

Knowledge and practices related to dengue and its vector: a community-based study from Southeast Brazil

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ABSTRACT

Introduction: This study investigated the knowledge of users of primary healthcare services living in Ribeirão Preto, Brazil, about dengue and its vector. **Methods:** A cross-sectional survey of 605 people was conducted following a major dengue outbreak in 2013. **Results:** Participants with higher levels of education were more likely to identify correctly the vector of the disease. **Conclusions:** The results emphasize the relevance of health education programs, the continuous promotion of educational campaigns in the media, the role of the television as a source of information, and the importance of motivating the population to control the vector.

Keywords: Knowledge. Attitude. Dengue vector.

Vector control, the most important strategy to prevent and control dengue, requires the cooperation of entire communities, as it is not solely a government responsibility. Communities should be educated about eliminating the potential for breeding and other prevention strategies, which requires an understanding of their knowledge and practices concerning dengue. There is a gap between knowledge and attitudes about dengue in various Brazilian regions⁽¹⁾⁽²⁾. Thus, this cross-sectional study investigated the knowledge of adults who are users of primary healthcare services of Ribeirão Preto, in Southeast Brazil, about dengue and its vector (transmission, symptoms, prevention, and treatment), and their source of the information and health practices.

The municipality of Ribeirão Preto, is divided into five health districts, consisting of 41 primary healthcare units with diverse demographic characteristics⁽³⁾. For sampling purposes, the healthcare units were classified using the São Paulo Social Vulnerability Index [Índice Paulista de Vulnerabilidade Social (IPVS)], based on their predominant areas of coverage. The IPVS, proposed by the State Data Analysis System Foundation, classifies geographical areas into six categories of social vulnerability. Thus, the units were grouped by health district and IPVS classification to form 10 strata. One unit was randomly selected from each stratum for the interviews. The minimum

sample size of 605 individuals was determined using a stratified sampling design, a confidence coefficient of 0.95, and an absolute precision of 0.04 for the proportion of individuals with satisfactory knowledge about dengue control. In 2008, 52% of the municipality's urban population had exclusive use of the public healthcare resources and 80% used these services at some time⁽³⁾. Thus, this study's sample of 605 participants is considered representative of the municipality's population.

Individuals were invited to participate in the study while they waited for medical care in the health units. A poster created using colorful images obtained from the Internet of the *Aedes aegypti* mosquito and seven other insects (*Rodnius prolixus*, *Angarotipula sp.*, *Anopheles gambiae*, *Palexorista sp.*, *Polistes metricus*, *Tabanus sp.*, and *Culex sp.*), was used to assess participants' ability to identify the dengue vector. *Aedes albopictus*, first reported in São Paulo State in September 1986⁽⁴⁾, was not included because its vector competence for dengue viruses in Brazil remains uncertain⁽⁵⁾.

Data were collected from July 2013 to September 2014, following a major dengue outbreak. All data were collected before the first autochthonous transmission of the chikungunya virus in Brazil that was detected in September 2014⁽⁶⁾. Thus, there was no possibility of confusion between the two different diseases. The proportions of respondents who correctly identified the dengue vector were analyzed using the general linear model and SAS software version 9.3.

The respondents' characteristics are presented in **Table 1**. The disproportionate number of women in the study was consistent with gender differences in the use of primary healthcare services in Brazil⁽⁷⁾. The percentage of respondents claiming to have dengue previously (26.9%) is imprecise because

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Received 14 July 2015

Accepted 23 September 2015

TABLE 1 - Participants' demographic characteristics and their knowledge and attitudes about dengue.

Characteristics	Total (n = 605)		Women (n = 414)		Men (n = 191)	
	n	%	n	%	n	%
Age groups (years)						
< 25	119	19.7	91	22.0	28	14.7
26 to 30	81	13.4	62	15.0	19	9.9
31 to 40	133	22.0	98	23.7	35	18.3
41 to 50	103	17.0	69	16.7	34	17.8
51 to 60	75	12.4	45	10.8	30	15.7
> 60	94	15.5	49	11.8	45	23.6
Education levels						
illiterate	14	2.3	9	2.2	5	2.6
incomplete primary education	118	19.5	71	17.1	47	24.6
complete primary education	164	27.1	103	24.9	61	31.9
complete secondary education	252	41.7	191	46.1	61	31.9
university education	57	9.4	40	9.7	17	8.9
Internet Access						
yes	372	61.5	279	67.4	93	48.7
no	233	38.5	135	32.6	98	51.3
Perception of health						
good	438	72.4	308	74.4	130	68.1
regular	149	24.6	94	22.7	55	28.8
poor	18	3.0	12	2.9	6	3.1
Have you ever had dengue fever?						
yes	163	26.9	115	27.8	48	25.1
no	442	73.1	299	72.2	143	74.9
If so, how many times have you had dengue fever? (n = 163)						
one	136	83.4	93	80.9	43	89.6
two	22	13.5	18	15.7	4	8.3
three	3	1.8	3	2.6	0	-
four	1	0.6	1	0.8	0	-
five	1	0.6	0	-	1	2.1
What medicine did you used to treat the dengue? (n = 163)*						
Paracetamol	72	44.2	51	44.3	21	43.7
saline solution	53	32.5	37	32.2	16	33.3
dipyrone	28	17.2	22	19.1	6	12.5
drank lots of water	6	3.7	6	5.2	0	-
did not use anything	16	9.8	12	10.4	4	8.3
do not remember	23	14.1	13	11.3	10	20.8

