BMJ Open

Sociodemographic factors associated to knowledge and attitudes towards dengue prevention among the Peruvian population: findings from a national survey

Daniel Fernandez-Guzman ,[1] Brenda Caira-Chuquineyra,[2] Pablo M Calderon-Ramirez,[2] Shanelin Cisneros-Alcca,[3] Raysa M Benito-Vargas[3]

To cite: Fernandez-Guzman D, Caira-Chuquineyra B, Calderon-Ramirez PM, *et al*. Sociodemographic factors associated to knowledge and attitudes towards dengue prevention among the Peruvian population: findings from a national survey. *BMJ Open* 2023;**13**:e071236. doi:10.1136/bmjopen-2022-071236

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (http://dx.doi.org/10.1136/bmjopen-2022-071236).

Received 23 December 2022
Accepted 13 March 2023

Check for updates

© Author(s) (or their employer(s)) 2023. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

[1]Carrera de Medicina Humana, Universidad Científica del Sur, Lima, Peru
[2]Facultad de Medicina, Universidad Nacional de San Agustín de Arequipa, Arequipa, Peru
[3]Escuela Profesional de Medicina Humana, Universidad Nacional de San Antonio Abad del Cusco, Cusco, Peru

Correspondence to
Dr Daniel Fernandez-Guzman; danferguz@gmail.com

ABSTRACT

Objectives To evaluate the frequency of knowledge and attitudes towards dengue prevention among the Peruvian population, as well as the sociodemographic factors associated with reported knowledge and attitude outcomes.

Design/setting A cross-sectional study was conducted, based on information from the National Survey of Budget Programs of Peru, 2019.

Participants We included 57 829 respondents with a mean age of 40.3±17.4 years, of whom 52.8% were women and 87.6% were from urban areas.

Primary and secondary outcomes Knowledge about dengue infection (transmission, symptoms, importance of going to a health centre and not self-medicating) and preventive attitudes to avoid infection.

Results Of all the respondents, 36.2% (n=23 247) presented good knowledge about dengue and 11.6% (n=7890) had a higher number of preventive attitudes (≥3 attitudes). In the multivariate regression analysis, we found that being female (for knowledge: aPR (adjusted prevalence ratio): 1.03; 95% CI 1.02 to 1.03; and for attitude: aPR: 1.02; 95% CI 1.01 to 1.02), being married/cohabiting (for knowledge: aPR: 1.02; 95% CI 1.00 to 1.03; and for attitude: aPR: 1.01; 95% CI 1.00 to 1.02) and residing in the jungle (for knowledge: aPR: 1.14; 95% CI 1.12 to 1.16; and for attitude: aPR: 1.09; 95% CI 1.07 to 1.11) were associated with better knowledge and more preventive attitudes. In addition, we found that being an adolescent (for knowledge: aPR: 0.97; 95% CI 0.96 to 0.99; and for attitude: aPR: 0.99; 95% CI 0.97 to 0.99), and belonging to the Quechua ethnic group (for knowledge: aPR: 0.93; 95% CI 0.91 to 0.94; and for attitude: aPR: 0.98; 95% CI 0.97 to 0.99) were associated with a lower proportion of adequate knowledge and fewer preventive attitudes.

Conclusions Our study found a high proportion of poor knowledge and few preventive attitudes towards dengue in the Peruvian population. That highlights the requirement to implement national strategies to educate people about dengue and promote preventive attitudes, considering the factors found.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ While this study draws on a nationally representative survey in Peru, it is worth noting that information about dengue prevention practices was not available. This limits our understanding of the measures in place to prevent the spread of the disease.
⇒ Also, it's important to recognise that dengue is not endemic in all parts of Peru. However, gaining insight into the current state of knowledge and attitudes towards dengue in the population could be a starting point for minimising outbreaks in non-endemic areas that may arise due to climate change.
⇒ Finally, given that the survey was conducted in areas where the disease is not endemic, it is possible that some respondents may have struggled to understand certain questions. However, the survey was carried out by trained personnel, which helped to minimise reporting bias.

INTRODUCTION

Dengue fever is a highly prevalent vectorborne viral infection that is transmitted primarily by *Aedes aegypti* mosquitoes. It is considered the most important mosquitoborne viral disease worldwide and is widely distributed in tropical and subtropical regions.[1 2] In Latin America (LATAM), dengue is hyperendemic, and its incidence has been increasing in recent years,[3 4] with an average of 72.1 cases per 100 000 person-years between 1995 and 2010, with a mortality rate of 0.02 per 100 000 persons.[5] The economic burden of dengue in the region has also been significant, with an average annual cost of over 3 billion US dollars.[6] Furthermore, in LATAM countries, the presence of weak health systems to cope with outbreaks of infections has been described,[7] which makes this region one of the most vulnerable globally.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

To prevent dengue outbreaks, the WHO recommends that endemic countries develop evidence-based strategies and policies that prioritise the prevention of mosquito breeding, community education, and the implementation of an active mosquito and virus surveillance system.[8] In response, various studies have demonstrated the effectiveness of prevention strategies aimed at reducing the presence of mosquitoes, including the use of insecticidal and non-insecticidal container covers, waste management and clean-up campaigns, and the elimination of potential mosquito breeding sites.[9]

Peru is a country that has historically been affected by dengue fever since the re-entry of *A. aegypti* mosquitoes in 1984, the arrival of the American/Asian genotype DENV-2 in 2010, and its outbreak during the 'El Nino phenomenon' in 2017.[10] There has been an increase in the number, severity and mortality of reported cases, as well as a spread to more areas, which has led to a crisis in the demand for health services in recent years.[10 11] The Peruvian government has made efforts to introduce a vaccine for dengue; however, its application is limited and requires laboratory testing in contexts without the necessary resources. As a result, vector control activities remain an important measure to control dengue fever outbreaks.[12 13] Although the development of dengue depends on multiple sociodemographic, ecological and environmental determinants,[14] the population's knowledge, attitudes, and practices regarding transmission and infection represent a significant starting point for the prevention of dengue infection.[15] For example, in Peru, a low level of knowledge has been reported in some coastal regions,[16 17] and the use of preventive measures without evidence, such as bathing or burning clothes to limit dengue transmission, stands out.[18] However, in the jungle regions of Peru, higher levels of knowledge and practices against dengue have been reported.[19] This highlights the heterogeneity of health education on dengue prevention in the Peruvian population, despite the increasing incidence of cases.

While there are studies in other countries on the factors associated with knowledge and attitudes towards dengue,[20–23] the present study is the first to use a representative sample of the Peruvian population. Thus, our objective was to evaluate the frequency of knowledge and attitudes towards dengue prevention, among the Peruvian population, as well as the sociodemographic factors associated with reported knowledge and attitude outcomes. These findings could serve as evidence for health officials and policy makers in formulating effective strategies and policies for controlling current and future outbreaks, with a particular focus on sociodemographic characteristics.

METHODS

Study design

We conducted an analytical cross-sectional study, using data collected by the National Survey of Budget Programmes (Encuesta Nacional de Programas Presupuestales (ENAPRES)), which was executed by the National Institute of Statistics and Informatics (Instituto Nacional de Estadistica e Informatica (INEI)) of Peru in 2019.[24]

Population, sample and sampling

The study population consisted of Peruvians over 14 years of age. ENAPRES used a random, stratified, two-stage, independent sampling method in each department to select individuals. The selection process was systematic, with probability proportional to size in the first stage and simple in the second stage. The survey included both urban and rural areas as strata, while the clusters were defined as blocks in the metropolitan area and census areas in rural areas, with approximately 140 and 100 dwellings, respectively.

