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Risk factors for the incidence of dengue in the Alhajuela community in Ecuador

Factores de riesgo en la incidencia del dengue en la parroquia Alhajuela in Ecuador

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ABSTRACT

This study analyzed the risk factors associated with dengue incidence in Alhajuela Parish, Manabí, Ecuador, to inform prevention strategies tailored to the local context. A structured survey was administered to 41 residents aged 18 years or older, gathering data on dengue knowledge, *Aedes aegypti* breeding sites, hygiene habits, and protective measures. Results showed that 41.5% of participants lacked basic knowledge about the disease, and 61% reported breeding sites near their homes. Only 34.1% of water containers were cleaned daily, while mosquito nets (95.1%) and repellents (53.6%) were the most common preventive methods. A clear association was found between poor domestic hygiene and higher exposure to the vector. The convergence of environmental factors, poor sanitation infrastructure, and limited community education increases the risk of dengue transmission. The study concludes that it is essential to strengthen educational campaigns, improve basic services, and promote community participation to reduce the incidence of this disease.

Keywords: dengue, risk factors, *Aedes aegypti*, prevention, community health.

RESUMEN

El estudio analizó los factores de riesgo asociados a la incidencia del dengue en la parroquia Alhajuela, Manabí, Ecuador, con el propósito de orientar estrategias preventivas adaptadas al contexto local. Se aplicó una encuesta estructurada a 41 residentes mayores de 18 años, recolectando información sobre conocimientos sobre dengue, presencia de criaderos de *Aedes aegypti*, hábitos de limpieza y medidas de protección. Los resultados revelaron que el 41,5% de los encuestados desconocía aspectos básicos de la enfermedad, mientras que el 61% reportó criaderos cerca de sus hogares. Solo el 34,1% limpiaba los reservorios de agua diariamente, y el uso de mosquiteros (95,1%) y repelentes (53,6%) fueron las medidas preventivas más comunes. Se identificó una relación entre las prácticas deficientes de higiene doméstica y una mayor exposición al vector. La combinación de condiciones ambientales, deficiencias en infraestructura sanitaria y limitada educación comunitaria incrementa el riesgo de transmisión del dengue. Se concluye que es fundamental fortalecer las campañas educativas, mejorar los servicios básicos y fomentar la participación comunitaria para reducir la incidencia de esta enfermedad.

Palabras clave: dengue, factores de riesgo, *Aedes aegypti*, prevención, salud comunitaria.

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INTRODUCTION

Dengue, also known as breakbone fever, is a mosquito-borne viral infection common in tropical and subtropical regions. In recent decades, its incidence has increased significantly, from 505,430 reported cases in 2000 to 5.2 million in 2019, according to the WHO. Although most cases are asymptomatic or present mild symptoms that do not require medical attention, the actual number of infections is estimated far to exceed the reported figures (PAHO, 2024).

Changes in climate patterns have a direct influence on the prevalence, incidence, and geographical distribution of vector-borne diseases. In this regard, mosquito-borne diseases must be taken into account, and among these, dengue fever stands out for its high morbidity rates (Cerda et al., 2008).

Dengue has established itself as one of the most prevalent vector-borne diseases in Latin America, characterized by recurrent outbreaks that pose a significant risk to countries such as Brazil, Colombia, and Ecuador. Furthermore, the province of Manabí has optimal climatic and geographic conditions for the proliferation of vectors responsible for disease transmission, a situation aggravated by structural poverty and health risks associated with rural communities in Manabí (Macías et al., 2025).

In Manabí, the spread of dengue is primarily influenced by climatic factors, such as rainfall, which favors the reproduction of the mosquito vector, as well as social factors including poverty, housing type, limited access to drinking water, and inadequate garbage collection (Vaca, 2020). In the parish of Alhajuela, an increase in dengue cases has been reported. This situation underscores the urgent need to strengthen prevention and control efforts, as well as develop community-targeted campaigns.

