Experience and perception of risk associated with knowledge, attitudes and practices regarding dengue in Riohacha, Colombia

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Abstract *Recognition of the determinants of knowledge, attitudes and practices (KAP), which could be conditioned by the experiences and perceptions of the population at risk, is essential for the control of dengue. The scope of this article is to estimate the relationship between the risk perception and dengue diagnosis experiences with KAPs on dengue in an endemic Colombian population. A cross-sectional study with multi-stage random sampling was conducted. Adjusted prevalence ratios (aPR) were estimated using regression models as measures of association. Of the 206 families interviewed, 7% know dengue is caused by a virus and less than 40% recognize other symptoms besides fever. As control strategies, 31% eliminate hatchery sites and 58% use fumigation, though 73% perceive the risk of dengue. The association was identified between the perception of the risk of dengue and knowledge about the vector (aPR = 3.32 CI95% 1.06–10.36), and the experience of diagnosis of dengue with the attitude towards dengue control (aPR = 1.61 CI95% 1.09–2.37). Risk perception and experience with dengue could become determinants of KAPs in relation to this disease.*

Key words *Knowledge, attitudes and practices (KAP) in health, Dengue, Perception, Risk*

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Introduction

Dengue is a viral disease transmitted through the *Aedes* mosquito bite. These mosquitoes also participate in the transmission of other diseases, such as Yellow Fever, Chikungunya, and Zika[1]. No specific antiviral therapy is currently available. Therefore, action taken against the reproduction of the vector, and to avoid the mosquito bite is a crucial strategic approach[2]. Nonetheless, its management and implementation require the involvement of numerous public sectors[3], where the community plays a leading role[4].

The occurrence of dengue cases globally has shown an upward trend in the last decades. By 2008, a little over 1,2 million cases were registered in the Americas, South East Asia, and the Western Pacific. By 2013, these cases doubled. Moreover, by 2015, 2,35 million cases had been notified only in the Americas Region[5]. This increase has been accompanied by an elevated mortality rate in Latin American and Caribbean countries, tripling every ten years[6].

Dengue is a primary public health issue in Colombia. It is characterized by an endemoepidemic and hyperendemic transmission pattern[3]. Notably, the department of La Guajira has reported seasonal outbreaks every four years between 1999 and 2010; and 34,7% of the cases were situated in its capital city, Riohacha[3]. The municipality of Riohacha's circumstances have favored the permanence of dengue in this population, such as urban overcrowded areas, poor sewerage system and waste disposal, limited control measures against the vector, and inadequate public health infrastructure[7].

The PAHO and the WHO emphasize that the community must commit itself to the control measures. Thus, programs ought to be structured considering the perspectives within the community, identifying the barriers that prevent it from bringing about a change in behavior, and guiding the organization of such programs in consistency with local necessities and realities[8]. For this purpose, an important step is the acquisition of information on Knowledge, Attitudes, and Practices (KAP) concerning the disease[9], which will help the community to be strategically involved through participatory research[10].

Countless studies have been carried out on dengue KAP in endemic Latin American areas, for instance, Brazil[11,12], Cuba[13], Venezuela[14], Puerto Rico[15], and Peru[16], as well as in other countries like Malaysia[17-19], India[20], Australia[21], and Pakistan[22]. Nevertheless, these studies have not assessed how risk perception and the experience of dengue could determine KAP.

Evaluating this type of association could be a valuable contribution to the planning of prevention and control activities. Those mentioned above can provide a way to learn about the community that will be submitted to intervention, as well as beliefs that could facilitate or hinder a change in behavior.

Concerning the above, this research is the first in Colombia which aimed to estimate the association of risk perception and experience with dengue, with factors such as knowledge about the disease and its transmission, the application of practices, and a willing attitude aimed at the control of such arbovirus.