The target population included private dwellings and their usual residents, excluding persons residing in collective buildings (hospitals, hotels, nursing homes, religious cloisters, barracks and prisons, among others). The level of inference is at the national, departmental, urban, rural and natural regions (coast, highlands and jungle). Further details of the methodology can be found in the Technical Report of ENAPRES, 2019.[24]

For reasons of our study, we included all respondents and excluded those participants who did not respond to the dependent variables (knowledge and attitudes about dengue) or who presented incomplete information on any of the variables of interest. Thus, 57 829 Peruvians were analysed (figure 1).

Questionnaire

The survey was developed in 2019 and conducted face-to-face interviews by trained personnel according to a standardised protocol. The survey was designed and executed in Spanish only. The survey included 10 general sections: (1) The first section included housing and household characteristics (such as type of housing, presence of essential services, among others); (2) The second section included sociodemographic characteristics of the usual residents of the household (such as age, gender, marital status and educational attainment); (3) The third section included data on identity, disability, emergencies, social programmes and ethnic self-identification; (4) The fourth section included telecommunication use (internet and mobile cellular); (5) A fifth section included perception of citizen security; (6) A sixth section included questions on metaxenical diseases and zoonoses (including dengue); (7) A seventh section included questions on road safety; (8) An eighth section included questions on heritage, services and cultural assets; (9) A ninth section included questions on fire care, mortality due to medical emergencies, infrastructure and exposure to disasters; (10) Finally, the last section included questions related to the environment. Sections 5, 7, 9 and 10 were offered only for the urban population. Therefore, we only included

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

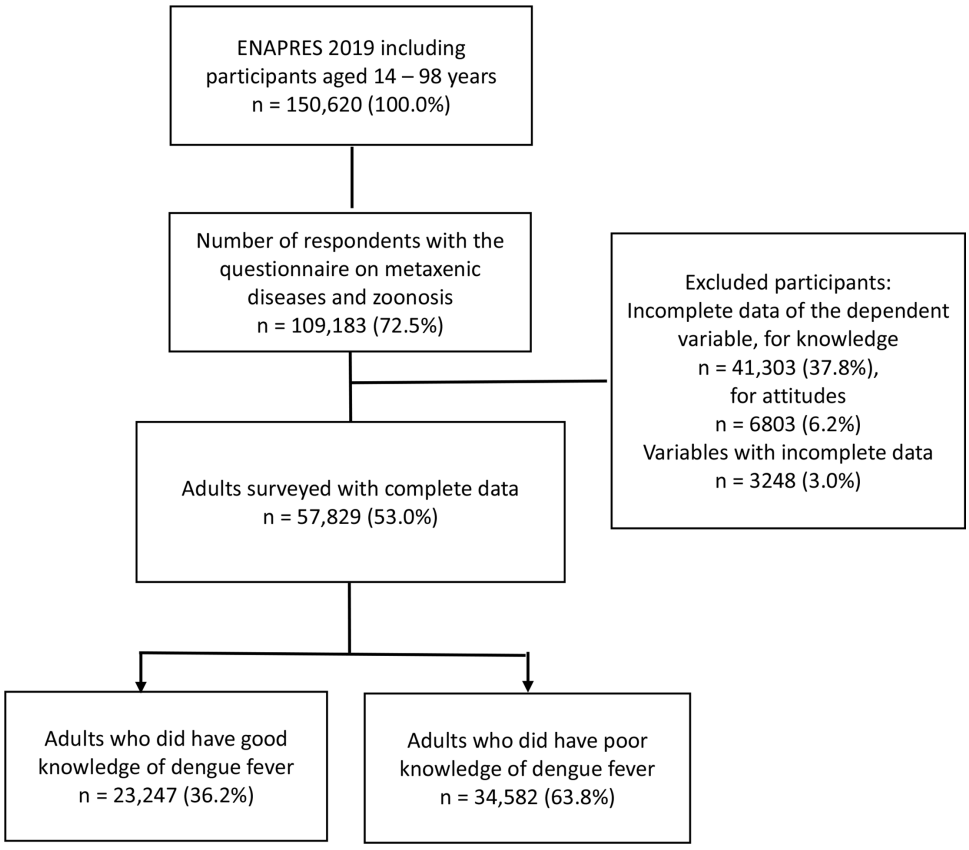


Figure 1 Flow chart of the selection of the study sample. ENAPRES, Encuesta Nacional de Programas Presupuestales.

questions from the present study's first, second, third and sixth sections.

Variables

Dependent variables: knowledge and attitudes towards dengue fever

Knowledge about dengue was evaluated through the following components: (1) Knowledge about how dengue is transmitted or contagious (did not know, vs knew), (2) Knowledge about the symptoms of dengue (did not know or knew less than three symptoms, vs knew three or more symptoms), (3) Knowledge about the actions that should be taken when dengue symptoms appear (go to a health centre and do not self-medicate). Similarly, attitudes were evaluated through the actions they would take to prevent contagion or transmission of dengue fever, which was assessed by the question: 'What would you do to prevent dengue fever?' This question was grouped into eight possible items: (1) Dispose of containers or objects that can contain (accumulate) water (tires, cans, bottles, plates, coconut shells, among others), (2) Eliminate rainwater accumulated in containers and puddles, (3) Fumigate the house, (4) Wash and brush the containers where water is stored, (5) Cover well the containers where water is stored, (6) Use the larvicidal provided by health personnel, (7) Use mosquito nets to protect against mosquito bites, (8) Change the water in flower vases.

It is important to mention that the questions used to assess knowledge and attitudes were open-ended and did not contain any alternatives. Therefore, respondents' answers were grouped into the above statements. In this way, it was possible to obtain knowledge and attitudes in dichotomous form (no vs yes).

For the study, we categorised it as 'good knowledge' if the respondents answered affirmatively to all three components. At the same time, we classified them as having 'more preventive attitudes' if respondents presented at least three preventive attitudes against dengue. We considered this cut-off point because it is necessary to have both attitudes to limit *A. aegypti* reproduction and bites.

Independent variables

Sociodemographic variables were used in the analysis as possible associated factors. Variables included gender (female and male), age groups (youth (18–29 years), adolescents (14–17 years), adults (30–64 years) and senior citizens (≥65 years)) as classified by the Peruvian Ministry of Health,[25] marital status (single; married/cohabiting and widowed/separated/divorced), educational level (elementary school or lower, high school, non-university higher education (educational level achieved in technical institutes), and university higher education (educational level achieved in universities)), ethnicity (mestizo; Quechua; negro/moreno/zambo and others (such as Native or indigenous to the Amazon, indigenous or originary people, among others)). In addition, the rurality (urban and rural) and natural region (coast, highlands and jungle) were also evaluated.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Statistical analysis

The 2019 ENAPRES databases were downloaded and imported into the statistical programme R V.4.0.3, where they were merged. Then, all analyses were performed, considering the complex sampling design of ENAPRES. The 'Survey' package (V.4.0) was used to specify the intricate design using weighting factors, clusters and strata for each observation.

