

Application of the COMBI Strategy: An Alternative for the Prevention of Dengue

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Abstract In order to achieve behavioral changes related to the prevention and control of dengue (COMBI strategy), there are not bibliographic references known in ethnic and afro-descendant communities of Ecuador. The main objective of this research was to train communities about this prevention strategy, promote community participation for the elimination of the vector transmitter and disease, as well as prioritize and refer cases. It was a descriptive and cross-sectional investigation. The sample: formed by the family heads of the "Chachi" (Naranjal de Canande) and afro-descendants (Malimpia) communities of the Quinindé Canton. The information was collected with an instrument that involved aspects such as: personal data, level of education, ethnic group, occupation and general knowledge of dengue. The data was recorded in a table with Microsoft Excel and analyzed with Statgraphics Plus 5.1. The survey in Canandé and Malimpia was applied to 97.7% and 97.9% of the dwellings, respectively. The registered female gender predominated (57.95% and 68.04%) respectively. For the Chachi and Afro population groups, ages between 5-9 years were more relevant (24.32 and 41.93%) individually. The Chachi community contributed more response data to the contained items, such as: Do you know the name of the dengue mosquito? Is there anyone in your home who has suffered from Dengue? (n = 94, 96.90%). In Malimpia, 67% of the housewives participated learning the washing and brushing of internal walls of the buckets. Both communities detected low tanks as the most frequent breeding place.

Keywords: ethnicity, strategy, COMBI, prevention, dengue

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1. Introduction

Dengue is a viral infection caused by a virus transmitted to humans by the bite of an infected mosquito (*Aedes aegypti*). It is an endemic disease caused by an arbovirus of the family Flaviridae [1]. This virus replicates in the target organs, infecting leukocytes and lymphatic tissues, then the virus is released and circulates in the blood. The infection causes flu-like symptoms and sometimes evolves into a condition that, depending on the severity, could become the so-called "severe dengue" or hemorrhagic dengue [3].

It is a widespread infection that occurs in all tropical and subtropical regions of the planet [3]. According to the Dengue and Severe Dengue technical document, it is estimated that the number of people affected annually by this disease varies between 50 and 100 million people, with an estimated of half million people requiring medical

attention for presenting this severe form of the disease with a mortality rate of 2.5% [11]. The incidence of dengue has increased 30 times in the last 50 years, as well as in the geographical distribution [5,11].

The epidemiological behavior presents a different pattern every year, the threats of epidemics caused by dengue are marked by geographic vulnerability, climatic aspects, absence of basic services, habits, overcrowding, viral circulation and other factors [6]. In this sense, it is necessary to have strategies and procedures for the dissemination of relevant information for the adequate prevention and control of the disease, which also includes communication activities to deal with epidemic situations. [3]

The COMBI Strategy is a methodology for planning actions of sustained communication and social mobilization [8]. It is an innovative approach to communication and social mobilization that incorporates the lessons learned during decades of communication in public health and the experiences of the marketing of communication in the

private sector [9]. The use of a behavioral focus change for the prevention and control of dengue is a strategic process that is used to identify, promote and facilitate behaviors that may have a positive and significant impact [10].

The COMBI Methodology is a communication and social mobilization approach that can be used for any disease that is related to human compartments. COMBI consists of the following programmatic phases: Planning, Execution and Monitoring and Evaluation [11]. The participatory approach is the complement that brings novelty to the strategy. Currently, community participation is about improving the knowledge of each person living in each of the communities and thus reduce the rate of morbidity and mortality due to indispositions such as dengue [12].

In relation to other experiences of application in the Region, the COMBI guide for Dengue uses the experiences of 12 countries of Southeast Asia and the region of the Americas to illustrate their steps [6]. Similarly, Mosquera et al. [13] in Barranquilla, Colombia, analyzed the psychosocial factors that influence the risk practices that exist for dengue in these municipalities. The project was carried out to raise awareness of the COMBI methodology with the purpose of improving the effectiveness and sustainability of dengue fever control programs, through a participatory communication strategy based on local communication resources. Sánchez et al. [14] in the city of Havana-Cuba, applied this strategy in order to contribute to the knowledge of how to organize effective community control of *Aedes aegypti*, and the prevention of dengue. The methodology was based on systematizing other Cuban experiences, the approaches of action research and popular education for capacity building and for the development of intersectorial community participation. As a result of the research, it was reflected that the members of the community recognized the utility of community participation in the solution of local problems and in particular for the control of the vector *Aedes aegypti*.