Materials and methods

A cross-sectional analytical study nested in a cohort study was conducted in the department of La Guajira and other departments of the Colombian Caribbean region[23]. Concerning the selection of participants, a cluster and multistage sampling were conducted in which, initially, the city blocks were randomly selected, and for each block, the participant households were then selected randomly. The target population included only adults and permanent residents in the household selected to take part in the study. The participants who were planning to change their household in the following six months were excluded.

In the same visit, two questionnaires were conducted in order to collect data. The first one aimed to evaluate the KAP, validated by Caceres-Manrique et al.[24], which contained 21 questions about knowledge and practices, 12 questions about attitudes, and nine questions concerning demographic data. Details on this questionnaire can be found in a previous article, which focused on the association between the educational level and the KAP[25].

The second questionnaire aimed to assess the determinants of perceived demand in dengue vaccines[26]. This last questionnaire was built from a data collection instrument implemented in a multi-country study, carried out in Vietnam, Thailand, and Colombia[27]. It contains eight questions about the experience with the disease and four questions about dengue risk perception (Table 1). The latter are related to the Health Belief Model by Hochbaum and Rosenstock[28,29]. Thus, elements, such as the perceived susceptibility to

becoming ill and the perceived severity in case of falling ill, were combined.

Regarding the collected data storage, an application in Access was employed, where data was double entered. The information was validated with the package Data Compare by Epi-Info. Concerning the description of the population, the absolute and relative frequencies were calculated in the case of the qualitative variables. On the other hand, the median and the interquartile range were calculated for the quantitative variables without a normal distribution.

As dependent variables, the KAP about dengue were considered, referred by the participants of the study. In the case of the open-ended questions, the responses were classified before the analysis. As independent variables, the following were considered: the perceived risk of falling ill; and the experience with dengue cases (diagnosed, hospitalized, and death from dengue) in the personal, family, and neighborhood levels. Moreover, as potentially confounding variables, the demographic variables including age, sex, educational level[25], inhabitants per dwelling, number of working people, and the presence of under 18-years-olds in the place of household were taken into consideration.

Fisher's exact test and the Mann–Whitney U test were applied in the bivariate analysis depending on the nature of the variable. The associations identified, which p-value was lower than 0.20, were evaluated in a multiple model employing log-binominal regression. In the models, statistically significant variables ($p < 0.05$) were maintained, including those who modified the estimate of the independent variable of interest

Table 1. Sociodemographic description, risk perception of dengue, and experience with dengue of the surveyed population in Riohacha - La Guajira. 2015.

Sociodemographic Variables	n	n (%)
Gender: Female	205	164 (80)
Age (years): under 30	204	32 (16)
From 30 to 49		96 (47)
From 50 to 69		65 (32)
From 70 on		11 (5)
Educational None	200	9 (5)
Level: Primary		52 (26)
Secondary		73 (37)
Technical		30 (15)
University		36 (18)
Number of inhabitants per household	205	4 (1-11)[1]
Number of under 18-year-olds per household	205	2 (0 – 7)[1]
Monthly income per household:	202	
Does not report income		20 (10)
Up to 1 CLMW 2015[2]		105 (52)
More than 1 CLMW 2015[2]		77 (38)
Number of people working and earning money per household	205	2 (0 – 6)[1]
Variables of dengue risk perception		
Considers that dengue is a severe disease for children	203	202 (99,5)
Considers that dengue is a severe disease for adults	203	201 (99)
Considers that he/she might get dengue in the next five years	202	162 (80)
Considers that their children might get dengue in the next five years	203	148 (73)
Variables of experience with dengue		
Personal: Diagnosis	203	7 (3)
Hospitalization		3 (1)
Family: Diagnosis	203	46 (23)
Hospitalization		42 (21)
Death		3 (2)
Neighbor: Diagnosis	203	46 (23)
Hospitalization		42 (21)
Death		15 (8)

[1] Median (range). [2] Colombian Legal Minimum Wage 2015: $ 644.350 Colombian pesos (206.67 USD).

by more than 10%. Poisson regression with the robust variance option was employed as an alternative when the log-binomial model did not converge[30]. These models allowed determining the adjusted Prevalence Ratio (aPR), with its 95% Confidence Intervals (CI). The analyses were performed in the statistical software STATA 12.0.