The descriptive analysis of categorical variables involved calculating absolute frequencies, weighted proportions and their corresponding 95% CIs. In the bivariate analysis, we calculated the association of sociodemographic factors with knowledge and preventive attitudes using the χ^2 test with the Rao-Scott correction method.

To evaluate the associated factors, we used generalised linear models of the Poisson family with logarithmic link function, considering complex sampling. Thus crude prevalence ratios and adjusted prevalence ratios (aPRs) with their respective 95% CIs were calculated. Only those variables with a value of p<0.05 were included in the bivariate regression analysis for the adjusted model. We evaluated multicollinearity in the adjusted regression model using the variance inflation factor, where a value >10 determined multicollinearity among the variables; however, all values obtained were less than 10. For all statistical tests, a value of p<0.05 was considered statistically significant.

Patient and public involvement

No patient was involved.

Ethical issues

This study did not require the approval of an ethics committee, as we analysed a secondary database. This database collected data without identifiers, ensuring that the confidentiality of survey participants was protected. Additionally, the respondents had provided informed consent before completing the survey. The survey database was freely obtained from the INEI website (https://proyectos.inei.gob.pe/microdatos/index.htm).

RESULTS

Sociodemographic characteristics of the respondents

We included a final sample of 57 829 Peruvians who responded to the zoonosis and metaxenical disease questionnaire (figure 1). The majority of the sample were women (52.8%), with a mean age of 40.3±17.4 years. Furthermore, the largest proportion of participants had a high school education (42.5%), were widowed/separated/divorced (38.4%), belonged to the mestizo ethnicity (60.4%), came from the coastal natural region (65.5%) and resided in urban areas (87.6%) (table 1).

Knowledge and preventive attitudes towards dengue

The majority of respondents had poor knowledge about dengue (63.8%) (table 2), and a lower preventive attitude towards dengue (88.4%) (table 3). In addition, the symptoms of dengue that were most identified by respondents were: 'fever' (90.4%), 'headache' (40.4%), 'nausea or vomiting' (22.7%) and 'chills' (21.3%) (online supplemental table S1). Likewise, the way of dengue transmission identified by respondents most frequently was 'by mosquitoes/mosquito bites' (85.5%), followed by 'drinking water containing mosquito larvae or eggs' (16.2%) and 'by person-to-person contact' (1.9%) (online supplemental table S2). On the other hand, regarding preventive attitudes towards dengue, the most frequently reported attitudes were: 'tightly cover containers where water is stored' (40.2%), 'discard containers or objects that may contain water' (27.4%) and 'wash and brush containers where water is stored' (25.7%) (table 3).

Sociodemographic characteristics of the respondents according to knowledge and preventive attitudes towards dengue fever

The proportion of respondents who had good knowledge about dengue was 36.2% (n=23 247), with a higher proportion among those young adults (38.2%; p<0.001), women (37.9%; p<0. 001), those who were married or cohabiting (38.4%; p<0.001), had elementary school education or lower (40.2%; p<0.001), belonged to the Negro/Moreno/Zambo ethnicity (40.8%; p<0.01), and lived in the jungle natural region (54.1%; p<0.001) (table 4).

The proportion of respondents reporting a higher number of preventive attitudes towards dengue (≥3 attitudes) was 11.6% (n=7890), with a higher proportion among young adults (12.5%; p<0.001), women (12.6%; p<0. 001), married or cohabiting (13.2%; p<0.001), those with an elementary school education level or lower (13.3%; p<0.001), individuals of Negro/Moreno/Zambo ethnicity (12.4%; p=0.008), those belonging to the jungle natural region (19.6%; p<0.001), and those living in rural areas (13.3%; p=0.019) (table 5).

The political regions of Peru that reported the highest proportion of good knowledge about dengue were Piura (73.0%), Ucayali (69.2%), Tumbes (61.9%) and Lambayeque (57.0%). Likewise, the political regions with the highest number of preventive attitudes towards dengue were Madre de Dios (31.2%), Piura (28.7%), Cajamarca (27.2%) and Huancavelica (18.9%) (figure 2, online supplemental tables S3 and S4).

Factors associated with knowledge and preventive attitudes towards dengue fever

In the multivariate regression analysis, being female (aPR: 1.03; 95% CI 1.02 to 1.03), being married or cohabiting (aPR: 1.02; 95% CI 1.00 to 1.03), and being widowed, separated or divorced (aPR: 1.02; 95% CI 1.00 to 1.03), belonging to the jungle (aPR: 1.14; 95% CI 1.12 to 1.16) were independently associated with a higher proportion of good knowledge about dengue. Whereas, being an adolescent (aPR: 0.97; 95% CI 0.96 to 0.99) or a senior citizen (aPR: 0.95; 95% CI 0.94 to 0.97), having high school education (aPR: 0.97; 95% CI 0.96 to 0.99), being

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 1 Sociodemographic characteristics of the respondents (n=57 829)

Characteristics	N	%*	95% CI*
Age			
Adolescents (14–17 years old)	5433	8.4	8.1 to 8.7
Youth (18–29 years old)	14 130	24.1	23.6 to 24.7
Young adult (30–64 years)	33 147	67.3	56.7 to 57.8
Senior citizens (≥65 years)	5119	10.2	9.8 to 10.7
Gender			
Male	27 752	47.2	46.7 to 47.6
Female	30 077	52.8	52.4 to 53.3
Marital Status			
Single	18 699	33.6	33.0 to 34.1
Married/cohabitant	18 301	28	27.3 to 28.8
Widowed/separated/divorced	20 829	38.4	37.7 to 39.1
Educational level			
Elementary school or lower	10 669	15.1	14.5 to 15.8
High school	25 193	42.5	41.7 to 43.4
Non-university higher education	14 235	26.5	25.8 to 27.2
University higher education	7732	15.8	15.0 to 16.6
Ethnicity			
Mestizo	32 674	60.4	59.5 to 61.3
Quechua	9281	12.8	12.2 to 13.5
Negro/moreno/zambo	5083	8.7	8.2 to 9.2
Other	10 791	18.1	17.4 to 18.7
Rurality			
Urban	43 448	87.6	86.3 to 88.7
Rural	14 381	12.4	11.3 to 13.7
Natural region of residence			
Coast	25 858	65.5	63.6 to 67.3
Highlands	15 185	18.9	17.6 to 20.2
Jungle	16 786	15.6	14.4 to 17.0

*Weighted percentages according to survey complex sampling.

of Quechua ethnicity (aPR: 0.93; 95% CI 0.91 to 0.94) or another ethnicity (different to mestizo; Quechua; Negro/Moreno/Zambo) (aPR: 0.97; 95% CI 0.95 to 0.98), and belonging to the highlands (aPR: 0.93; 95% CI 0.92 to 0.95) were associated with a lower proportion of knowledge about dengue.

On the other hand, being female (aPR: 1.02; 95% CI 1.01 to 1.02), being married or cohabiting (aPR: 1.01; 95% CI 1.00 to 1.02) and belonging to the jungle (aPR: 1.09; 95% CI 1.07 to 1.11) were associated with a higher proportion of presenting a more significant number of preventive attitudes. Meanwhile, being an adolescent (aPR: 0.99; 95% CI 0.97 to 0.99) and being of Quechua ethnicity (aPR: 0.98; 95% CI 0.97 to 0.99) were associated with a lower number of preventive attitudes towards dengue (table 6).