Likewise, San Martín and Brathwaite-Dick [15], offer an analysis of the Integrated Management Strategy for the Prevention and Control of Dengue (EGI-dengue), approved at the 44th Directing Council of the Pan American Health and its main preliminary results by country include: greater coordination within the ministries, both from the technical and managerial point of view, greater coordination with other sectors, especially with the municipalities, better coordination with organized community groups and the implementation in practice of new local communication projects to change habits and behaviors related to dengue, an increase in the capacity to mobilize resources, which requires taking into account the costs of activities, tasks and facilitates negotiation. Peru exhibits the experience of how to impact on the behavior of the population through the COMBI strategy for the prevention and control of Dengue in Pampas Grande and Pampas del Hospital in a work carried out during the years 2006-2008 [16] emphasizing among the behaviors to modify, that the women housewives of the mentioned localities, improve in the practice of the washing of the containers where water is stored. As a result, 50% (3000) of the households of Pampa Grande and Pampas de Hospital, every five days, wash and brush with detergent the internal walls of the

tanks and plastic tanks where they store water. Similarly, the development of new skills and abilities in issues of community participation, education and anthropological research and an increase in the response capacity and the incorporation of new tools for epidemiological surveillance, such as the lifting of fast aedic indexes (LIRAA) in Brazil and the new Mosquitrap traps to calculate the *Ae. aegypti* index in adults [17].

In Ecuador, one of the first projects applying the COMBI strategy, was executed in the Housing Cooperative Guayas and Quil II in Guasmo Sur, Province of Guayas [19] called scope on the execution of the COMBI Plan. The results about the implementation revealed among others that the low tanks are the main generators of *Aedes aegypti* and consequently the proposed behavioral objective was to confirm that 100% of the housewives cooperatives wash and brush the low tanks once a week containing water and keep it properly covered. Esmeraldas is one of the Provinces of Ecuador where dengue is endemic.

It represents the province located in the fifth place of prevalence in the country in the last five years. There were reported 6122 cases and 95% of them had no warning signs. The Quinindé Canton contributes with 28% of cases of dengue, registering 1824 cases for the study date [20]. The "Chachi and Afro-descendant" communities represent localities belonging to the Naranjal de Canandé and Malimpia sectors. They are located in the Quininde Canton. The Malimpia parish registered 147 cases of dengue for the year in which the study was conducted. In Naranjal de Canandé, cases are recorded but there is a sub-registration of the information, perhaps due to the distance from the locality to the urban area and the weekly notification of cases despite having a simplified medicine clinic. In the aforementioned communities, little knowledge about dengue has been documented, with favorable attitudes towards control, but insufficient practices to achieve it.

Motivated that in the Province of Esmeraldas, even less in ethnic communities, no bibliographical references related to the application of the COMBI strategy have been found, the main objective of this research was to train the communities about the strategy, apply the methodology for the prevention of dengue and promote community participation through training and allusive messages to improve the knowledge society has about health education related to the vector transmitting dengue and disease. This research aims to improve the quality of understanding of each person and encourage community participation, to have a greater discernment about the disease.

2. Material and Methods

It was a descriptive investigation, known as the one where the data are described and these should have an impact on the lives of the people around [22]. Also, it is a field research, since it is done in the site where the object of study is located [21] where the data are collected transversally, since it implied observations made in a single moment of the investigation [22].

The population in the aforementioned study was comprised of all the inhabitants of the "Chachi and Afro-descendant"

communities of the Naranjal de Canande and Malimpia localities located in the Canton of Quininde, Province of Esmeraldas located in the north of Ecuador [23].