The Research Ethics Committee approved the umbrella project (agreement 019, 2014) of the University of Santander, Bucaramanga, Santander, Colombia. The participants signed an informed consent form. The research complies with the Declaration of Helsinki and does not represent a risk for the participants according to Resolution 008430, 1993 of Colombia.

Results

Two hundred six households from the municipality of Riohacha were invited to participate, from October 31st to December 19th, 2015, to apply the two questionnaires. In total, 99,5% (n = 205) of the households participated in the first questionnaire, and 99% (n = 204) in the second one.

Most of the participants were women (80%), and an educational level between primary and secondary education prevailed. Nearly half of the respondents (47%) were aged between 30 and 49 years. The median of the number of inhabitants per dwelling was 4, and minors were found in 81% of the households. Also, 98% were working people, most households had an income of up to 1 Colombian legal minimum wage (SMLV, in Spanish), equivalent to 206.67 USD by 2015 (Table 1).

Concerning dengue risk perception, we observed that 99% of the respondents consider dengue a severe disease, both for adults and children. Furthermore, most of the respondents admitted the probability of contracting dengue themselves (80%) or their children (73%) in the next five years. As for the experience with dengue, more than 20% of the respondents refer to earlier cases in their family and neighbors, including the experience of having had been diagnosed (23%) and hospitalized (21%) (Table 1).

Concerning knowledge about dengue, most (75%) defined it as a disease and 7% related it to a viral etiology. Fever was the most referred symptom (95%). Meanwhile, the other symptoms that were questioned where recognized by less than 50% of the respondents. In what concerns knowledge of the vector, less than 40% of the respondents were aware that the name of the

mosquito is *Aedes aegypti* and that it is identified by the white stripes in its legs. Most indicated their understanding that dengue is transmitted by a mosquito bite, that it reproduces in stagnant water, either clean or due to rainfall; and knew about the mosquito larvae (Table 2).

Regarding practices, 97% indicated seeking medical care if a family member had dengue. Besides, in order to avoid dengue, the most prevalent actions were eliminating breeding areas and fumigating, each with a frequency of 31%. Regarding the measures taken to avoid the mosquito bite, 58% mentioned fumigating, and less than 15% referenced other practices (Table 2).

The dengue control attitude manifested through participation in community actions showed a frequency of less than 40% for most of the respondents (Table 2). Also, 56% of them considered that the lack of information hindered measures against dengue. Concerning the preventive measures for dengue, 62% estimated that the local government is the one responsible for carrying these out, while less than 50% noted that each member of the community shares the responsibility (Table 2).

When evaluating the variables associated with KAP in multiple models, it was gathered that general knowledge about dengue (how it is transmitted, name, and vector's appearance) was positively associated with risk perception (PR 3.32 95%CI 1.06-10.36) and the educational level (Table 3). As for the practices, measures against the adult stage of the vector were significantly less frequent among respondents who were not aware of whether their neighbors had been diagnosed with dengue (PR 0.57 95%CI 0.35-0.94).

Regarding the attitude towards dengue control, the attendance to meetings arranged by the community was directly associated with the experience of having been diagnosed with dengue (1.61 95%CI 1.09-2.37). This attitude was less frequent among those living with minors (0.56 95%CI 0.37-0.83). A positive association was observed between the experience with the hospitalization of a neighbor due to dengue and the acknowledgment of the responsibility of every person in the control of dengue (PR 1.52 95%CI 1.05-2.19). This attitude was less frequent among male respondents (Table 3).

Discussion

Risk perception of experiencing dengue was a factor associated with the general knowledge

Table 2. Knowledge, Attitudes, and Practices about dengue in Riohacha – La Guajira, 2015. (n = 205).