DISCUSSION

Summary of main findings

This study evaluated factors associated with dengue knowledge and preventive attitudes in a population of 57 829 Peruvians over 14 years of age. We found that 36.2% had good knowledge about dengue, and 11.6% presented at least three preventive attitudes during 2019. In addition, we identified that being female, being married/cohabiting and residing in the jungle were associated with having good knowledge about dengue and a higher number of preventive attitudes. On the other hand, being an adolescent and belonging to the Quechua ethnic group were associated with poor knowledge and a lower number of attitudes to prevent dengue.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 2 Assessment of knowledge about dengue (n=57 829)

Questions and general assessment	n	%*	95% CI*
Do you know how dengue is transmitted?			
No	9613	19.3	18.6 to 20.2
Yes	48 216	80.7	79.8 to 81.4
Do you know at least three symptoms of dengue fever?			
No	28 233	54.3	53.2 to 55.4
Yes	29 596	45.7	44.6 to 46.8
Do you recognise that you should go to a health centre if you have symptoms of dengue fever?			
No	2650	2.8	2.6 to 3.0
Yes	55 179	97.2	97.0 to 97.4
Do you recognise that you should not self-medicate?			
No	54 842	97.0	96.7 to 97.2
Yes	2987	3.0	2.8 to 3.3
Knowledge about dengue			
Poor	34 582	63.8	62.7 to 64.8
Good	23 247	36.2	35.2 to 37.3

*Weighted percentages according to survey complex sampling.

Frequency of good knowledge about dengue fever

Approximately 4 out of 10 respondents had good knowledge about dengue. In this regard, this finding is compatible with that reported in other countries such as Nepal, Tanzania and Vietnam, with levels of good knowledge ranging from 2.3% to 37.2%,[20 26 27] being developing countries endemic to dengue and which have recently reported outbreaks.[28–30] However, in other contexts, where there are governmental and educational strategies for this disease, greater use of technology to access information, and better healthcare and knowledge levels above 50% have been reported.[21 31–33] That could be because, in at least 7 of the 25 political regions of Peru, the incidence of dengue fever in the last 5 years has been less than 153 cases per 100 000 population. In five political regions, less than 10 cases have been reported in the same period.[34] That contrasts with the finding of a higher level of knowledge about the infection in political regions where there has been an outbreak of dengue in recent years.[35] Meanwhile, in areas with low incidence,[34] the population would be unfamiliar with the infection (forms of transmission, symptoms, treatment) and therefore would explain the lower proportion of knowledge. However, since projections for this virus show an increase in the number of cases,[2 36] even in areas where it has never been reported,[34 37] the evaluation of knowledge in

Table 3 Assessment of attitudes towards dengue (n=57 829)

Question and general assessment	n	%*	95% CI*
What would you do to prevent dengue fever?			
Change the water in flower vases	1290	3.4	3.1 to 3.8
Use the larvicidal provided by health personnel	1854	4.1	3.7 to 4.5
Use mosquito nets to protect against mosquito bites	8156	9.4	8.7 to 10.1
Eliminate rainwater accumulated in containers and puddles	10 643	14.2	13.5 to 15.0
Fumigate the house	11 131	16.4	15.7 to 17.0
Wash and brush the containers where water is stored	12 749	25.7	24.8 to 26.6
Dispose of containers or objects that can contain (accumulate) water (tires, cans, bottles, plates, coconut shells, among others)	20 377	27.4	26.4 to 28.6
Cover well the containers where water is stored	21 314	40.2	39.2 to 41.1
Preventive attitudes towards dengue			
Lower (less than three attitudes)	49 939	88.4	87.7 to 89.0
Higher (at least three attitudes)	7890	11.6	11.0 to 12.3

*Weighted percentages according to survey complex sampling.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 4 Knowledge about dengue according to the sociodemographic characteristics of the respondents

Characteristics	Knowledge about dengue						
	Poor			Good			
	n	%†	95% CI†	n	%†	95% CI†	*P value**
Age							
Youth (18–29 years old)	8555	64.3	62.9 to 65.7	5575	35.7	34.3 to 37.1	**<0.001**
Adolescents (14–17 years old)	3603	70.2	68.3 to 72.1	1830	29.8	27.9 to 31.7	
Young adult (30–64 years)	19156	61.8	60.6 to 62.9	13991	38.2	37.1 to 39.4	
Senior citizens (≥65 years)	3268	68.4	66.3 to 70.5	1851	31.6	29.5 to 33.7	
Gender							
Male	17171	65.7	64.5 to 66.8	10581	34.4	33.2 to 35.5	**<0.001**
Female	17411	62.1	60.9 to 63.2	12666	37.9	36.8 to 39.1	
Marital status							
Single	11900	66.7	65.3 to 67.9	6799	33.4	32.1 to 34.7	**<0.001**
Married/cohabitant	10418	61.6	60.2 to 63.0	7883	38.4	37.0 to 39.8	
Widowed/separated/divorced	12264	62.8	61.5 to 64.1	8565	37.2	35.9 to 38.5	
Educational level							
Elementary school or lower	6021	59.8	58.0 to 61.6	4648	40.2	38.4 to 42.0	**<0.001**
High school	15386	66.2	65.0 to 67.5	9807	33.8	32.5 to 35.0	
Non-university higher education	8494	62.6	61.2 to 64.0	5741	37.4	36.0 to 38.8	
University higher education	4681	62.8	60.9 to 64.6	3051	37.2	35.4 to 39.1	
Ethnicity							
Mestizo	18275	61.5	60.2 to 62.7	14399	38.5	37.3 to 39.8	**<0.001**
Quechua	6681	74.9	73.4 to 76.3	2600	25.1	23.7 to 26.6	
Negro/Moreno/Zambo	2827	59.2	56.9 to 61.5	2256	40.8	38.5 to 43.1	
Other	6799	65.7	64.0 to 67.3	3992	34.3	32.7 to 36.0	
Rurality							
Urban	26151	64.1	62.9 to 65.2	17297	36	34.8 to 37.1	0.0608
Rural	8431	61.8	59.7 to 63.8	5950	38.2	36.2 to 40.3	
Natural region of residence							
Coast	15379	64.7	63.2 to 66.1	10479	35.3	33.9 to 36.8	**<0.001**
Highlands	11503	75.4	74.3 to 76.5	3682	24.6	23.5 to 25.7	
Jungle	7700	45.9	44.4 to 47.3	9086	54.1	52.7 to 55.6	

*Calculated by χ^2 test of independence with Rao-Scott correction for complex sampling. Values of p<0.05 are in bold.
†Weighted percentages according to survey complex sampling.

these political regions could be necessary for dealing with future outbreaks.