Quinindé, is an intermediate city located at 190 meters above sea level, with an average temperature of 25°C [26]. The rainfall is 2297 mm per year. [27] The canton is divided into urban or rural parishes and is represented by the Parish Councils before the Municipality of Quinindé. The urban parish is represented by Rosa Zarate. The rural parishes include: Cube, Chura, Malimpia, La Unión and Viche [23]. It represents 22.9% of the total of the province of Esmeraldas inhabitants respectively [26]. 74.4% of its population resides in the rural area. It is characterized for being a young population. Malimpia, is an Afro-descendant community. The parish bases the economic development of its inhabitants mainly on agricultural and livestock activities [25]. Naranjal de Canandé, on the other hand, is a community inhabited by the Chachi ethnic group, a characteristic group that lives in the jungle area of northwest Esmeraldas. They are dedicated to hunting, fishing, collecting wild edible fruits and making handicrafts.

Malimpia has an estimated population of 17,772 inhabitants and it is observed that approximately 85% of the population ends up with primary education and basic education, which means the majority of the population has an education from the 1st to the 10th year. However, 39.06% of the population of the parish attends the high school and only 2.81% of the population attends university education [25]. There are significant differences between the urban and rural areas in terms of the availability of these basic services [28]. The sources of employment are scarce because they dedicate their activity to the agriculture of the place (women) that serves as sustenance. Others handle informal work (selling crops) primarily. The sample was represented by a part of the population considered as any person who met the inclusion criteria and who were at the time of application of the survey. In this regard, the following were considered as criteria for inclusion: all family chiefs independent of gender and age who were at home at the time of the interview. The following criteria were excluded: any person who did not reside permanently in the communities under study, and people with hearing disabilities. The study was conducted between August and September of 2016.

Before the application of the strategy in each community, three meetings (trainings) and a talk were held, aimed to diffuse the most outstanding aspects of the vector and the disease. For the collection of the information, a structured instrument was designed in sections (items) that consisted of aspects such as: Item 1: generalities about the agent, the vector and the biological cycle of the mosquito. Item 2: signs and symptoms of dengue, treatment, warning signs and patient care. Item: 3 measures of prevention and control of dengue: management of the environment, use of a mosquito net, use of repellent, washing of containers, search and elimination of hatcheries, home visits and education to other people. The data obtained was systematized in a master table made in Microsoft Excel for later, analyzed in the statistical processor Statgraphics Plus 5.1 represented in frequency distributions and shown in statistical tables. The proportions of each of the variables of knowledge and practices in the interviews

were calculated and were associated each one of the variables under study according to the communities of origin through the χ^2 square test. Significant differences were considered with $p < 0.05$, with a confidence level of 95%.

3. Results

Table 1. Distribution of the surveyed population according to age and gender group. COMBI strategy Alternative for the prevention of dengue. Communities Naranjal de Canandé and Malimpia. August-September. Year 2016

| Canton Quinindé | | | | |
|-----------------|---------------------|-------|----------|-------|
| Community | Naranjal de Canandé | | Malimpia | |
| Age groups | f | % | f | % |
| 5-9 years | 15 | 17,04 | 21 | 21,65 |
| 10-14 years | 12 | 13,63 | 16 | 16,49 |
| 15-19 years | 10 | 11,36 | 5 | 5,15 |
| 20-24 years | 11 | 12,5 | 8 | 8,24 |
| 25-29 years | 13 | 14,77 | 18 | 18,55 |
| 30-34 years | 8 | 9,09 | 7 | 7,21 |
| 35-39 years | 11 | 12,5 | 11 | 11,34 |
| 40-44 years | 6 | 6,81 | 3 | 3,09 |
| 45-49 years | - | - | 3 | 3,09 |
| 50-54 years | 1 | 1,13 | - | - |
| 55-59 years | - | - | - | - |
| 60 years > | 1 | 1,13 | | |
| Genre | f | % | f | % |
| Feminine | 51 | 57,95 | 66 | 68,04 |
| Masculine | 37 | 42,05 | 31 | 31,96 |
| Total | 88 | 100 | 97 | 100 |