Despite the existence of information on how to prevent the transmission of vector-borne diseases and the availability of public health agencies, these continue to be a problem that warrants addressing to achieve structural solutions that extend beyond individual awareness and lead to state intervention aimed at addressing infrastructure issues (Intriago-Guillén et al., 2023).

Furthermore, economic disparities increase risk by limiting access to prevention and control measures. Identifying these factors is crucial for directing public health strategies focused on dengue prevention, control, and mitigation in the most vulnerable areas (Flórez-Mogollon, 2022).

This research analyzed some of the risk factors associated with dengue, emphasizing the

environmental factors that influence its incidence among residents of Alhajuela. Based on an analysis of previous studies and epidemiological data, this study aims to provide a comprehensive overview that will enable the development of more effective prevention and control strategies tailored to the specific conditions of this community.

METHODOLOGY

This study is a descriptive and cross-sectional investigation conducted in the Alajuela parish, Manabí, Ecuador, from June to October 2024. Its main objective was to identify the risk factors associated with the presence of the *Aedes aegypti* mosquito and the incidence of dengue in the area.

The study population included residents of the Alhajuela parish, selected using a non-probability convenience sample. Forty-one people over the age of 18 who resided in the area voluntarily participated and signed an informed consent form. Those who did not meet these criteria or whose survey results showed inconsistencies were excluded from the analysis.

A structured survey was administered in homes and public spaces within the Health Center's area of influence. The questionnaire addressed the presence of mosquito breeding sites, cleaning habits, protective measures, and knowledge about dengue. The responses were written by the participants and reviewed for consistency.

The data were coded and processed using Excel, applying descriptive analysis to identify trends and correlations between risk factors and dengue incidence.

The study was conducted in accordance with the ethical principles of confidentiality, autonomy, and beneficence. All participants were duly informed about the objectives and scope of the research and provided their voluntary, informed consent before participating in the survey.

RESULTS AND DISCUSSION

The age distribution of the participants ranged from 25 to 90 years (Figure 1). Respondents were classified into three groups: adults (18 people, 44%), older adults (12 people, 29%), and senior citizens (11 people, 27%). The average age of the sample was 48.07 years, indicating a predominantly adult population.

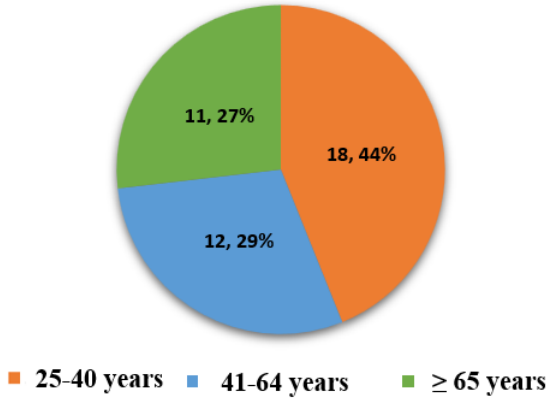

Figure 1. Age distribution of people surveyed in the parish of Alhajuela.

It is essential to note that older adults may experience more severe symptoms if they contract dengue, due to factors such as the progressive decline in immune system activity, which renders them more vulnerable to nutritional and functional limitations (Forbes-Hernández et al., 2020; Angulo et al., 2024). A study by Rosso et al. (2016) found that dengue infection was common in older adults as a cause of acute febrile syndrome, and a significant proportion required hospitalization and experienced complications, although no fatal cases were recorded.

According to Castellanos et al. (2014), older adults are more susceptible to developing severe complications from dengue due to their weakened immune systems and the presence of other health conditions. This study highlights that those symptoms in this population can be more severe and progress more rapidly, especially in those with comorbidities, which is a key finding for the Alhajuela community.

Figure 2 shows that 24 people (58.5%) reported being informed about dengue, while 17 (41.5%) were unaware of the topic. Although most are aware of the disease, the percentage of ignorance remains concerning, as it can affect dengue prevention and control. According to studies, community education plays a key role in reducing the spread of the virus, particularly in tropical and subtropical regions (Zamora et al., 2024).