Frequency of preventive attitudes towards dengue fever

Regarding the frequency of preventive attitudes, we found that approximately 1 out of 10 Peruvians had at least three preventive attitudes. Although our results are compatible with the literature, we place our population as one of those with lower positive attitudes since other studies report at least 15% good attitudes.[26 31 38] That could be related to the previously discussed low level of knowledge and poor health literacy in the Peruvian population.[39 40] In this regard, poor attitudes and preventive practices have also been reported in past outbreaks of viruses (including Zika, chikungunya and influenza A H1N1),[39 40] with negative attitudes even during the COVID-19 pandemic.[41] On the other hand, it should be taken into account that comparison with other studies could be imprecise, due to methodological differences between studies, with heterogeneous scoring systems or cut-off points for defining preventive attitudes towards dengue. However, we observed that less than half of the respondents would discard stagnant water and that in the political regions of Peru with the highest incidence of dengue cases,[34] acceptable attitudes would be close to 30%. Given this, it would be necessary to implement strategies to educate and raise awareness of dengue among

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 5 Preventive attitudes towards dengue fever according to the sociodemographic characteristics of the respondents

Characteristics	Preventive attitudes towards dengue fever						
	Lower			Higher			
	N	%†	95% CI†	N	%†	95% CI†	*P value**
Age							
Youth (18–29 years old)	12 199	88.8	87.9 to 89.7	1931	11.2	10.3 to 12.1	**<0.001**
Adolescents (14–17 years old)	4884	91.3	90.2 to 92.4	549	8.7	7.6 to 9.8	
Young adult (30–64 years)	28 334	87.5	86.7 to 88.3	4813	12.5	11.7 to 13.3	
Senior citizens (≥65 years)	4522	89.8	88.5 to 91.0	597	10.2	9.0 to 11.5	
Gender							
Male	24 374	89.4	88.7 to 90.1	3378	10.6	9.9 to 11.3	**<0.001**
Female	25 565	87.4	86.6 to 88.2	4512	12.6	11.8 to 13.4	
Marital status							
Single	16 432	89.9	89.0 to 90.6	2267	10.2	9.4 to 11.0	**<0.001**
Married/cohabitant	15 527	86.8	85.8 to 87.8	2774	13.2	12.2 to 14.2	
Widowed/separated/divorced	17 980	88.2	87.3 to 89.0	2849	11.8	11.0 to 12.7	
Educational level							
Elementary school or lower	9279	86.7	85.4 to 88.0	1390	13.3	12.0 to 14.6	**<0.001**
High school	21 989	89.4	88.5 to 90.2	3204	10.6	9.8 to 11.5	
Non-university higher education	12 193	88.1	87.1 to 89.0	2042	11.9	11.0 to 12.9	
University higher education	6478	87.6	86.4 to 88.7	1254	12.4	11.3 to 13.6	
Ethnicity							
Mestizo	28 094	88.2	87.4 to 89.0	4580	11.8	11.0 to 12.6	**0.008**
Quechua	8021	90.1	89.1 to 91.1	1260	9.9	8.9 to 10.9	
Negro/Moreno/Zambo	4453	87.6	86.0 to 89.1	630	12.4	10.9 to 14.0	
Other	9371	88.0	86.9 to 89.1	1420	12.0	10.9 to 13.1	
Rurality							
Urban	37 359	88.6	87.8 to 89.3	6089	11.4	10.7 to 12.2	**0.019**
Rural	12 580	86.7	85.2 to 88.1	1801	13.3	11.9 to 14.8	
Natural region of residence							
Coast	23 113	90.0	89.0 to 90.9	2745	10.0	9.1 to 11.0	**<0.001**
Highlands	13 482	89.4	88.5 to 90.3	1703	10.6	9.7 to 11.5	
Jungle	13 344	80.4	78.9 to 81.8	3442	19.6	18.2 to 21.1	

*Calculated by χ^2 test of independence with Rao-Scott correction for complex sampling. Values of p<0.05 are in bold.
†Weighted percentages according to survey complex sampling.

the population since it has been shown that this could improve attitudes and preventive practices.[42]

Factors associated with knowledge about dengue fever and preventive attitudes towards dengue fever

We found that, in Peru, being female, being married/cohabiting, and residing in the jungle were associated with good knowledge of dengue and preventive attitudes towards dengue. These results are compatible with those reported in previous studies.[17 19 31] However, the knowledge and attitudes of women could be more remarkable since they are more likely to have higher health literacy,[43 44] and it is also possible that women are more likely to participate in workshops against diseases,[45] so that they would be more exposed to contact with health personnel. On the other hand, the greater knowledge and attitudes among married and cohabiting couples could be because having a partner entails a greater responsibility towards their family than single inhabitants. Thus, families with children tend to allocate more resources to ensure their homes and environment are comfortable, safe and free of *A. aegypti* breeding sites.[17 46] Accordingly, a higher incidence of dengue has been reported in dwellings where people live alone.[47] Meanwhile, the greater knowledge and attitudes of Peruvians residing in a political region of the jungle could be due to the higher incidence of the vector and dengue disease in these regions,[34 48] which

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

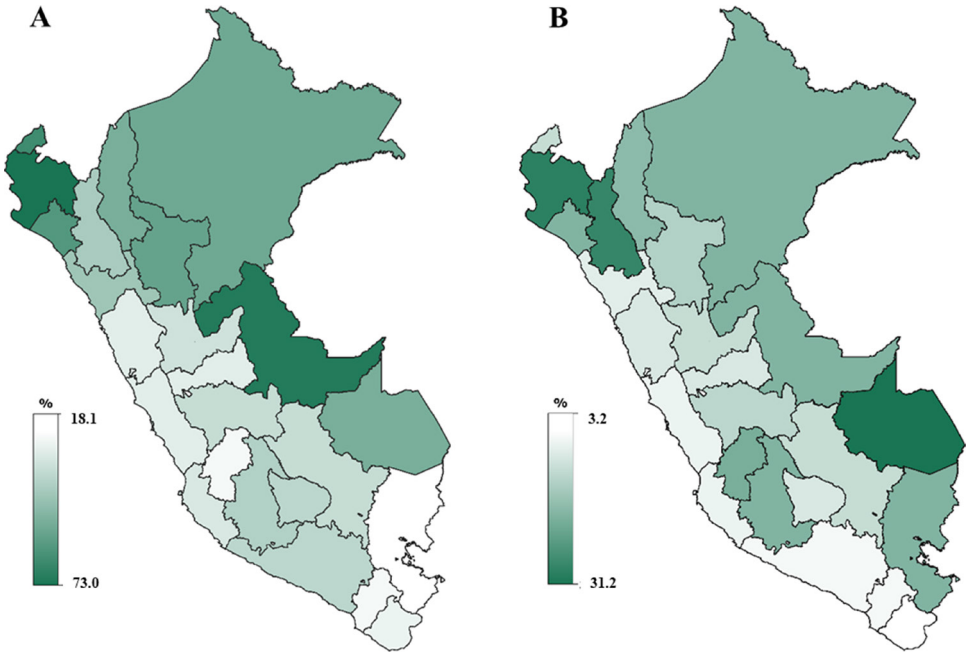


Figure 2 (A) Heat map of the level of adequate knowledge about dengue in the political regions of Peru. (B) Heat map of preventive attitudes towards dengue in the political regions of Peru.

would oblige the Peruvian Ministry of Health to have more significant promotion and prevention actions in these areas and therefore more training and awareness of this type of infection in the general population.[49]

On the other hand, we found that being an adolescent and belonging to the Quechua ethnic group were associated with less knowledge about dengue and lower attitudes towards its prevention. Deficient knowledge and attitudes in adolescents have been reported previously.[21 31] That could be due to a probable indifferent attitude towards awareness programmes on preventive measures and dengue control since the heads of the family take greater responsibility and care concerning the disease.[46] However, adolescents likely have greater access to and use the information available on the internet about dengue fever.[23] On the other hand, the lower knowledge and preventive attitudes among the Quechua ethnic group, who make up the majority of the indigenous population in Peru and whose native language is Quechua,[50] could be because most of the health advertisements in the media and preventive campaigns against dengue are mainly in the language understood by the majority of the national population. In addition, the majority of the population belonging to the Quechua ethnic group resides in high Andean areas, where the dengue vector is not present.[51] This lack of knowledge and preventive attitudes reveals the urgent need for massive dengue awareness campaigns, with emphasis on adolescents, who could face new dengue outbreaks in the future. Similarly, in the population belonging to the Quechua ethnic group, although they do not currently report cases with high frequency in their living areas, they may experience the disease in the future due to vector expansion into these areas, climate change, or migration to other regions of the country or abroad.