In relation to the distribution of the population surveyed in the dwellings, according to age groups it was observed that in the Naranjal de Canandé community, the group of 5-9 years prevailed (17.04% = 15 cases), followed by those with 25 -29 years (14.77% = 13 cases). Likewise, in the Malimpia community, the same group of 5 to 9 years prevailed (21.65% = 21 cases), followed also by the group of 25 to 29 years (18.55% = 18 cases). Regarding gender, in both communities the female gender prevailed in Naranjal de Canandé, (57.95% = 51 cases), in Malimpia, (68.04% = 66 cases). Meanwhile, the male sex in Naranjal de Canandé was 42.05% (37 cases) and in Malimpia the proportion was 31.96% (31 cases). By grouping the age variable into 5 intervals (according to age groups), no statistically significant association was found between the community of origin and the age groups ($X^2 = 1.34$, 4 gl, P value = $0.8000 > 0, 05$); nor was there a statistically significant association between the community of origin and gender ($X^2 = 2.01$; 1 gl; P value = $0.1000 > 0.05$).

In this way, 5 intervals were formed:

| Community | Naranjal de Canandé | | Malimpia | |
|--------------|---------------------|-------|----------|-------|
| Age groups | f | % | f | % |
| 5-9 years | 15 | 17,04 | 21 | 21,65 |
| 10-19 years | 22 | 25 | 21 | 21,65 |
| 20-34 years | 32 | 36,36 | 38 | 39,17 |
| 35-49 years | 17 | 19,32 | 17 | 17,53 |
| 50 years > | 2 | 2,7 | - | - |
| Total | 88 | 100 | 97 | 100 |

In the Naranjal Community of Canandé 100% of the surveys indicated that the predominant ethnic group was "chachi", also, in Malimpia all respondents were afro-descendants.

Table 2 shows the results of each of the questions contained in the instrument that were applied in the Naranjal de Canandé and Malimpia communities during the study period. As for the question, do you know the word dengue? the community of Malimpia obtained the highest percentage of affirmative answers (87.62% = 85 responses) while the community of Naranjal de Canandé recorded the highest percentage of negative responses (95.45% = 84).

Regarding question No. 2, do you know or how do you think dengue is transmitted? The Naranjal de Canandé community contributed a greater number of negative responses (98.86% = 87), in contrast to the Malimpia community, which recorded the highest number of affirmative answers (79.38% = 77).

The total number of respondents from the community of Naranjal de Canandé do not know the name of the vector that transmits the disease (preg 3) or where the dengue mosquito reproduces (preg 4) (100% = 88 cases). In the case of the Malimpia community, although they do not know how the vector is called (3.09% = 3), they do know where it reproduces (62.88% = 61).

Regarding question No. 5, if any person in their home had suffered the disease, both communities denied this reality: Naranjal de Canandé (97.72% = 86) and Malimpia (96.90% = 94). Regarding the knowledge of the symptoms of a person with dengue (preg 6), respondents from the community of Naranjal de Canandé denied knowing them (96.59% = 85), while a good number of inhabitants from the community of Malimpia, affirmed knowing them (70.10% = 68).

Regarding the existence of water supply in dwellings (preg 7) the people of both communities answered affirmatively: Naranjal de Canandé (96.59% = 85 cases) and Malimpia (91.75% = 89).

Table 3 shows the results of the application of the strategy in the selected communities. When evaluating the answers to the prior knowledge of the strategy, it was observed that in the community Naranjal de Canandé (n = 1) 1.13% of the informants knew the strategy and (n = 87) 98.86% did not know it. Not so, in Malimpia when (n = 87) 89.69% were familiar with this tool and (n = 10) 10.30% did not know that it existed. When evaluating after applied this tool in the community Naranjal de Canandé (n = 78) 88,63% applied it; however, (n = 10) 11.36% did not apply it. In Malimpia, (n = 97) 92.78% was applied in the whole community.