Observation	Description	n	%
Conocimiento	What is dengue for you?		
	A disease	154	75
	Related to a mosquito	107	52
	Related to a virus	14	7
	Does not know	11	5
	What are the symptoms of someone with dengue?		
	Fever	195	95
	Pain in the body	79	39
	Headache	89	43
	Bone pain	41	20
	Vomit	76	37
	Diarrhea	68	33
	Petechiae	23	11
	About the vector		
	Dengue transmission (n = 203)	175	86
	Name of the vector (n = 204)	46	23
	Its appearance (n = 205)	69	34
	Where it reproduces (n = 205)	155	76
	Knows the larvae (n = 205)	157	77
Actitudes	Reasons that difficult the implementation of measures against dengue		
	Lack of time	49	24
	Lack of information	115	56
	Lack of resources	40	20
	Entity in charge of taking preventive measures against dengue		
	Local government	128	62
	Medical staff	15	7
	Parents	31	15
	All	87	42
	Participation in community activities		
	Attends community meetings	64	31
	Participates in activities in the neighborhood	34	17
	Collection of disposables around the house	49	24
	Educates about preventing dengue	108	53
	Take action towards dengue control	85	41
	Considers that their suggestions are listened	110	54
	Leads dengue prevention campaigns	23	11
	Seeks help about dengue prevention campaigns	27	13
Prácticas	What do you do when a family member contracts dengue?		
	Take care at home	5	2
	Self-medicate	6	3
	Seek medical attention	198	97
	What do you do to avoid contracting dengue?		
	Do not take any measure	15	7
	Eliminate breeding areas	64	31
	Cover stagnant water	51	25
	Wash water deposits	37	18
	Fumigate	64	31
	Measures for blocking[1]	7	3
	What do you do to avoid the mosquito bite?		
	Does not take any measure	28	14
	Fumigate	118	58
	Use repellent[2]	52	25
	Use mosquito net or fan	13	6
	Measures against larvae[3]	7	3

Note: [1]Use of mosquito net, fan, repellent, or body-covering clothes. [2]Burn egg carton, menthol, alcohol, or white spirit. [3]Wash, cover water deposits, or eliminate breeding areas.

Table 3. Variables associated with knowledge, Attitudes, and Practices about dengue.

Outcome	Associated variables	cPR (95% CI)	aPR (95% CI)
General knowledge on the vector1 (n = 196). Log binomial	Perceives the risk of dengue[2]	3.88 (1.23 – 12.26)	3.32 (1.06 – 10.36)
	Higher educational level[3]	2.47 (1.30 – 4.69)	2.48 (1.29 – 4.74)
Knowledge about the vector's breeding areas4 (n = 193). Poisson robust variance	Dengue risk perception in children of up to five years of age		
	Does not perceive	1	1
	Perceives	0.78 (0.67 – 0.90)	0.80 (0.68 - 0.93)
	No response	0.78 (0.62 – 0.98)	0.77 (0.60 – 0.97)
	Higher educational level[3]	1.22 (1.05 – 1.41)	1.28 (1.09 – 1.49)
	Age in decades	1.05 (0.99 – 1.11)	1.07 (1.01 – 1.14)
Practices on taking measures against the adult stage of the vector5 (n = 201). Poisson robust variance	Neighbor's dengue diagnosis		
	No	1	1
	Yes	0.71 (0.43 – 1.17)	0.76 (0.47 – 1.24)
	DK/NR	0.54 (0.33 – 0.89)	0.57 (0.35 – 0.94)
	Age in decades	1.20 (1.07 – 1.35)	1.22 (1.09 – 1.37)
Attitudes of attending community meetings when they are summoned (n = 202). Log binomial	Experience with dengue diagnosis[6]	1.53 (1.02 – 2.28)	1.61 (1.09 – 2.37)
	Presence of under 18-year-olds	0.60 (0.40 – 0.91)	0.56 (0.37 – 0.83)
Attitude of considering that the person in charge of carrying out preventive measures is each person (n = 202). Log binomial	Hospitalization of a neighbor due to dengue		
	No	1	1
	Yes	1.55 (1.06 – 2.25)	1.52 (1.05 – 2.19)
	DK/NR	0.98 (0.66 – 1-46)	1.01 (0.68 – 1.49)
	Male respondents	0.52 (0.30 – 0.91)	0.55 (0.31 – 0.96)

