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## RESEARCH ARTICLE

### Public Knowledge, Attitudes and Behavior Towards Zika Virus in Saudi Arabia

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#### Abstract

**Aim:** To assess Public knowledge, attitudes and behavior towards Zika virus in Saudi Arabia.

**Methods:** A prospective cross-sectional survey conducted for a period of 2 months from June-2016 to July-2016. Knowledge scoring was given based on the percentage of correct responses. Data were collected using a self-prepared questionnaire and analyzed using descriptive statistics. Association of respondent's knowledge score with sex, age group, and educational level, was analyzed by Chi-square test.

**Results:** The total sample size of the present study was 284 members, of which 187 were males and 97 were females. There was no statistical difference regarding Zika virus infection in the knowledge between both genders. There was no statistical difference regarding Zika virus infection in the knowledge between age groups. The majority of respondents were found by completing secondary schooling with 66 (36.7%), followed by no education with 50 (27.8%), primary schooling in 45 (25%), and finally completing graduate with 19 (10.5%). There was significant difference in knowledge between education level groups ( $p < 0.0001$ ). 35.6% of them didn't hear about Zika virus, while 30.6% hear about the virus in the previous few months and 26% knew about it in the last year. About 46 % don't know if there is a treatment of Zika virus infection while about 11 % they said yes there is a treatment. The majority of them 57 % don't take any measure to protect themselves from the virus, 39.4% who said no they don't know how to protect themselves. 44% don't know if there is a national or global organization to protect them or their family from the virus and 45.4 % they don't know while 10.6 % they said yes. When they asked how to protect themselves from mosquito's bite or decrease the mosquito's exposure 64.1% said all of above (keep the environment clean, clean the body and hands and sterilization of water, don't keep collect water) while 20.1% don't know the exact protection way.

**Conclusion:** There is lack of public knowledge about Zika infection transmission, symptoms, treatment and prevention, thus needs more education by health facilities and social media.

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#### Introduction

Zika virus infection is a rapidly evolving disease currently spreading in the continental United States and in US territories, the Caribbean, North America, Central America, and South America. The current outbreak has been in the news regularly since the Pan American Health Organization identified the first case in May 2015 [1].

The US Centers for Disease Control and Prevention (CDC) predicted that the high volume of travel to Brazil for the Olympics would increase Zika distribution worldwide, with the potential to increase the regions of spread in the current outbreak by 19 countries [2].

In 1947 in the Zika forest of Uganda, the first samples of the virus were isolated from a captive rhesus monkey. The next year, scientists recovered the virus from an *Aedes africanus* mosquito in the same forest [3]. Four years later, the first cases of the Zika virus were found in humans, both in

Uganda and the United Republic of Tanzania [4]. In 2007, the first largest outbreak of Zika was found on the Pacific Island of Yap with 185 suspected cases. Prior to this, only 14 cases of Zika had ever been documented, hence the concern; although other cases were likely to have occurred and were not reported. Outbreaks of Zika have been reported in tropical Africa, Southeast Asia, and the Pacific Islands [5]. Because the symptoms of Zika are similar to those of many other diseases, many cases may not have been recognized and thus measures of prevention are not being held out. As of February 2016, Brazilian national authorities estimate 500,000 to 1.5 million cases of the Zika virus and a total of 39 countries reporting local circulation of the disease [6].

The Zika virus does not cause severe disease in a healthy individual, affected individuals may not even show symptoms [7]. In pregnant women, it can cause their baby to be born with microcephaly thus the reason for large concern [8]. Additionally, there has been an increase in the incidence of Guillain-Barre Syndrome in regions of Zika virus affection [9]. Saudi Arabia has not reported of any cases of the presence of Zika virus, and to continue to prevent Zika virus in Saudi Arabia residents it is important to assess the knowledge of the residents regarding the spread of the virus, concern and its prevention [10].

In Africa, Zika virus exists in a sylvatic transmission cycle involving nonhuman primates and forest-dwelling species of aedes mosquitoes. In Asia, a sylvatic transmission cycle has not yet been identified. Several mosquito species, primarily belonging to the *stegomyia* and *diceromyia* subgenera of aedes, including *A. africanus*, *A. luteocephalus*, *A. furcifer*, and *A. taylori*, are likely enzootic vectors in Africa and Asia [3,11].