Table 2. Answers to the questions contained in the survey. COMBI strategy Alternative for the prevention of dengue in the Naranjal de Canandé and Malimpia communities. August-September. Year 2016

| Questions | Cantón Quinindé | | | | | | | |
|--|---------------------|------------|-----------|------------|-----------|------------|-----------|------------|
| | Naranjal de Canandé | | | | Malimpia | | | |
| | Yes | | No | | Yes | | No | |
| | f | % | f | % | f | % | f | % |
| 1. Do you know the word Dengue? | 4 | 4,54 | 84 | 95,45 | 85 | 87,62 | 12 | 12,37 |
| 2. How is Dengue Transmitted? | 1 | 1,13 | 87 | 98,86 | 77 | 79,38 | 20 | 20,61 |
| 3. Do you know the name of the dengue mosquito? | - | - | 88 | 100 | 3 | 3,09 | 94 | 96,90 |
| 4. Do you know the places of the reproduction of the mosquito? | - | - | 88 | 100 | 61 | 62,88 | 36 | 37,11 |
| 5. Is there any person who suffered dengue in your home? | 2 | 2,27 | 86 | 97,72 | 3 | 3,09 | 94 | 96,90 |
| 6. Do you know the symptoms of a person with dengue? | 3 | 3,40 | 85 | 96,59 | 68 | 70,10 | 29 | 29,89 |
| 7. Do you stock wáter at home? | 59 | 67,04 | 29 | 32,95 | 82 | 84,53 | 15 | 15,46 |
| 8. Is there a constant supply of water at home? | 85 | 96,59 | 3 | 3,40 | 89 | 91,75 | 8 | 8,24 |
| 9. Can dengue be prevented? | 7 | 7,95 | 81 | 92,04 | 63 | 64,94 | 34 | 35,05 |
| 10. Would you like to participate in the control of dengue? | 85 | 96,59 | 3 | 3,40 | 97 | 100 | - | - |
| Total | 88 | 100 | 88 | 100 | 97 | 100 | 97 | 100 |

Table 3. Evaluation of results. COMBI strategy Alternative for the prevention of dengue. Communities Naranjal de Canandé and Malimpia. August -September 2016

| Evaluation of the strategy | Canton Quinindé | | | |
|--|---------------------|------------|-----------|------------|
| | Naranjal de Canandé | | Malimpia | |
| Knew previously the strategy | Fa | Fr% | Fa | Fr% |
| Yes | 1 | 1,13 | 87 | 89,69 |
| No | 87 | 98,86 | 10 | 10,30 |
| Total | 88 | 100 | 97 | 100 |
| When evaluating the strategy, they applied | Fa | Fr% | Fa | Fr% |
| Positively | 78 | 88,63 | 97 | 92,78 |
| Negatively | 10 | 11,36 | - | 7,21 |
| Total | 88 | 100 | 97 | 100 |

4. Discussion

Dengue continues to be a public health problem in the Americas region despite efforts by member states to contain it and mitigate the impact of epidemics. It is a systemic and dynamic infectious disease. The infection may be asymptomatic or may be expressed with a broad clinical spectrum that includes both severe and non-severe expressions. After the incubation period, the disease begins abruptly and goes through three phases: febrile, critical and recovery [10].

The infection generates long-lasting immunity against the specific serotype of the virus. However, it does not protect against other serotypes and may later exacerbate hemorrhagic dengue. In dispersed communities such as those shown here, health systems designed to contain the disease can not maintain permanent, active and supervised surveillance for various reasons, perhaps the availability of resources for mobilization is more important. However, communication strategies would mitigate the problem.

COMBI, promotes the adoption of new behaviors or the modification of existing ones [29]. Although the opinions of the population and the facilities of adopting the promoted behaviors are taken into account, the views of the professionals involved are valued in the first place. This strategy also focuses on the changes in individual behavior and in the interior of the dwellings of its residents, leaving the transformations at the community level on a lower level. For which as a first step we proceeded to train through meetings, talks, and when applying the survey, knowledge was reinforced.

The inhabitants of the communities under study, attended equally to the training summoned. With similar results in the percentage of surveys applied: Naranjal de Canandé (97.7%, in Malimpia (97.9%). These findings do not agree with Prado (2006) who recorded that the inhabitants mostly attended the talks that the meetings (30%.) but differs with the results found by Gubler [31] who found greater participation when the surveys were applied, in which case the cipher of 70% was reached, being the community participation one of the socialization mechanisms of the power, is not developed in all scenarios for multiple reasons, arranged at different levels of power. From the macro, the lack of development of a clear and coherent public policy regarding participation, partisan clientelism, lack of ethics in the exercise of participation, the presence of groups outside the law in the communities, as well as other factors in the community environment, such as the lack of knowledge and information, poverty, displacement, lack of interest and lack of leadership, among others [32].

