

EDUCATIONAL LEVEL AND POSITIVE SEROLOGY FOR DENGUE. A KNOWLEDGE, ATTITUDES AND PRACTICES STUDY IN HUÁNUCO, PERU

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ABSTRACT

Dengue is a worldwide spread arboviral disease. Huánuco region is an endemic area for dengue. Understanding the influence of Knowledge, Attitudes and Practices (KAP) in dengue endemic areas can provide important insight for improving public health policies. The purpose of this study was to understand the KAP about dengue in the marginal urban city of Tingo Maria, district of Rupa-Rupa, a rain forest area in Huánuco region and its association with positive serology for dengue. An analytical, retrospective, cross-sectional study was carried out in which a randomized sample of 112 people were evaluated using a semi structured questionnaire and tested for IgG against dengue virus. Most participants recruited were from marginal urban settlements. The median age was 38 years and 64% were female. A bivariate analysis showed an association between educational level and serological positivity. Over 95% of participants with only primary school education had a positive serological test for dengue. No statistical significances were found between attitudes towards dengue control initiatives ($p=0.221$), preventive practices against dengue ($p=0.773$), and the level of knowledge about dengue ($p=0.073$). Although attitudes, preventive practices and level of knowledge were not related to positive serology in dengue cases, educational level showed an association with serological positivity for dengue.

KEY WORDS: Dengue; knowledge; attitude; practice; education; Peru.

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INTRODUCTION

Dengue virus is an arbovirus that belongs to the *Flaviviridae* family; it is transmitted through the bite of the female mosquito of the *Aedes* genus. There are 4 different serotypes: DEN 1, 2, 3, 4, which share similar structural characteristics and pathogenic action (Halstead, 2019). Infection by any dengue serotype generates immunity that is long lasting and is manifested by producing antibodies which are specific for each serotype (Pardo Martínez et al., 2018).

The disease is more prevalent in tropical and subtropical areas, with approximately 3 billion people living in endemic areas (Wilder-Smith et al., 2019). The estimated disease burden is approximately 390 million worldwide, with 96 million new cases per annum (Guzman & Harris, 2015) resulting in an increased frequency of epidemics and severe dengue disease, hyperendemicity of multiple dengue virus serotypes in many tropical countries, and autochthonous transmission in Europe and the USA. Today, dengue is regarded as the most prevalent and rapidly spreading mosquito-borne viral disease of human beings. Importantly, the past decade has also seen an upsurge in research on dengue virology, pathogenesis, and immunology and in development of antivirals, vaccines, and new vector-control strategies that can positively impact dengue control and prevention. More than three-quarters of these cases are registered in Asia, followed by Latin America and Africa (Bhatt et al., 2013; Otu et al., 2019).

Dengue is endemic to Central America, South America, and the Caribbean. In 2019, there was an increase in reported cases of 101.5% compared with 2018 (OCHA, 2019.). Moreover, the average annual cost of the disease in this part of the world was more than USD 3 billion, and direct costs represented more than 70% of the total for hospitalized cases (Laserna et al., 2018).

Peru has critical endemic areas, such as the northern coast and the rainforest. According to the Centers for Disease Control in 2019, 15,290 dengue cases were registered as confirmed or probable. The national accumulated incidence rate (TIA) was 47.1 cases per 100,000 inhabitants, with a higher frequency reported in regions such as Loreto, Madre de Dios, Tumbes, Piura and Ayacucho (Ministerio de Salud Peru, 2020a).

In the Huánuco region, significant variations have been reported on the incidence of dengue disease, both annually and seasonally. In 2016, the incidence for the provinces of Rupa-Rupa and Luyando was 30 cases per 100,000 inhabitants (Arteaga-Livias et al., 2017; Ministerio de Salud Peru, 2020b).

The observation of attitudes towards initiatives to control dengue, preventive practices and knowledge, are tools that enable the analysis of the role of human behavior on the regional epidemiology of dengue. Its application can promote the improvement of welfare and social development in native communities. Bad attitudes towards the disease or vector control initiatives, such as having the toilet in inappropriate places in the household, lack of hygiene or preventive behavior, and inadequate storage of water, are factors associated with dengue outbreaks (Cabrera et al., 2016; Ruiz, 2021).