The incubation period for Zika virus is unknown, but if it is similar to that of other mosquito-borne flaviviruses, it is expected to be generally less than 1 week. In one volunteer, a febrile illness of 4 days' duration developed 82 hours after subcutaneous inoculation of Zika virus [12].

Common symptoms were macular or papular rash (90% of patients), fever (65%), arthritis or arthralgia (65%), nonpurulent conjunctivitis (55%), myalgia (48%), headache (45%), retro-orbital pain (39%), edema (19%), and vomiting (10%). No patient was hospitalized during the outbreak in Yap. These common symptoms occurred at frequencies similar to those in the Yap outbreak in a cohort of pregnant women with Zika virus infection in Brazil.<sup>69</sup> The rash is generally maculopapular and pruritic,<sup>69</sup> and fever, when present, is generally short-term and low-grade [13, 14].

Microcephaly is a clinical finding of a small head size for gestational age and sex and is indicative of an underlying problem with the growth of the brain. The findings of Zika virus RNA in the amniotic fluid of fetuses with microcephaly and in the brain tissue of fetuses and infants with microcephaly, as well as the high rates of microcephaly among infants born to mothers with proven antecedent acute Zika virus infection,<sup>69</sup> provide strong evidence linking microcephaly to maternal Zika virus infection [15, 16].

The mainstays of the routine diagnosis of Zika virus infection are the detection of viral nucleic acid by RT-PCR and the detection of IgM antibodies by IgM-capture enzyme-linked immunosorbent assay (MAC-ELISA). The detection of viral nucleic acid in serum provides a definitive diagnosis; however, in most instances viremia is transient, and diagnosis by RT-PCR has been most successful within 1 week after the onset of clinical illness [17,18,19].

As with the other mosquito-borne flaviviruses, treatment for uncomplicated Zika virus infection focuses on symptoms. No Zika virus vaccine exists; thus, prevention and control measures center on avoiding mosquito bites, reducing sexual transmission, and controlling the mosquito vector. Potentially effective methods of prevention that are focused on reducing infections among pregnant women include avoiding unnecessary travel to areas of ongoing Zika virus transmission, avoiding unprotected sexual contact with partners who are at risk for Zika virus infection,<sup>103</sup> and using mosquito repellent, permethrin treatment for clothing, bed nets, window screens, and air conditioning. The most effective *A. aegypti* vector control relies on an integrated approach that involves elimination of *A. aegypti* mosquito breeding sites, application of larvicides, and application of insecticides to kill adult mosquitoes [20,21,22].

The underlying reasons for the emergence of Zika virus in the past decade are unknown. Recent global increases in the incidence and spread of dengue, chikungunya, and now Zika virus — all with *A. aegypti* as the primary vector — suggest common underlying mechanisms for their emergence, such as globalization and urbanization [23].

## Problem Statement

After the outbreak of the Zika virus, there was a sharp rise in the incidence of the number of cases of microcephaly in the areas affected by the virus thus, indicating a link between the two. Microcephaly is a congenital malformation, which is associated with serious complications such as cerebral damage, thereby causing a concern about the Zika virus and stressing upon its prevention.

The current study aimed to assess the knowledge and attitude of the Saudi residents in regards to the Zika virus epidemic.

## Methods

### Study design and population

The present study was conducted Jeddah, from June 2016 to July 2016. The study was initiated after getting approval from the Institutional Ethical Committee, Ministry of Health, KSA. The method of study is a cross-sectional survey using a validated Google Forms (Online Survey) Tool [24] and the Population included in this study were selected in purposeful random method.

### Statistical analysis

All the data of the study populations was entered into Microsoft excel spreadsheet and descriptive statistics were used for demographic characteristics. Association of respondent's knowledge score with sex, age group, educational level and income was analyzed by Chi-square test using Graph pad prism.  $p \leq 0.05$  were considered significant.

## Results

The total sample size of the present study was 284 members, of which 187 were males and 97 were females. There was no statistical difference regarding Zika virus infection in the knowledge between both genders. Poor knowledge was observed in 61% of male and 71.21% of female out of the total respondents as shown in Fig. 1.