The results of the distribution according to age group and gender in the communities, indicate that in the community Naranjal de Canandé and Malimpia the group of 5-9 years predominated and also, the group of 20-29 years. Data registered in the surveys that usually this group was represented by the heads of families who were at home at the time of the interview. In Malimpia, in this case group the female sex prevailed. These results differ from those obtained by Criollo Fonseca et al. [33] in a study aimed at identifying knowledge, attitudes and

practices on dengue, following the application of social mobilization strategies in Yopal-Casanare, Colombia, during the year 2012, who found the predominant age group was 14-44 years (63.3%).

No settlers were found who identified themselves of mixed-race and indigenous when interviewing the population. A relevant aspect worth mentioning in this investigation is the fact that for members of the Chachi ethnic group, it is forbidden to marry people of other ethnic groups, although according to information obtained from the president of the Decentralized Autonomous Government [25], there have been cases of chachis who have children with black women.

Understood as a learning process of this field experience, it was appreciated that both communities do not know the name of the mosquito that transmits Dengue. This extremely important information demonstrates that preventive activities aimed at knowing the transmitting vector of the disease led from the health sector and operated from the school should be reinforced. On the other hand, it is clear in this intervention that in both locations they would like to participate in the control of dengue. This attitude could be used as a training strength for each geographical area evaluated, considering the potential of training and the influence of Chachi missionaries in the area, in contrast to Malimpia who receive this support influenced by the Centralized Autonomous Government through the health commission. The work team was able to show support in these and other activities aimed at containing epidemics.

Although, in both communities, the family heads revealed a very low percentage of relatives with dengue, and for this reason the lack of information on this topic suggests that most people in Canandé may not know how the disease is transmitted and how to prevent it. Also answer the question of why in Malimpia, you do not know how the transmitting mosquito is called? These results show the lack of information and knowledge of each of the inhabitants, on the subject in the communities evaluated. However, in Malimpia most people knew about this prevention strategy and applied it correctly because they did not know how the mosquito transmitter was called.

The COMBI strategy, effectively applied in the community of Naranjal de Canandé had been heard before in a very small proportion, at 1.13%, even though inhabitants were found to be unaware that it was dengue, as reflected in the survey. With the information provided, the strategy was explained and made known, about what it was about and how it could help them to avoid diseases, not just dengue. The lack of information that was presented in this community, made difficult the learning of the inhabitants but not impossible, for that reason, the training focused on informing them and the importance of each message received to prevent dengue. It was observed that 77% applied it affirmatively; however, the remaining 11% did not apply it; so it could be expressed that there was a positive balance with the application of the strategy in this community.

In the community of Malimpia, a different response was found by the community since they knew it was dengue and part of them knew what the strategy was about, so when applied in the community, it facilitated the work.

Perhaps, the most relevant aspect was knowing that most of the people who live in this community participated through washing, brushing tanks, swimming pools, cleaning their homes and surroundings as well as informing and motivating their neighbors.

It should be noted that the approach carried out in this study does not emphasize intersectoral cooperation. To perceive how a community conceives a disease was one of the distinctive elements of the experience developed, that will serve in the design of the adaptation to implement the strategy in other localities. It is important in this sense through the program of prevention and control of dengue to achieve behavioral and attitudinal changes. It was evidenced that the communities must be permanently informed through communication channels of how to prevent diseases and not expect economic affectations generated by this cause as it has been referred by other authors [34].

An important aspect observed is that the community relates the disease to the vector in its adult state, but not to the early stages. The informants indicated that the health personnel should participate efficiently in the actions of prevention and control of dengue in a timely and conscientious manner to obtain the expected results. Consider that control actions are carried out throughout the year and not only on dates where there is a greater rebound in the number of cases. The majority of the respondents indicated their willingness to collaborate in the control of *Aedes aegypti*, although a minority would not act accordingly.