[1]Knowledge about how dengue is transmitted, its appearance and its name. [2]Considers that dengue is a serious dengue for children and adults, and considers possible contracting dengue in the next five years. [3]Technical and university. [4]Stagnant, clean, or rainfall water. [5]Fumigate, use a mosquito net, fan, or repellent. [6]The respondent, a family member, or a neighbor, was diagnosed with dengue by a doctor.

of the vector and the knowledge of its breeding areas. This could suggest that recognition of the epidemiological situation can be a determinant in the acquisition of knowledge about dengue. Educational level and age are essential variables of adjustment as they had already been recognized as factors associated with knowledge about dengue and its transmission in the study population[25], as it was observed in Malaysia[17] and Brazil[11].

This suggests that the university community could be a facilitator in the knowledge transference. On a separate note, this also shows that the population with low educational levels would have significant barriers to acquiring knowledge relevant to the prevention of the disease[25].

A study in Puerto Rico evidenced that people who had had a previous diagnosis of dengue were more knowledgeable[15]. Nevertheless, in this study, experience with dengue was not associated with dengue knowledge. This could be explained partially due to the small number of respondents with a personal history of the disease. Consequently, a study including a larger sample with a history of the disease was required in order to accurately assess this association.

While the study population is endemic to dengue and displayed some knowledge of the topic, this could be insufficient, as described in other cities in Colombia and South America[12,16], and Asian countries such as India and Malaysia[20,18]. In this respect, the community itself expressed that the lack of information limits action taken against dengue. This observation is significant since, as stated by the COMBI experience[4], the community itself should identify its weaknesses and manage what it needs to improve. Consequently, the comprehensive integration of all the sectors is imperative and relevant to solve this type of issue.

Concerning the practice of preventive measures, the respondents that did not know (or did not answer) whether any neighbor had been diagnosed with dengue showed a lower frequency of measures taken against the adult stage of the vector. This association suggests that unawareness of dengue cases around them could be associated with indifference to the control of this arbovirus. The mentioned above highlights the importance of communication among neighbors as a way of raising public consciousness and preparation in case of an outbreak[21].

On another note, the study did not find any association between risk perception and practices against dengue, similar to a study carried out in Cuba[13]. Nonetheless, a study in Karachi, Pakistan[22], endemic regions for dengue, determined that risk perception are a significant predictor of adequate preventive measures. These results highlight the importance of the regional differences, which must be considered when planning dengue control strategies.

Regarding water storage, it is essential to mention the low proportion of adequate practices observed in the population studied (Table 2), unlike findings in Malaysia[19] where more than 50% of the respondents had good practices in this regard. The unawareness of the vector's characteristics in its immature form may explain the findings in the population of La Guajira, as proposed in a study conducted in Venezuela[14]. Therefore, it is recommended that indications given to the community be complemented with information on this aspect.

Attitudes concerning control of dengue manifested in the attendance to meetings arranged by the community were associated positively with a history of diagnosis of dengue in the respondent, family member, or neighbor. Moreover, the experience of their neighbors being hospitalized due to dengue was associated positively with the reasoning that everyone in a community is responsible for taking preventive measures against dengue. Consequently, communication amongst community members is proposed as a cross-cutting element of the health education programs and actions[31]. These associations are relevant when planning strategies to accomplish empowerment, understood as "people's ability to work together, organize themselves, and mobilize resources to solve problems of common concern"[32].

Although the study did not find any association between risk perception and dengue control attitude, there is evidence that carrying out activities to enhance risk perception promotes

decision-making towards adopting an expected behavior[33]. It is also worth mentioning that risk perception is a highly polysemous construct, product of a cognitive process based on information that every person possesses from different contexts[28]. Also, the acceptability level, benefits associated with the risks, and the level of control intervene in the estimation of the risk. With this in mind, people tend to tolerate risk as long as it is associated with a benefit, or they consider such risk to be under control, which then leads to perceiving the risk to a lesser extent[29].