To improve this situation, it is recommended that information campaigns be strengthened through talks in community centers, the distribution of educational materials, and local media. Community participation in these initiatives has been shown to enhance dengue prevention (Jara & Almeida, 2023), aligning with educational strategies proposed in academic forums on health innovation (García, 2024).

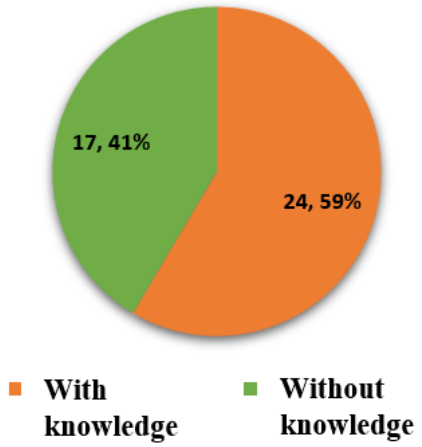

Figure 2. General knowledge about dengue and its risk factors.

Figure 3 shows the presence of *A. aegypti* breeding sites near their homes. 61% indicated they did have them, while 39% stated they did not. The proximity of *A. aegypti* breeding sites increases the risk of dengue transmission among the population. The accumulation of water in household containers facilitates the reproduction of bacteria, which increases the likelihood of infection. Therefore, eliminating these breeding sites is essential to reducing the incidence of the disease.

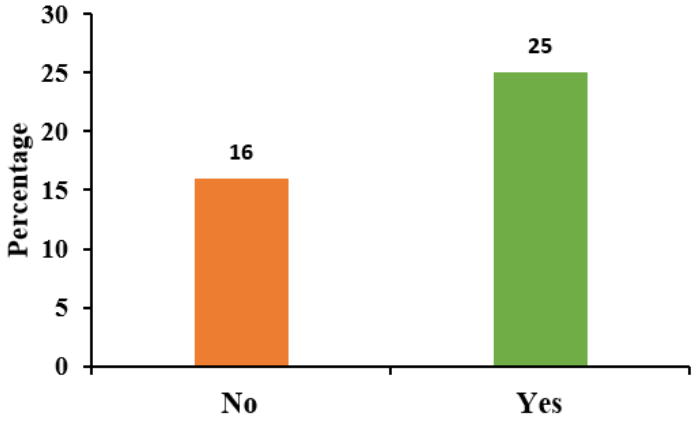

Figure 3. Presence of *Aedes aegypti* breeding sites near homes.

Community awareness and education campaigns have proven effective in preventing dengue, especially when implemented in educational settings. Raising awareness about proper waste management and water storage has significantly reduced the spread of mosquitoes in several

communities (Aragundi, 2024).

Figure 4 shows the frequency with which respondents clean water reservoirs, which are potential breeding sites for the *A. aegypti* mosquito. The results showed that 14 people (34.1%) clean them daily, 13 (31.7%) do so weekly, 5 (12.2%) biweekly, another 5 (12.2%) monthly, and four people (9.8%) admitted to never cleaning these containers.

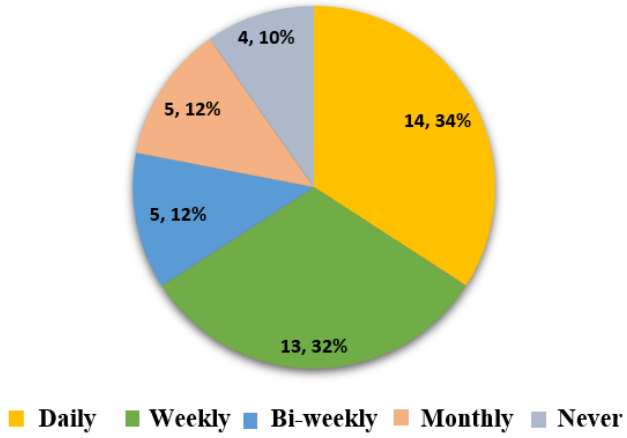

Figure 4. Frequency of cleaning water reservoirs.