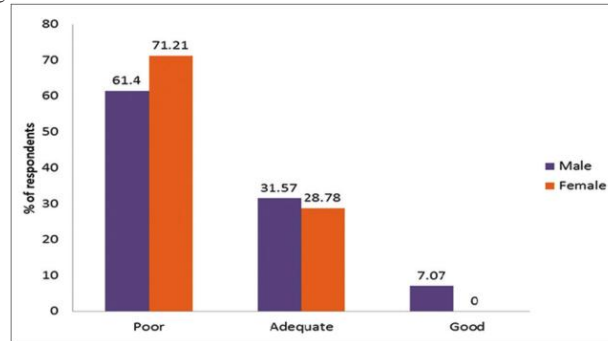


Fig. 1: Knowledge based on gender distribution

Out of total respondents, 64 (35.55%) were between the age group 26-35 years, followed by 53 (29.44%) in between the age group 36-45 years, 34 (18.89%) in between the age group >45 years then finally 29 (16.11%) in between the age group 18-25 years. There was no statistical difference regarding Zika virus infection in the knowledge between age groups. The results were presented in Fig. 2.

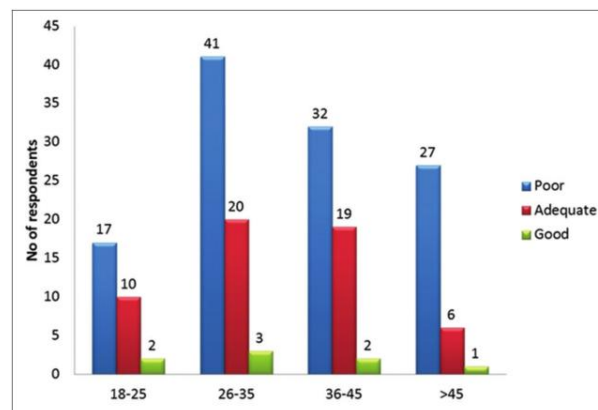


Fig. 2: Knowledge based on age group distribution

Total distribution of respondents with respect to education level shows that majority of respondents were found by completing secondary schooling with 66 (36.7%), followed by no education with 50 (27.8%), primary schooling in 45 (25%), and finally completing graduate with 19 (10.5%). There was significant difference in knowledge between education level groups ( $p < 0.0001$ ). The percentage of respondents with good knowledge was low in primary and secondary education level and high in graduates with 36.8% as represented in Fig. 3.

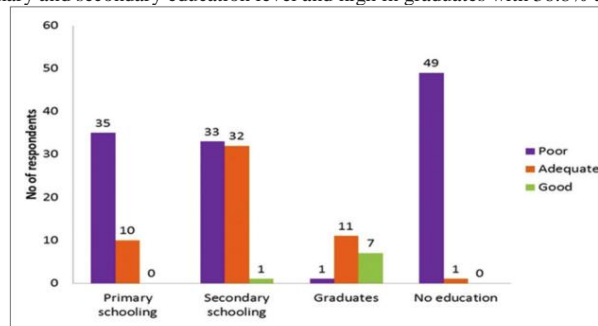


Fig. 3: Knowledge based on education level

35.6% of them didn't hear about Zika virus, while 30.6% heard about the virus in the previous few months and 26% knew about it in the last year. Among those who heard about the virus, only very little knew about it years ago. The majority of them didn't know someone who has been infected with Zika virus. Most of them said they don't know the cause of fever if someone of their family had it. 46% said they don't know the route of transmission of Zika virus, while 32% said that the cause are mosquitoes. The remaining 22% had different answers distributed between (sexually transmitted, pollution, and dirty environment). More than half of them didn't know the symptoms of Zika virus infection. 9.5% said that the symptoms are fever and headache. 33% said that fever and headache, joints pain, rash, fatigue and red eyes all are symptoms of the virus.

39% said yes there is a prevention way to protect against the virus, while 30% said maybe, 30% didn't know, and very few said no. 41% of respondents who knew a prevention way against the virus didn't know the exact way, while 47% said the mosquito's protection way.