Several studies that have analyzed dengue risk perception have suggested that it was not associated with a preventive behavior[34]. Other papers suggest that people who perceive the risk of catching the disease are more likely to adopt preventive practices[22]. Furthermore, interactions between experiences, perceptions, and decision-making were evaluated in Madeira Island, Portugal; a learning that lived experience due to an outbreak in the community improved risk perception and practices to some extent. Still, other perceptions and beliefs arose, leading to less preventive practices[35]. Meanwhile, in Sri Lanka, most of the population had a low-risk perception, and control measures were scarce, although it is a dengue endemoepidemic region[36].

Due to the above, the complex connection between experience, perception, and KAP justifies carrying out studies in different regions in order to identify barriers and enablers in the acquisition of KAP. This knowledge will allow generating strategies towards social movements, dengue control, as well as other arboviruses.

Among the potential study limitations is the size of the sample, which might be insufficient to explore the associations between some of the variables, such as experience with dengue. Besides that, the cross-sectional design of the study hinders establishing a time connection between experience and dengue risk perception with the KAP. Nevertheless, regardless of those mentioned above, it is likely that experience and perception precede current knowledge, along with the attitudes and practices mentioned by the respondents. Consequently, we consider this study describes relevant associations to recognize communities that require a particular emphasis when carrying out dengue control campaigns.

While KAP descriptions are of a regional nature, the associations found could be useful to develop campaigns that improve KAP about dengue in other endemic countries. This way, it may be plausible to affirm that community cam-

paigns could be mediated and enhanced by integrating the people who have been exposed and have a higher risk perception.

Although the study of KAP is a strategy that has been used for several decades and allows describing characteristics in the study population, it is worth saying that the present is the first study in Colombia that evaluates the associations in risk perception and experience with the KAP about dengue. Besides this, probability sampling, which reduces the risk of selection bias; the use of validated questionnaires and data auditing, which reduces the risk of reporting bias; and the evaluation of other potential confounding variables, are among the strengths of this research.

In conclusion, we observed that risk perception of suffering from dengue was associated with knowledge regarding this arbovirus, and that experience with dengue cases was related to a positive attitude concerning its control. These results show the importance of the individual and collective context in the planning of preventive strategies based on communication and social change.

Collaborations

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References

1. Lima-Camara TN. Emerging arboviruses and public health challenges in Brazil. *Rev Saude Publica* 2016; 50:36.

2. Fusco DN, Chung RT. Review of Current Dengue Treatment and Therapeutics in Development. *J Bioanal Biomed* 2014; S8:002.

3. Padilla JC, Rojas DP, Sáenz-Gómez R. *Dengue en Colombia. Epidemiología de la reemergencia a la hiperendemia.* Bogotá: Guías de Impresión Ltda.; 2012.

4. Parks W, Lloyd L, UNDP/World Bank/ World Health Organization (WHO) Special Programme for Research and Training in Tropical Diseases. *Planificación de la movilización y comunicación social para la prevención y el control del dengue. Guía paso a paso.* Ginebra: WHO; 2004.

5. Organización Mundial de la Salud (OMS). *Dengue y dengue grave.* [cited 2017 Apr 8]. Available from: http://www.who.int/mediacentre/factsheets/fs117/es/

6. Díaz-Quijano FA, Waldman EA. Factors Associated with Dengue Mortality in Latin America and the Caribbean, 1995–2009: An Ecological Study. *Am J Trop Med Hyg* 2012; 86(2):328-334.

7. Castrillón JC, Castaño JC, Urcuqui S. Dengue en Colombia: diez años de evolución. *Rev Chil Infectol* 2015; 32(2):142-149.