*Respondents were allowed to choose more than one answer.

dengue may easily be confused with other causes of fever, its clinical manifestations are not always present⁽⁸⁾, and not all suspected cases are laboratory confirmed during epidemics⁽⁹⁾. Most of the respondents did not correctly identify the time of day that mosquitos bite (**Table 2**). More than half reported that mosquitoes bite at any time. This belief is not entirely wrong because although their activity is predominantly diurnal⁽¹⁰⁾, mosquitoes bite at any time if there is enough ambient light.

However, accurate knowledge of the *Aedes*' biting habits is important, as mosquito repellents will be ineffective if used at night. Among the 11 respondents who believed that dengue is transmitted through standing water, three completed secondary education, five completed primary education, and three had not completed primary education. A large number of respondents did not know the number of times a person could have dengue fever; only 3.5% responded that it was four times.

TABLE 2 - Participants' knowledge of dengue and their perceptions of the risk of becoming infected with dengue.

Knowledge and perceptions	Total (n = 605)		Women (n = 414)		Men (n = 191)	
	n	%	n	%	n	%
Perception of risk of dengue infection						
very high	84	13.9	57	13.8	27	14.1
high	216	35.7	144	34.8	72	37.7
medium	180	29.8	130	31.4	50	26.2
low	66	10.9	45	10.9	21	11.0
very low	17	2.8	10	2.4	7	3.7
do not know	42	6.9	28	6.7	14	7.3
How serious is the dengue infection?						
very serious	524	86.6	367	88.7	157	82.2
more or less serious	72	11.9	44	10.6	28	14.7
it is not serious	4	0.7	2	0.5	2	1.0
do not know	5	0.8	1	0.2	4	2.1
How is dengue fever transmitted?						
through a mosquito	592	97.9	407	98.3	185	96.9
through standing water	11	1.8	6	1.4	5	2.6
do not know	2	0.3	1	0.2	1	0.5
What time of year do most cases of dengue occur?						
rainy periods	371	61.3	248	59.9	123	64.4
at any time of the year	188	31.1	136	32.8	52	27.2
during periods without rain	28	4.6	19	4.6	9	4.7
do not know	18	3.0	11	2.7	7	3.7
How many times can a person have dengue?						
only once	23	3.8	18	4.3	5	2.6
two times	110	18.2	74	17.9	36	18.8
up to three times	123	20.3	78	18.8	45	23.6
up to four times	21	3.5	16	3.9	5	2.6
there is no limit to the number of times	155	25.6	115	27.8	40	20.9
do not know	173	28.6	113	27.3	60	31.4
The mosquito that transmits dengue has the habit of biting people:						
during the day	216	35.7	153	37.0	63	33.0
during the night	36	5.9	29	7.0	7	3.6
at any time	321	53.1	212	51.2	109	57.1
do not know	32	5.3	20	4.8	12	6.3

Television was the main source of information about dengue (87.8%), followed by pamphlets/posters (41.8%), internet (17.5%), hospitals and health units (17.4%), radio (12.2%), newspapers (9.7%), children's schools (5.6%), friends (4.6%), relatives (4.3%), schools, colleges, or faculty (4%), and church or religious groups (2.2%). The percentage of respondents who cited the internet as an information source ranged from 0% (illiterate) to 45.6% (university-educated). During data collection, several of the educational pamphlets/posters in the health units were found to represent the mosquito in a very stylized and often humanized form, with wicked

facial expressions, similar to cartoon characters, as if dengue transmission is a rational act. Exposure to these metaphors could have adversely affected respondents' ability to identify realistic pictures of the vector and their understanding of the dynamics of disease transmission.

When asked to list dengue symptoms, most (79.7%) participants listed fever, which is similar to other studies⁽¹¹⁾⁽¹²⁾⁽¹³⁾. This result was probably due to educational messages in the mass media, citing fever as dengue's primary symptom⁽¹¹⁾. The recognition of dengue symptoms is crucial for early treatment⁽¹³⁾. Other symptoms reported by participants in descending order

TABLE 3 - Characteristics of the respondents who correctly identified the dengue vector.