Public health implications and recommendations

It is known that the increase in temperature due to climate change and the presence of the 'El Niño Southern Oscillation' phenomenon significantly influences dengue outbreaks in Peru,[36] causing the incidence in all regions to fluctuate.[34] Consequently, the Ministry of Health has a fundamental role in epidemiological and active entomological surveillance,[52] since an outbreak could result in significant human and economic losses.[34] Therefore, it is necessary to carry out awareness and promotion strategies to prevent infection in all regions of Peru. It has also been shown that community participation is essential to curb the transmission, reducing the risk of dengue infection by up to four times compared with those who do not apply preventive measures.[53]

Our results suggest a long way to go to improve knowledge and preventive attitudes towards dengue in Peru. Therefore, implementing policies in favour of community-based elimination of breeding sites and the participation of health personnel to continue training the population is fundamental for dengue prevention. In addition, it is crucial to consider the sociodemographic factors reported in this study to formulate strategies based on teaching and strengthening knowledge about dengue. Finally, due to the importance of climate change on the increase of dengue cases,[36] we consider it essential to consider future studies to evaluate knowledge, mitigation attitudes and prevention in areas where sporadic cases of dengue are reported.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 6 Factors associated with knowledge and preventive attitudes towards dengue fever

	Knowledge				Preventive attitudes			
	Crude model		Adjusted model		Crude model		Adjusted model	
Characteristics	cPR (95% CI)	P value	aPR (95% CI)	P value	cPR (95% CI)	P value	aPR (95% CI)	P value
Age								
Youth (18–29 years old)	Ref.		Ref.		Ref.		Ref.	
Adolescents (14–17 years old)	0.96 (0.94 to 0.97)	**<0.001**	0.97 (0.96 to 0.99)	**0.001**	0.98 (0.97 to 0.99)	**<0.001**	0.99 (0.97 to 0.99)	**0.012**
Young adult (30–64 years)	1.02 (1.01 to 1.03)	**<0.001**	1.01 (0.99 to 1.02)	0.286	1.01 (1.00 to 1.02)	**0.003**	1.01 (0.99 to 1.02)	0.173
Senior citizens (≥65 years)	0.97 (0.95 to 0.99)	**<0.001**	0.95 (0.94 to 0.97)	**<0.001**	0.99 (0.98 to 1.00)	0.140	0.99 (0.97 to 1.00)	0.138
Gender								
Male	Ref.		Ref.		Ref.		Ref.	
Female	1.03 (1.02 to 1.03)	**<0.001**	1.03 (1.02 to 1.03)	**<0.001**	1.02 (1.01 to 1.02)	**<0.001**	1.02 (1.01 to 1.02)	**<0.001**
Marital status								
Single	Ref.		Ref.		Ref.		Ref.	
Married/cohabitant	1.04 (1.03 to 1.05)	**<0.001**	1.02 (1.00 to 1.03)	**0.016**	1.03 (1.02 to 1.04)	**<0.001**	1.01 (1.00 to 1.02)	**0.017**
Widowed/separated/divorced	1.03 (1.02 to 1.04)	**<0.001**	1.02 (1.00 to 1.03)	**0.013**	1.02 (1.01 to 1.02)	**<0.001**	1.01 (0.99 to 1.02)	0.144
Educational level								
Elementary school or lower	Ref.		Ref.		Ref.		Ref.	
High school	0.95 (0.94 to 0.97)	**<0.001**	0.97 (0.96 to 0.99)	**<0.001**	0.98 (0.97 to 0.99)	**<0.001**	0.99 (0.98 to 1.01)	0.267
Non-university higher education	0.98 (0.97 to 0.99)	**0.006**	1.01 (0.99 to 1.02)	0.51	0.99 (0.98 to 1.00)	0.054	1.01 (0.99 to 1.02)	0.425
University higher education	0.98 (0.96 to 0.99)	**0.018**	1.01 (0.99 to 1.03)	0.295	0.99 (0.98 to 1.01)	0.305	1.01 (0.99 to 1.03)	0.177
Ethnicity								
Mestizo	Ref.		Ref.		Ref.		Ref.	
Quechua	0.9 (0.89 to 0.92)	**<0.001**	0.93 (0.91 to 0.94)	**<0.001**	0.98 (0.97 to 0.99)	**0.001**	0.98 (0.97 to 0.99)	**<0.001**
Negro/Moreno/Zambo	1.02 (1.00 to 1.03)	**0.047**	1.01 (1.00 to 1.03)	0.067	1.00 (0.99 to 1.02)	0.467	1.01 (0.99 to 1.02)	0.319
Other	0.97 (0.96 to 0.98)	**<0.001**	0.97 (0.95 to 0.98)	**<0.001**	1.00 (0.99 to 1.01)	0.754	1.00 (0.99 to 1.01)	0.974
Rurality								
Urban	Ref.		Ref.		Ref.		Ref.	
Rural	1.02 (0.99 to 1.03)	0.061	1.01 (1.00 to 1.03)	0.115	1.02 (1.00 to 1.03)	**0.022**	1.00 (0.98 to 1.01)	0.750
Natural region of residence								
Coast	Ref.		Ref.		Ref.		Ref.	
Highlands	0.92 (0.91 to 0.93)	**<0.001**	0.93 (0.92 to 0.95)	**<0.001**	1.01 (0.99 to 1.02)	0.395	1.01 (0.99 to 1.02)	0.102
Jungle	1.14 (1.12 to 1.16)	**<0.001**	1.14 (1.12 to 1.16)	**<0.001**	1.09 (1.07 to 1.10)	**<0.001**	1.09 (1.07 to 1.11)	**<0.001**

Values of p<0.05 are in bold.
aPR, adjusted prevalence ratio; cPR, crude prevalence ratio.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Limitations and strengths

Some limitations should be mentioned. First, due to the cross-sectional design, the associations found do not imply causality. Second, we emphasise the possible recall bias or inadequate understanding of the questions in some subgroups; however, the interviewing staff received adequate training to carry out the fieldwork. Third, as the data came from a secondary database, some antecedents or factors of interest were not evaluated, such as the history of training on dengue, type of housing, socioeconomic level and environmental variables such as the presence of green spaces around the houses.[20 31] Finally, we do not have data from the survey to assess preventive practices, so we cannot be sure that preventive attitudes translate into better practices.

