sexuales. **Conclusión:** Hay necesidad de educar a la población sobre el virus de Zika para reducir las ideas erróneas sobre la transmisión, prevención y posibles complicaciones durante el embarazo. Esfuerzos de concientización deben enfatizar la prevención del virus durante el embarazo y la disponibilidad de alternativas contraceptivas.

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