Characteristics	Total	Vector correctly identified		Proportion ratio (95% CI)
		n	%	
Sex				
men	191	124	64.9	Reference
women	414	295	71.3	1.10 (0.97 – 1.24)
Age groups (years)				
< 25 years	119	100	84.0	Reference
26 to 30	81	66	81.5	0.96 (0.85 – 1.10)
31 to 40	133	100	75.2	0.89 (0.78 – 1.01)
41 to 50	103	60	58.3	0.69 (0.57 – 0.83)*
51 to 60	75	49	65.3	0.78 (0.64 – 0.93)*
> 60	94	44	46.8	0.55 (0.44 – 0.70)*
Educational levels				
illiterate	14	5	35.7	Reference
incomplete primary education	118	64	54.2	1.52 (0.73 – 3.13)
complete primary education	164	104	63.4	1.77 (0.87 – 3.62)
complete secondary education	252	197	78.2	2.19 (1.08 – 4.43)*
university education	57	49	86.0	2.41 (1.18 – 4.90)*
Internet Access				
no	233	127	54.5	Reference
yes	372	292	78.5	1.44 (1.07 – 1.64)*
Health perception				
good	438	316	72.1	Reference
regular	149	92	61.7	0.85 (0.58 – 1.23)
poor	18	11	61.1	0.85 (0.74 – 0.98)
Use of mosquito repellent				
no	500	333	66.6	Reference
yes	63	50	79.4	1.19 (1.03 – 1.37)*
sometimes	42	36	85.7	1.28 (1.12 – 1.48)*

95% CI: confidence interval; CI that does not include the value 1 are marked with an asterisk and they indicate significant differences at 0.05 level.

of frequency were muscular pain (66.6%), headache (65.1%), redness of the skin (36%), pain behind the eyes (26.1%), fatigue (20.8%), joint pain (17.4%), vomiting (16.2%), diarrhea (15%), malaise (5.8%), itch (5.1%), nausea (4.5%), loss of appetite (4.3%), dizziness (1.5%), and weakness (1.2%).

Only 10.4% of respondents used mosquito repellent regularly; fewer used homemade repellents (e.g., citronella oil and alcohol with Indian clove). The proportion of respondents who used repellent regularly showed a gradual increase with educational level, ranging from 7.1% among the illiterate respondents to 21.1% among the respondents with a university education.

Participants' answers to an open-ended question about ways to prevent dengue revealed that only 8.8% believed that avoiding dengue was impossible or did not know how to avoid

it. Other methods included not allowing standing water to accumulate (67.4%), maintaining hygiene and cleanliness in the environment (21.3%), preventing mosquito proliferation (9.4%), increasing public awareness and knowledge (8.1%), not leaving potential breeding environments exposed (tires, buckets, water tanks, and water drains) (7.3%), cooperating with local governments and health surveillance, encouraging public investments in sanitation services (3.5%), and following the instructions of health surveillance or community-based health workers e.g., allowing home inspections (0.7%).

In response to an open-ended question about what participants actually did to prevent dengue, 9.9% believed it was possible to avoid dengue, but did nothing to prevent it. The most frequent answers were avoiding the accumulation of standing water (44.3%) and keeping the house and/or yard clean (23%).

When respondents were shown the poster to identify the insects responsible for dengue fever transmission, 3.5% said they did not know. The remaining respondents identified more than one insect; 69.3% correctly identified *Aedes aegypti*, 12.1% indicated *Angronotipula sp.* (a crane fly), 8.3% chose *Culex sp.*, and 6.1% indicated *Anopheles gambiae*. Two respondents selected *Rodnius prolixus*, two chose the fly, *Palexorista sp.* and the wasp, *Polistes metricus*, while three respondents answered that none of the insects on the poster transmit dengue.

The correct identification of the dengue vector varied with respondents' age and education (**Table 3**). The proportion of correct identifications decreased from 84% among the respondents under 25 years of age to 46.8% among those above 60 years of age. Higher educational level and internet access increased the likelihood of identifying the vector, with a proportion ratio (PR) of 1.44 [95% confidence interval (95% CI): 1.07-1.64] compared to those without internet access. This finding was still significant when the model was adjusted for age (PR = 1.24, 95% CI: 1.07-1.44) or educational level (PR = 1.27, 95% CI: 95%: 1.10-1.47). The proportion of correct identifications of the vector was significantly higher among respondents who used mosquito repellent sometimes or regularly, and the results remained significant after adjusting for age or educational level.

This study's limitation is that the results cannot be generalized to a broader population. However, they are similar to those of other studies^{(1) (2) (11) (12) (13)}, and they reinforce the relevance of health education programs, the continuous promotion of educational campaigns in the media, the role of television as a source of information, and the importance of motivating people to control the vector.

Recently, a phase 3 efficacy trial showed that a tetravalent dengue vaccine was efficacious against virologically confirmed dengue⁽¹⁴⁾, which brings new hope for control of the disease. However, efforts must continue to improve mosquito control, given the likely rise of other arboviruses transmitted by *Aedes* mosquitoes, such as the Zika virus infection, identified the first time in Brazil in 2015⁽¹⁵⁾, and Chikungunya fever, first detected in Brazil in 2014⁽⁶⁾.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

FINANCIAL SUPPORT

This work has received financial support by National Counsel of Technological and Scientific Development [*Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq)] (Process 305942/2012-3).

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