About 46 % don't know if there is a treatment of Zika virus infection while about 11 % they said yes there is a treatment (Fig 4). Most of them don't know the word (microcephaly) means. When asked about if the pregnant women infected with the virus what is the side effect, about 150 responses (52.8%) said don't know, while 20.8 % said all of above (abortion, infected with virus, microcephaly of baby, difficulty of labor, malformation of baby, affected next baby). 55.6% didn't take any pregnancy prevention measure to protect from the virus while only 5.3 % take a prevention way (Fig. 5). The majority of them 57 % don't take any measure to protect themselves from the virus, 39.4% who said no they don't know how to protect themselves. 44% don't know if there is a national or global organization to protect them or their family from the virus and 45.4 % they don't know while 10.6 % they said yes. When they asked how to protect themselves from mosquito's bite or decrease the mosquito's exposure 64.1% said all of above (keep the environment clean, clean the body and hands and sterilization of water, don't keep collect water) while 20.1% don't know the exact protection way.

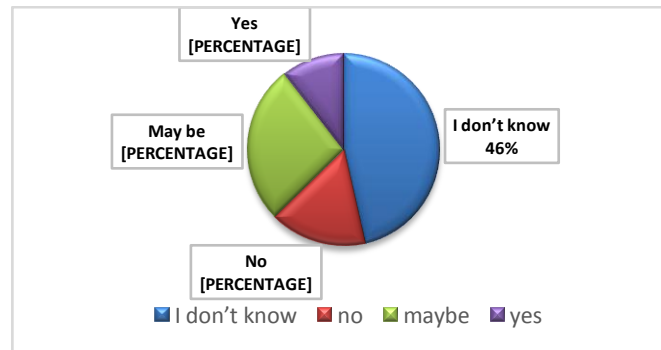


Fig. 4: Knowledge based on Zika virus Treatment

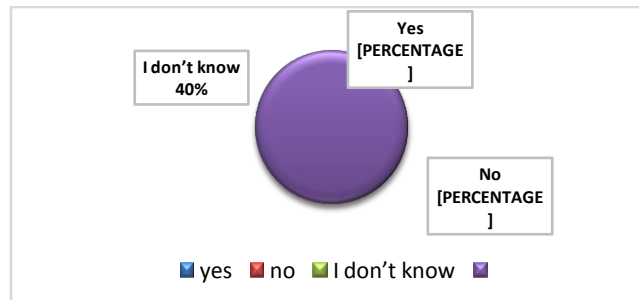


Fig. 5: Knowledge based on Zika virus Prevention during Pregnancy

## Discussion

The Zika could a potentially devastating disease affecting the lives of many. As an emerging threat, it is important to recognize how much the public understands about the Zika virus and whether they are familiar with the preventative measures and applying their knowledge to help prevent disease.

A total of 284 participants answered a questionnaire created to evaluate the knowledge about the virus and the results were variable, but the common theme from the results was that raising awareness about all aspects of the disease and its prevention is essential. According to whether the public knew about the Zika virus or not, the majority of people who answered the questionnaire were aware about the Zika virus. A similar result was received by the Harvard Opinion Research Program, which conducted a poll regarding the public's response regarding the Zika virus. Their survey also conveyed that the majority of their participants knew about the Zika virus [25]. A study regarding public knowledge done by the Harris Poll also showed that 'that three out of four Americans are very or somewhat familiar with the Zika virus' [26]. The consistent results through the three studies show that whether in Jeddah or the United States, the public is aware of the emerging of the Zika virus.

Even though our questionnaire indicated that the majority of the participants did know of the Zika virus, but majority of them did not know what symptoms a person of the Zika virus would present with neither did they show understanding that a person infected with the virus would most likely now show any symptoms. 9.5% of the participants said the symptoms were fever and headache and 33% answered fever, headache, joint pain, rash, fatigue and red eyes were symptoms of the virus and 56% which is the majority of the participants, did not know what the symptoms are. Likewise, in the Harvard survey referred to previously, 71% of the participants said that people with Zika would most likely show symptoms [26], which is not true as people affected by the Zika virus usually do not show any symptoms. This was also indicated in the article published in *Journal of American Medical Association* (JAMA) that mentioned that 80% of the Zika infections are usually asymptomatic, and due to that "individuals make not take precautions to avoid transmission" [28].