8. San Martín JL, Prado M. Percepción del riesgo y estrategias de comunicación social sobre el dengue en las Américas. *Rev Panam Salud Publica* 2004; 15(2):135-139.

9. Holman A. *Encuestas de Conocimientos, Actitudes y Prácticas en el ámbito de la Protección de la Infancia.* Sierra Leone: Iniciativa de Protección de la Infancia Save the Children; 2012.

10. Organización Panamericana de la Salud (OPAS), Organización Mundial de la Salud (OMS), Ministerio de la Protección Social República de Colombia (MPS-RC), Agencia Canadiense para el Desarrollo Internacional (ACDI). *Estrategia de Gestión Integrada Nacional Colombia.* Bogotá: MPSRC; 2006.

11. Alves AC, Fabbro AL, Passos AD, Carneiro AT, Jorge TM, Martinez EZ. Knowledge and practices related to dengue and its vector: a community-based study from Southeast Brazil. *Rev Soc Bras Med Trop* 2016; 49(2):222-226.

12. Santos SL, Parra-Henao G, Silva MB, Silva LG. Dengue in Brazil and Colombia: a study of knowledge, attitudes, and practices. *Rev. Soc. Bras. Med. Trop* 2014; 47(6):783-787.

13. Castro M, Sánchez L, Pérez D, Sebrango C, Shkedy Z, Stuyft PV. The Relationship between Economic Status, Knowledge on Dengue, Risk Perceptions and Practices. *PLoS ONE* 2013; 12(8):6.

14. Martínez M, Espino C, Moreno N, Rojas E, Mazzarri M, Mijares V, Herrera F. Conocimientos, Actitudes y Prácticas sobre dengue y su relación con hábitats del vector en Aragua-Venezuela. *Bol Mal Salud Amb* 2015; 55(1):69-85.

15. Pérez-Guerra CL, Zielinski-Gutierrez E, Vargas D, Clark G. Community beliefs and practices about dengue in Puerto Rico. *Rev Panam Salud Publica* 2009; 25(3):218-226.

16. Paz-Soldán VA, Morrison AC, López JJ, Lenhart A, Scott TW, Elder JP, Sihuincha M, Kochel TJ, Halsey ES, Astete H, McCall PJ. Dengue Knowledge and Preventive Practices in Iquitos, Peru. *Am J Trop Med Hyg* 2015; 93(6):1330-1337.

17. Wong LP, Shakir SM, Atefi N, AbuBakar A. Factors Affecting Dengue Prevention Practices: Nationwide Survey of the Malaysian Public. *PLoS ONE* 2015; 10(4):16.

18. Mohamad M, Selamat MI, Ismail Z. Factors Associated with Larval Control Practices in a Dengue Outbreak Prone Area. *J Environ Public Health* 2014; 2014:459173.

19. Wong LP, AbuBakar S, Chinna K. Community Knowledge, Health Beliefs, Practices and Experiences Related to Dengue Fever and Its Association with IgG Seropositivity. *PLoS Negl Trop Dis* 2014; 8(5):e2789.

20. Arunachalam N, Tyagi BK, Samuel M, Krishnamoorthi R, Manavalan R, Tewari SC, Ashokkumar V, Kroeger A, Sommerfeld J, Petzold M. Community-based control of Aedes aegypti by adoption of eco-health methods in Chennai City, India. *Rev. Pathog Glob Health* 2012; 106(8):488-496.

21. Gyawali N, Bradbury RS, Taylor-Robinson AW. Knowledge, attitude and recommendations for practice regarding dengue among the resident population of Queensland, Australia. *Asian Pac J Trop Biomed* 2016; 6(4):360-366.

22. Siddiqui TR, Ghazal S, Bibi S, Ahmed W, Sajjad SF. Use of the Health Belief Model for the Assessment of Public Knowledge and Household Preventive Practices in Karachi, Pakistan, a Dengue-Endemic City. *PLoS Negl Trop Dis* 2016; 10(11):15.