It is important to improve knowledge, attitudes, and preventive practices on dengue to achieve a significant reduction of new cases of the disease. The purpose of this study is to investigate the association between attitudes, preventive practices, and level of knowledge on positive serology for dengue in the marginal urban city of Tingo Maria, district of Rupa-Rupa, a rain forest area in the Huánuco region.

MATERIAL AND METHODS

Research design and participants

An analytical, cross-sectional study was carried out in marginal urban settlements endemic for dengue in the Huánuco region, Peru. To calculate the sample size, the finite population formula was used for a total population of 41,228 inhabitants, with an expected frequency of positivity of 9% for a confidence of 95%, resulting in a sample of 126 people.

Between August and September 2019, inhabitants of the selected districts were chosen by probabilistic sampling with reference to the unit of metaxenic diseases of the Regional Directorate of Health - Huánuco (DIRESA).

The study was carried out by randomly selecting five marginal settlements (Keiko Fujimori, Svin Ericson, Brisas, Malecon Lima, Alberto Paes), focusing on their main square and surrounding streets. All inhabitants of the surveyed areas over 18 years of age were included. Only one family member who agreed with the study was chosen for each household surveyed.

The instrument is a semi-structured questionnaire previously optimized by applying it on a marginal settlement for the development of its internal consistency.

A survey about dengue to evaluate knowledge, attitudes and preventive practices was carried out, with subsequent blood sampling for serological testing against dengue. Serological tests for IgG were performed by ELISA (dengue IgG ELISA CE. CTK Biotech®).

The questionnaire was divided into 4 sections as follows: 5 questions on participants' personal information, 9 questions on knowledge about dengue, 7 questions on attitudes towards dengue control initiatives, and 8 questions on preventive practices against dengue. The classification of the answers in the different components were: negative attitude towards initiatives for dengue control: 0-3 points; positive attitude towards disease control: 4-7 points. Poor preventive practice: 0-4 points; adequate preventive practice: 5-8 points. Low level of knowledge: 0-4 points; acceptable level of knowledge: 5-9 points.

Participants with rheumatologic and neoplastic comorbidities, individuals with unknown diagnosis, residents living in the area for less than a month, people in close contact or who live near a person with dengue, were excluded.

Statistical analysis

The frequency and proportion of variables attitudes, preventive practices, level of knowledge, positive serology for dengue, and bivariate analysis were performed using Chi square test not independent (paired), considering a value of $p < 0.05$ as the level of statistical significance with a confidence interval (CI) of 95%. Data analysis was performed using Epidat version 3.1, Microsoft Office Excel 2013, and SPSS version 25.

Ethics

The study was approved by the Ethics Committee of the Dirección de Investigación Universitaria of the Universidad Nacional Hermilio Valdizan (OFICIO N°900-2019-UNHEVAL-DIU). Additionally, informed consent was applied to participants, explaining the purpose of the research, risk-benefit and participants' tasks. The study followed all recommendations for research in humans, and regarding the principles of the World Medical Association. Recruited volunteers were given the option to withdraw their participation at any time.

RESULTS

One hundred and twenty-six people were interviewed; however, 14 participants were withdrawn for being under 18 years of age. 112 individuals with a median age of 38 years (range: 18 – 84) participated in the present study, the other characteristics of the population are described in Table 1.

Table 1. Epidemiological characteristics and attitudes, preventive practices and level of knowledge of individuals with serological tests for dengue in the Rupa district, Huánuco (n = 112).