Regarding understanding about whether the Zika virus would affect pregnant ladies adversely, 52.8% of the participants denied that they knew about the effects of the virus on pregnancy. Additionally, a survey done by the Harris Polls in the United States found that not a lot of people

understood that a fetus can contract Zika from an infected mother and that Zika can adversely affect the brains fetus inside the womb [27,28]. However, inconsistent results were gathered by a poll done by The Associated Press-NORC Center for Public Affairs Research. This poll showed that two thirds of the participants knew about the birth defects associated with the Zika virus [29]. The discrepancy between this study and our study might be due to the fact that there were 312 confirmed Zika virus cases in the United States and this could have led to increasing awareness among Americans. Meanwhile, there have been no confirmed cases in Saudi Arabia leading a limited amount of knowledge of the virus. The difference between the two American studies might be due to the amount of participants that participated in the studies. The study done by the Harris Polls included 2,026, while the study done by The Associated Press included 1,004 adults [26].

In respect to the treatment of the Zika virus, about 40% of the participants said they did not know of any treatment for the virus, about 9% said there was a treatment, 36.3% said there might be a treatment and 14.1% said there is no treatment. This indicates that there is clearly a lack of knowledge regarding the treatment availability of the Zika virus. It is important for the public to realize that there is no treatment currently available for Zika and therefore, all measures should be done to prevent getting affected by the virus and consequently. Likewise, the poll done by The Associated Press-NORC Center for Public Affairs Research, Americans are unclear about the unavailability of any sort of treatment of the virus [29]. Additionally, our survey indicates that the majority of the population has very little knowledge of how the measures of prevention that one needs to take in order to prevent mosquito bites. For example, 64.1% of the participants mentioned that keeping the environment clean, sterilization of water, cleaning the body and hands, and removing collected water are all a part of preventing mosquito bites. 20.1% of the participants did not know how to prevent the virus. This indicates that there is gap in the public knowledge of prevention and the public isn't aware of other measures such as using mosquito nets and insect replants to prevent mosquito bites neither are they aware that the virus could be sexually transmitted and the use of condoms is a method of prevention of the spread of the virus. Likewise, the Harris Poll also established through their survey that 'there's a significant lack of understanding regarding the other ways Zika can be transmitted' and thus prevented [29], therefore indicating that awareness about prevention and transmission of the Zika virus needs to be introduced to a further extent, including awareness about other methods of prevention as indicated by the article published in the *Infectious Disease of Poverty Journal* "The Global Spread of Zika" which says "Aedes mosquitoes are active and bite during the day, so use of an effective repellent is highly recommended. The fitting of house door and window screens, use of air-conditioning, removal of yard and household debris and containers (e.g. disposed tyres, broken bowls and cups, flower vases) that provide breeding sites for mosquitoes, are all measures that contribute to control of the vector within a local community" [30].

The above analysis of the results is indicative of the fact that the public is aware of the presence of Zika virus to a certain extent most probably due to social media and television news channels; however, there is a limited amount of knowledge that people have regarding this issue for example the treatment, the symptoms, and the link to birth defects. Raising awareness about this issue is imperative to prevent the virus from spreading and eventually eradicating it.

The findings in this report are subject to a couple of limitations. First, our research includes the responses of 284 participants. The number of responses may not be enough to gather enough information regarding the knowledge of the Zika virus. Despite having 284 responses, the majority of the respondents were of ages between 20-30 while only 12% were below the age of 20 and 12% were above the age of 20. This is another limitation that was faced in this research. In order to gain a complete idea of the knowledge of the public, a wider scope of participants with a more variety of ages including more participants above and below the age of 20 and 30 is needed. Lastly, this research only represents the information in Jeddah and no other city in Saudi Arabia.

## Conclusion

In conclusion, our research demonstrates that awareness about the Zika virus and its prevention and other factors related to the virus is needed. Despite the public being aware of the presence of the virus, there is lack of knowledge about the symptoms, treatment and prevention and thus more education should be provided by health facilities.

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