23. Martínez-Vega RA, Rodriguez-Morales AJ, Bracho-Churio YT, Castro-Salas ME, Galvis-Ovallos F, Díaz-Quijano RG, Luna-González ML, Castellanos JE, Ramos-Castañeda J, Diaz-Quijano FA. A prospective cohort study to assess seroprevalence, incidence, knowledge, attitudes and practices, willingness to pay for vaccine and related risk factors in dengue in a high incidence setting. *BMC Infectious Diseases* 2016; 16(1):9.

24. Cáceres-Manrique F, Vesga-Gómez C, Perea-Florez X, Ruitort M, Talbot Y. Conocimientos, actitudes y prácticas sobre dengue en dos barrios de Bucaramanga, Colombia. *Rev Salud Pública* 2009; 11(1):27-38.

25. Diaz-Quijano FA, Martínez-Vega RA, Rodriguez-Morales AJ, Rojas-Calero RA, Luna-González ML, Díaz-Quijano RG. Association between the level of education and knowledge, attitudes and practices regarding dengue in the Caribbean region of Colombia. *BMC Public Health* 2018; 18(1):143.

26. Bracho-Churio YT, Martínez-Vega RA, Rodriguez-Morales AJ, Díaz-Quijano RG, Luna-González ML, Diaz-Quijano FA. Determinants of felt demand for dengue vaccines in the North Caribbean region of Colombia. *Ann Clin Microbiol Antimicrob* 2017; 16:38.

27. Lee JS, Mogasale V, Lim JK, Carabali M, Sirivichayakul C, Anh DD, Kang-Sung L, Thiem VD, Limkittikul K, Tho LH, Velez ID, Osorio JE, Chanthavanich P, Silva LJ, Maskery BA. A Multi-country Study of the House hold Willingness-to-Pay for Dengue Vaccines: House hold Surveys in Vietnam, Thailand, and Colombia. *PLoS Negl Trop Dis* 2015; 9(6):e0003810.

28. García del Castillo JA. Concepto de Percepción de Riesgo y su Repercusión en las Adicciones. *Salud y drogas* 2012; 12(2):133-151.

29. Mikulic IM, Cassullo GL, Crespi MC, Caruso AP, Elmasian M, Muiños R. Evaluación de la Percepción de Riesgo en Diferentes Grupos Sociales: Propuesta de un Modelo de Ecuaciones Estructurales. *Anuario de Investigaciones* 2012; 19(2):37-44.

30. Barros JD, Hirakata VN. Alternatives for logistic regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. *BMC Med Res Methodol* 2003; 3:21

31. Díaz H, Uranga W. Comunicación para la salud en clave cultural y comunitaria. *Revista de Comunicación y Salud* 2011; 1(1):113-124.

32. Cáceres-Manrique FM, Vesga-Gómez C, Angulo-Silva ML. Empoderamiento para la prevención y control del Dengue. *Rev Salud Pública* 2010; 12(5):798-806.

33. Escudero-Támara E, Villarreal-Amaris G. Intervención educativa para el control del dengue en entornos familiares en una comunidad de Colombia. *Rev Perú Med Exp salud pública* 2015; 32(1):19-25.

34. Daudé E, Mazumdar S, Solanki V. Widespread fear of dengue transmission but poor practices of dengue prevention: A study in the slums of Delhi, India. *PLoS One* 2017; 12(2):e0171543.

35. Nazareth T, Sousa CA, Porto G, Gonçalves L, Seixas G, Antunes L, Teodósio R. Impact of a Dengue Outbreak Experience in the Preventive Perceptions of the Community from a Temperate Region: Madeira Island, Portugal. *PLoS Negl Trop Dis* 2015; 9(3):e0003395.

36. Banneheke H, Paranavitane S, Jayasuriya V, Banneheka S. Perceived Risk of Dengue in Ones' Living Environment as a Determinant of Behavior Change through Social Mobilization and Communication: Evidence from a High Risk Area in Sri Lanka. *J Arthropod Borne Dis* 2016; 10(3):392-402.