Regular cleaning of reservoirs is essential to prevent the reproduction of *A. aegypti*, a vector of diseases such as dengue. A study conducted in Jutiapa, Guatemala, found that the average frequency of pool cleaning was biweekly, which was insufficient to control the proliferation of the mosquito (Monzón et al., 2019). This finding aligns with the variability observed in cleaning frequency in Alhajuela, where a significant proportion of the population does not adhere to optimal maintenance practices, thereby facilitating the proliferation of the vector.

It is alarming that 9.8% of participants do not clean their reservoirs, as stagnant water in household containers represents the ideal breeding ground for *A. aegypti*. To reduce the risk of spread, it is essential to develop community education initiatives that encourage the elimination of breeding sites and reinforce hygiene practices. Community education is essential for preventing the proliferation of *A. aegypti* and reducing the incidence of diseases transmitted by this mosquito (UNICEF, 2019).

Figure 5 presents protective measures against *A. aegypti*. The results indicated that the use of mosquito nets was the most frequently mentioned protective measure, reported by 39 people.

The use of repellent was also relevant, being reported in 22 cases, while the elimination of stagnant water was mentioned 18 times. Finally, the use of palo santo as a protective measure was mentioned only three times.

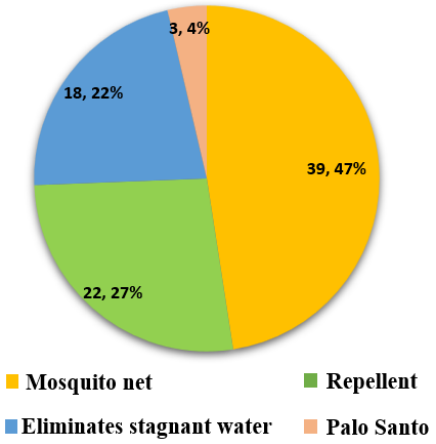

Figure 5. Protective measures against the *Aedes aegypti* mosquito.

The use of mosquito nets and repellents is a commonly recommended strategy to prevent *A. aegypti* bites. A study conducted in Costa Rica highlighted the importance of these measures in reducing the incidence of dengue in rural communities. The authors emphasized that the use of mosquito nets and repellents, along with the elimination of breeding sites, are essential components of a dengue control strategy (Troyo, 2006).

Eliminating standing water is another crucial measure for reducing mosquito populations. Eliminating standing water can reduce the adult mosquito population by up to 70% if done at least once a week in the same areas (Breakthrough ACTION + RESEARCH, 2018).

CONCLUSIONS

The study in the parish of Alhajuela revealed that the increase in the *A. aegypti* population is linked to problems such as stagnant water, poor drainage systems, and inadequate waste management. Although some residents are aware of dengue, there is a lack of knowledge about eliminating breeding sites and other preventive practices. This highlights the importance of intensifying educational campaigns and improving local infrastructure. The discussions conducted with the surveys were helpful, but further awareness-raising and community action are needed to reduce the spread of dengue.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: Zdravko Ivicevic and Edgar E. Rodríguez. **Data curation:** Zdravko Ivicevic and Edgar E. Rodríguez. **Formal analysis:** Winther B. Moreira, Claudia V. Constante, and Andrea V. Dueñas. **Research**: Zdravko Ivicevic, Edgar E. Rodríguez, Winther B. Moreira, Claudia V. Constante, Andrea V. Dueñas, Frank S. Vinces, and José H. Párraga. **Methodology:** Frank S. Vinces and José H. Párraga. **Software:** Zdravko Ivicevic and Edgar E. Rodríguez. **Supervision**: Frank S. Vinces and José H. Párraga. **Validation**: Frank S. Vinces and José H. Párraga. **Visualization:** Winther B. Moreira and Claudia V. Constante. **Writing of the original draft:** Zdravko Ivicevic, Edgar E. Rodríguez, Winther B. Moreira, Claudia V. Constante, and Andrea V. Dueñas. **Writing, review, and editing:** Zdravko Ivicevic, Edgar E. Rodríguez, Winther B. Moreira, Claudia V. Constante, Andrea V. Dueñas, Frank S. Vinces, and José H. Párraga.

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