Despite these limitations, we analysed the information recorded in the National Survey of Budgetary Programs of Peru in 2019, which had national, regional and rural representativeness. On the other hand, this is the first study in Peru that uses nationally representative data to assess knowledge and attitudes about dengue infection and associated sociodemographic factors. In addition, this survey was conducted by previously trained personnel to avoid errors in the collection of information, thus improving the quality and veracity of the data. Therefore, we believe that the findings of this study can provide an overview of the factors associated with dengue knowledge and preventive attitudes in the Peruvian population.

CONCLUSIONS

In conclusion, Peru is a country highly affected by dengue disease. However, in terms of knowledge, only 4 out of 10 Peruvians possess good knowledge about dengue. The majority of respondents are aware of the transmission pathways and where to seek help if they have symptoms, but a large proportion does not have enough knowledge about the symptoms and self-medication. Regarding attitudes, only 1 out of 10 participants had three or more dengue preventive attitudes, and less than half of the participants were willing to adopt measures to prevent dengue. Additionally, being female, being married or cohabiting, and residing in the jungle region were associated with better knowledge and preventive attitudes towards dengue. However, overall, the level of knowledge and attitudes could be improved. Nevertheless, being an adolescent and belonging to the Quechua ethnic group were associated with worse knowledge and attitudes towards dengue. Consequently, our findings can be taken into account by health authorities and organisations responsible for the prevention of the disease and can be useful in the implementation of policies and programmes to prevent and control dengue in Peru. For example, it is imperative to implement national strategies and campaigns to promote awareness and knowledge about dengue, as well as to foster preventive attitudes. In addition, the results can help identify population groups that require special attention in dengue education and prevention.

Contributors The study was conceived and designed by DF-G and BC-C. Data were analysed by DF-G, BC-C. Data were interpreted by all authors. Drafting and revision of the manuscript were carried out by all authors. All authors reviewed and gave approval to the final submitted manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Map disclaimer The inclusion of any map (including the depiction of any boundaries therein), or of any geographic or locational reference, does not imply the expression of any opinion whatsoever on the part of *BMJ* concerning the legal status of any country, territory, jurisdiction or area or of its authorities. Any such expression remains solely that of the relevant source and is not endorsed by *BMJ*. Maps are provided without any warranty of any kind, either express or implied.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The survey database was freely obtained from the 'Instituto Nacional de Estadistica e Informatica' website (https://proyectos.inei.gob.pe/microdatos/index.htm).

Supplemental material This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iD

Daniel Fernandez-Guzman http://orcid.org/0000-0002-9441-1067

REFERENCES

1 Brady OJ, Hay SI. The global expansion of dengue: how Aedes aegypti mosquitoes enabled the first pandemic arbovirus. *Annu Rev Entomol* 2020;65:191–208.
2 Messina JP, Brady OJ, Golding N, *et al*. The current and future global distribution and population at risk of dengue. *Nat Microbiol* 2019;4:1508–15.
3 Messina JP, Brady OJ, Scott TW, *et al*. Global spread of dengue virus types: mapping the 70 year history. *Trends Microbiol* 2014;22:138–46.
4 Guo C, Zhou Z, Wen Z, *et al*. Global epidemiology of dengue outbreaks in 1990-2015: a systematic review and meta-analysis. *Front Cell Infect Microbiol* 2017;7:317.
5 Cafferata ML, Bardach A, Rey-Ares L, *et al*. Dengue epidemiology and burden of disease in Latin America and the Caribbean: a systematic review of the literature and meta-analysis. *Value Health Reg Issues* 2013;2:347–56.
6 Laserna A, Barahona-Correa J, Baquero L, *et al*. Economic impact of dengue fever in Latin America and the Caribbean: a systematic review. *Rev Panam Salud Publica* 2018;42:e111.
7 Litewka SG, Heitman E. Latin American healthcare systems in times of pandemic. *Dev World Bioeth* 2020;20:69–73.
8 World Health Organization (WHO). Dengue and severe dengue. 2022. Available: https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue#:~:text=environment%20and%20climate.-,%20prevention%20and%20control,in%20turn%20infect%20other%20people
9 Buhler C, Winkler V, Runge-Ranzinger S, *et al*. Environmental methods for dengue vector control-a systematic review and meta-analysis. *PLoS Negl Trop Dis* 2019;13:e0007420.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