	Frequency	Percentage (%)
Age		
06-26	39	31.0
27-47	46	36.5
48-68	33	26.2
69-89	8	6.3
Age (years)		
Median: (IQR)	38: (27-54)	
Sex		
Female	64	57.1
Male	48	42.9
Schooling		
Primary	21	18.7
High school	65	58.1
Higher education	26	23.2
Birthplace		
Tingo María	104	92.9
Ilo	1	0.9
Tarapoto	2	1.8
Cerro de Pasco	1	0.9
San Martín	4	3.5
Attitude		
0-3 Negative	39	34.8
4-7 Positive	73	65.2
Preventive practices		
0-4 Poor	65	58.1
5-8 Adequate	47	41.9
Knowledge level		
0-4 Low	53	47.3
5-9 Acceptable	59	52.7
Serology		
Negative <9	18	16.1
Positive > 11	94	83.9

Table 2. Bivariate inferential analysis of individuals with serological tests for dengue in the Rupa Rupa district, Huánuco 2019 (n = 112).

Characteristics	Serology				p value *	OR	CI 95%	
	Positive		Negative				Inf	Sup
	Frequency	%	Frequency	%				
Attitudes								
0-3 Negative	35	89.7	4	10.3	0.221	0.481	0.146	1.578
4-7 Positive	59	80.8	14	19.2				
Preventive Practices								
0-4 Poor	54	83.1	11	16.9	0.773	1.164	0.414	3.267
5-8 Adequate	40	85.1	7	14.9				
Knowledge Level								
0-4 Low	41	77.4	12	22.6	0.073	2.585	0.894	7.472
5-9 Acceptable	53	89.8	6	10.2				
Age (Years)					0.051**			
Median: (IQR)	41: (28-57)		35.5: (24-41)					
Place of Origin					0.8			
Tingo Maria	86	82.7	18	17.3				
Ilo	1	100	0	0.0				
Tarapoto	2	100	0	0.0				
Cerro de Pasco	1	100	0	0.0				
San Martin	4	100	0	0.0				
Schooling								
Primary	20	95.2	1	4.8	0.01	0.284	0.116	0.694
High School	57	87.7	8	12.3				
Higher	17	65.4	9	34.6				
Sex								
Female	55	85.9	9	14.1	0.504	0.709	0.258	1.948
Male	39	81.3	9	18.7				

* Chi squared, ** Mann Withney's U

Odds Ratio (OR), Inferior (Inf), Superior (Sup)

Over 95% of participants with only primary school education had a positive serological test for dengue. This value drops to 87.7% for participants with secondary school education and to 65.4% with higher education.

Most of the participants showed an acceptable level of knowledge about dengue (52.7%). They reported accurately its causative agent and the transmission mechanism. Additionally, a high proportion of the population recognized the symptoms associated with the disease satisfactorily as well as the sites where the mosquito breeds.

Regarding attitudes, 65.2% of the studied population showed a positive attitude towards initiatives against dengue; however, 58.1% of the participants showed poor preventive practices. Positive serology for dengue was detected in 83.9% of the studied population (Table 1).

Table 2 presents the bivariate analysis. No statistical significance was found between attitudes ($p=0.221$), preventive practices ($p=0.773$), the level of knowledge about dengue ($p=0.073$), and participant place of origin ($p=0.800$).

DISCUSSION

The Province of Leoncio Prado is in Huánuco, the central region of Peru. It is located in the tropical area known locally as high and low rainforest. It is divided into 6 districts, including Rupa, which has a classic tropical climate, with considerable humidity, broad temperature variations, and significant precipitation. Its population is 41,228 according to the DIRESA statistical report - Huánuco - 2019.

Our study recruited a higher number of female participants (57.1%). This could be due to gender differences regarding temperament or sociability, which would make women more likely to agree to be interviewed. This may be suggested by the results of other studies that evaluated knowledge, attitudes and practices, where the higher proportion of participants were female (Ghani et al., 2019; Harapan et al., 2018; Mayo et al., 2016; Ortiz et al., 2018) there is limited understanding of dengue among the general population of Aceh. The aim of this study was to assess the knowledge, attitude, and practice (KAP). Nonetheless, a study by Maestre-Serrano et al. (2015) recruited 94.6% of male participants by focusing the interview on the family perceived head of the household.