10 Hasan MM, Hernández-Yépez PJ, de Los Angeles Rivera-Cabrera M, *et al*. Concurrent epidemics of dengue and COVID-19 in Peru: which way forward? *Lancet Reg Health Am* 2022;12:100277.
11 Plasencia-Dueñas R, Failoc-Rojas VE, Rodriguez-Morales AJ. Impact of the COVID-19 pandemic on the incidence of dengue fever in Peru. *J Med Virol* 2022;94:393–8.
12 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;86:328–34.
13 The Lancet Infectious Diseases. The dengue vaccine dilemma. *Lancet Infect Dis* 2018;18:123.
14 Instituto Nacional de Salud del Perú. Eficacia y seguridad de la vacuna contra el dengue. Revisión rápida, MINSA. Perú, Available: http://bvs.minsa.gob.pe/local/MINSA/4511.pdf
15 Winch PJ, Leontsini E, Rigau-Pérez JG, *et al*. Community-based dengue prevention programs in Puerto Rico: impact on knowledge, behavior, and residential mosquito infestation. *Am J Trop Med Hyg* 2002;67:363–70.
16 Dávila-González JA, Guevara-Cruz LA, Díaz-Vélez C. Nivel de conocimientos de dengue, signos de alarma y prevención en distrito de reciente brote. *Rev Haban Cienc Méd Internet* 2021;20:e3133.
17 Elson WH, Ortega E, Kreutzberg-Martinez M, *et al*. Cross-sectional study of dengue-related knowledge, attitudes and practices in villa El Salvador, lima, Peru. *BMJ Open* 2020;10:e037408.
18 Carmona G, Donaires LF. Percepciones comunitarias relativas a la prevención del dengue en asentamientos humanos afectados. Lima-Perú, 2015. *Interface (Botucatu)* 2015;20:839–52.
19 Paz-Soldán VA, Morrison AC, Cordova Lopez JJ, *et al*. Dengue knowledge and preventive practices in iquitos, Peru. *Am J Trop Med Hyg* 2015;93:1330–7.
20 Phuyal P, Kramer IM, Kuch U, *et al*. The knowledge, attitude and practice of community people on dengue fever in central Nepal: a cross-sectional study. *BMC Infect Dis* 2022;22:454.
21 Hossain MI, Alam NE, Akter S, *et al*. Knowledge, awareness and preventive practices of dengue outbreak in Bangladesh: a countrywide study. *PLoS One* 2021;16:e0252852.
22 Saied KG, Al-Taiar A, Altaire A, *et al*. Knowledge, attitude and preventive practices regarding dengue fever in rural areas of Yemen. *Int Health* 2015;7:420–5.
23 Alves AC, Fabbro ALD, Passos ADC, *et al*. Knowledge and practices related to dengue and its vector: a community-based study from Southeast Brazil. *Rev Soc Bras Med Trop* 2016;49:222–6.
24 Instituto Nacional de Estadística e Informática del Perú. Encuesta Nacional de Programas Presupuestales 2019 - ENAPRES - Ficha Técnica. 2020. Available: http://proyecto.inei.gob.pe/enapres/wp-content/uploads/2019/04/FICHA_TECNICA_EPPENAPRES_2019.pdf
25 Ministerio de Salud del Perú. Modelo de atención integral en salud basado en familia y comunidad: Documento técnico/ Ministerio de Salud. Lima. 2011. Available: http://bvs.minsa.gob.pe/local/MINSA/1617.pdf
26 Kazaura M. Knowledge, attitude and practices about dengue fever among adults living in pwani region, Tanzania in 2019. *Afr Health Sci* 2020;20:1601–9.
27 Van Nguyen P, Quang VoT, Dang Nguyen T, *et al*. Dengue fever in southern of Vietnam: a survey of reported knowledge, attitudes, and practices. *J Pak Med Assoc* 2019;69:S118–30.
28 Rijal KR, Adhikari B, Ghimire B, *et al*. Epidemiology of dengue virus infections in Nepal, 2006-2019. *Infect Dis Poverty* 2021;10:52.
29 Ward T, Samuel M, Maoz D, *et al*. Dengue data and surveillance in Tanzania: a systematic literature review. *Trop Med Int Health* 2017;22:960–70.
30 Nguyen-Tien T, Lundkvist Å, Lindahl J. Urban transmission of mosquito-borne flaviviruses-a review of the risk for humans in Vietnam. *Infect Ecol Epidemiol* 2019;9:1660129.
31 Selvarajoo S, Liew JWK, Tan W, *et al*. Knowledge, attitude and practice on dengue prevention and dengue seroprevalence in a dengue hotspot in Malaysia: a cross-sectional study. *Sci Rep* 2020;10:9534.
32 Naing C, Ren WY, Man CY, *et al*. Awareness of dengue and practice of dengue control among the semi-urban community: a cross sectional survey. *J Community Health* 2011;36:1044–9.
33 Piroonamornpun P, Looareesuwan P, Luvira V, *et al*. Treatment-seeking behaviors and knowledge, attitude and practices among suspected dengue adult patients at the hospital for tropical diseases, Bangkok, Thailand. *Int J Environ Res Public Health* 2022;19:6657.
34 Ministerio de Salud del Perú. Sala situacional de Dengue. 2022. Available: https://www.dge.gob.pe/sala-situacional-dengue/#grafico01
35 Medrano-Velásquez O, Córdova-Calle E, Ojeda-Gallo PM, *et al*. Perfil clínico, epidemiológico del brote epidémico de dengue durante El fenómeno El niño costero 2017, red asistencial piura, Perú. *Rev Cuerpo Med HNAAA* 2018;11:52–60.
36 Dostal T, Meisner J, Munayco C, *et al*. The effect of weather and climate on dengue outbreak risk in Peru, 2000-2018: a time-series analysis. *PLoS Negl Trop Dis* 2022;16:e0010479.
37 Kulkarni MA, Duguay C, Ost K. Charting the evidence for climate change impacts on the global spread of malaria and dengue and adaptive responses: a scoping review of reviews. *Global Health* 2022;18:1.
38 Harapan H, Rajamoorthy Y, Anwar S, *et al*. Knowledge, attitude, and practice regarding dengue virus infection among inhabitants of Aceh, Indonesia: a cross-sectional study. *BMC Infect Dis* 2018;18:96.
39 Ávila J, Munayco CV, Gomez J, *et al*. Conocimientos y prácticas sobre la nueva influenza A (H1N1) en trabajadores de salud y pacientes ambulatorios, Perú (mayo 2009). *Rev Perú Med Exp Salud Publica* 2009;26:5–8.
40 Mateo SY, Guzmán-Cuzcano JC, Peña-Sánchez ER, *et al*. Conocimientos, actitudes, prácticas Y percepción sobre Zika en mujeres en edad fértil de amazonas, Perú. *Rev Peru Med Exp Salud Publica* 2021;38:551–61.
41 Fernandez-Guzman D, Soriano-Moreno D, Ccami-Bernal F, *et al*. Prácticas de prevención Y control frente a la infección POR sars-cov2 en La población peruana. *Rev Cuerpo Med HNAAA* 2021;14:13–21.
42 Kusuma YS, Burman D, Kumari R, *et al*. Impact of health education based intervention on community's awareness of dengue and its prevention in Delhi, India. *Glob Health Promot* 2019;26:50–9.
43 Sørensen K, Pelikan JM, Röthlin F, *et al*. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). *Eur J Public Health* 2015;25:1053–8.
44 Zrubka Z, Hajdu O, Rencz F, *et al*. Psychometric properties of the Hungarian version of the ehealth literacy scale. *Eur J Health Econ* 2019;20:57–69.
45 Harapan H, Anwar S, Bustaman A, *et al*. Community willingness to participate in a dengue study in Aceh province, Indonesia. *PLoS One* 2016;11:e0159139.
46 Sayavong C, Chompikul J, Wongsawass S, *et al*. Knowledge, attitudes and preventive behaviors related to dengue vector breeding control measures among adults in communities of Vientiane, capital of the Lao PDR. *J Infect Public Health* 2015;8:466–73.
47 Zellweger RM, Cano J, Mangeas M, *et al*. Socioeconomic and environmental determinants of dengue transmission in an urban setting: an ecological study in Nouméa, new Caledonia. *PLoS Negl Trop Dis* 2017;11:e0005471.
48 Hayes CG, Phillips IA, Callahan JD, *et al*. The epidemiology of dengue virus infection among urban, jungle, and rural populations in the Amazon region of Peru. *Am J Trop Med Hyg* 1996;55:459–63.
49 Ministerio de Salud del Perú. Dengue and Chikungunya prevention is a priority for Loreto. 2015. Available: https://www.gob.pe/institucion/minsa/noticias/30819-prevencion-del-dengue-y-chikungunya-es-prioridad-para-loreto
50 Ministerio de Cultura del Perú. Pueblos quechuas. 2018. Available: https://bdpi.cultura.gob.pe/sites/default/files/archivos/pueblos_indigenas/Ficha Quechuas.pdf
51 Ministerio de Salud del Perú. Aprendiendo de la experiencia: lecciones aprendidas para la preparación y respuesta en el control vectorial ante brotes de dengue en el Perú. Lima Dirección General de Salud Ambiental; 2011. Available: http://bvs.minsa.gob.pe/local/MINSA/1828.pdf
52 Ministerio de Salud del Perú. Norma Técnica De Salud Para La Vigilancia Epidemiológica Y Diagnóstico De Laboratorio de Dengue, Chikungunya, Zika y otras Arbovirosis en el Perú. 2017. Available: https://www.dge.gob.pe/portal/docs/tools/arbovirosis18.pdf
53 Tapia-Conyer R, Méndez-Galván J, Burciaga-Zúñiga P. Community participation in the prevention and control of dengue: the patio limpio strategy in Mexico. *Paediatr Int Child Health* 2012;32:10–3.

BMJ Open: first published as 10.1136/bmjopen-2022-071236 on 21 March 2023. Downloaded from http://bmjopen.bmj.com/ on November 15, 2025 by guest. Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.