The participants' median age in previous studies was young with an age range between 31 and 46 years while our study has a broader age range (Elsinga et al., 2018; Maestre-Serrano et al., 2015; Nguyen et al., 2019; Saied et al., 2015).

An association between level of education and serological positivity for dengue was found. This could suggest that access to education is linked to less risk of disease, which has also been noted by other authors. Ortiz et al. (2018) found that in neighborhoods with a high incidence of dengue, 70% had no formal educational or this was restricted to primary level. Diaz-Quijano et al. (2018) evaluated the knowledge about dengue, and showed that the knowledge was higher in graduates than in the population with a lower educational level attitudes and practices (KAPs). Ghani et al. (2019) suggested directly that knowledge, attitudes, and practices are influenced by educational level. Saied et al. (2015) also indicated that age, educational level, and knowledge and attitudes were associated with preventive practices. However, Elsinga, Verma and Nguyen in their respective studies found no association with educational level (Elsinga et al., 2018; Nguyen et al., 2019; Verma et al., 2019) attitudes, practice (KAP). Even

though Maestre-Serrano et al. (2015) did not show this association, it is important to highlight that 100% of the participants had some level of instruction.

Several studies, like ours, have shown that the general populations have an acceptable level of knowledge, probably due to persistent information campaigns which are common in endemic areas (Agüero-Vega & Ramos-Pando, 2018). Additionally, it is important to consider that a high prevalence of the disease motivates the population to inform itself, as stated by Elsinga et al. (2018) in Venezuela, by showing that knowledge about dengue is significantly better in a people that have had dengue. Nonetheless, some studies in non-Latin American countries, like the work by Nguyen et al. (2019), found that the average knowledge was poor in Vietnam. Likewise, Harapan et al. (2018) found that knowledge about dengue was low with only 45% of correct answers in a structured questionnaire applied in Indonesia.

The attitude section presents the most variance between studies. In our study, the population has a positive attitude towards initiatives against dengue, similarly to a study carried out in Colombia by Diaz-Quijano et al. (2018). Moreover, Mayo et al. (2016) in Cuba, provided a thorough description of the attitudes of the population as positive. In contrast, Nguyen et al. (2019) in Vietnam showed that the population has a neutral attitude towards dengue initiatives attitudes, practice (KAP), while the study carried out in Indonesia by Harapan et al. (2018) showed that only 32% had good attitudes towards initiatives against dengue.

Regarding preventive practices, we found that our participants have poor prevention practices (58.1%), which is similar to multiple other studies (Alyousefi et al., 2016; Ghani et al., 2019; Ortiz et al., 2018). Maestre-Serrano et al. (2015) found that 90% of the studied population discards tires inadequately, and 82.6% do not carry out Dengue prevention activities. In addition, Saied et al. (2015) showed deficient preventive practices. Niño-Effio et al. (2019) studied a Peruvian population immediately after the Niño phenomenon, reporting that 50% of the population had poor practices. On the other hand, Elsinga et al. (2018) found that the most common practices were the use of repellent and mosquito nets.

Regarding serology, we found that 83.9% of the Rupa - Rupa population are positive for dengue. In the northern coast of Peru, in Lambayeque, Coronado et al. (2019) found a 35.3% positivity for IgM. In other Latin American countries, like Paraguay, endemic areas have shown positivity for IgG in 24.2% of the population (Pereira et al., 2015).

Our study has certain limitations. Reliable determination of the effect of KAP on positive dengue serology in an endemic area would require carrying out an intervention and follow-up in a serologically negative population. Another important limitation has been the withdrawal of patients for reasons of age under 18 years, which could affect the certainty that the level of education is an influencing factor in positive serology; however, after the withdrawal of these participants, the significant differences still remain.

We conclude that attitudes, preventive practices and level of knowledge are not related to positive serology for dengue. However, the educational level seems to have an important influence. This characteristic needs to be studied further due to its potential utility for improving public health policies.

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CONFLICTS OF INTERESTS

The authors declare no conflicts of interest

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