Finally, encourage the participation of the entire population, promoting the importance of keeping their homes free of useless objects, which can serve as breedings for mosquitoes.

5. Conclusions

This research allowed to apply the COMBI strategy in the communities under study. Each of the communities was trained with the strategy. It was possible to appreciate that the previous knowledge about prevention strategies does not guarantee the obtention of the learning in the proper case of the vector, reason why it must be monitored and evaluated periodically. This approach can help in a strategic and structured way, to plan, implement, monitor mobilization and social communication, to achieve very specific behavioral results related to the prevention and control of diseases not only of dengue but of other communicable diseases.

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References

- [1] Sarti, E., L'Azou, M., Mercado, M., Kuri, P., Siqueira, J.B. Jr., Solis, E., Noriega, F., et al., A comparative study on active and passive epidemiological surveillance for dengue in five countries of Latin America. *Int J Infect Dis.* 2016; (44):44-9.
- [2] PAHO, Sistematización de lecciones aprendidas en proyectos de comunicación para impactar en conductas (COMBI) en dengue en la Región de las Américas. Costa Rica: OPS/OMS, 2011.
- [3] PAHO, ¿Qué es el dengue y cómo se trata? 2012. [consulted: September 10, 2012]. Available from: <http://www.who.int/features/qa/54/es/index.html>
- [4] PAHO, Guía de bolsillo: Diagnóstico y manejo clínico de casos de dengue. 2013. p 1-39.
- [5] Brady, O.J., Gething, P.W., Bhatt, S., Messina, J.P., Brownstein, J.S., Hoen, A.G., et al., Refining the global spatial limits of dengue virus transmission by evidence-based consensus. *PLoS Negl Trop Dis.* 2012; (6):1760.
- [6] Parks, W.J. and Lloyd, L.S, Planificación de la movilización y comunicación social para la Prevención del Dengue: guía paso a paso. 2004; OPS, OMS. Washington, DC. p.1-200.
- [7] PAHO, Dengue y dengue hemorrágico diagnóstico y tratamiento. 2005. Santo Domingo, R.D.p.1-12
- [8] Lloyd, L.S, Mejores prácticas para la prevención y el control del dengue en las Américas, informe estratégico 7, 2003. Arlington, VA: Environmental Health Project.
- [9] Mosquera, M., Obregón, R., Lloyd, L., Orozco, M., and Peña, A, Reflexiones sobre el alcance de la investigación formativa en comunicación en salud en los programas de prevención y control de dengue el caso Barranquilla (Colombia). *Revista Investigación y Desarrollo, Universidad del Norte.* 2010; 18(1), p. 186.
- [10] PAHO/WHO, Los casos de dengue en las Américas se quintuplicaron en diez años, según nuevos datos de la OPS/ OMS. Washington, D.C: PAHO; 2014.
- [11] WHO, Dengue y dengue hemorrágico: Nota descriptiva No. 117; [Cited October 12, 2012]. Available from: <http://www.who.int/mediacentre/factsheets/fs117/es/>.
- [12] Toledo Romani, M.E., Vanlerberghe, V., Perez, D., Lefevre, P., Ceballos, E., Bandera, D., et al., Achieving sustainability of community-based dengue control in Santiago de Cuba. *Soc Sci Med.* 2007; 64(4): 976-88.
- [13] Mosquera, M., Obregón, R., Lloyd, L., Orozco, M. and Peña, A, Comunicación, movilización y participación: lecciones aprendidas en la prevención y control de la fiebre dengue. (FD). *Investigación y desarrollo* 2006; 14(1). p120-151.
- [14] Sánchez, L., Pérez, D., Alfonso, L., Castro, M., Sánchez, L.M., Van der Stuyft, P., et al., Estrategia de educación popular para promover la participación comunitaria en la prevención del dengue en Cuba. *Rev Panam Salud Pública.* 2008; 24 (1):61-9.
- [15] San Martín, J.L. and Brathwaite, O, "La Estrategia de Gestión Integrada para la Prevención y el Control del Dengue en la Región de las Américas". *Rev. Panam Salud Pública/Pan Am J Public Health.* 2007; 21 (1): 55-63.
- [16] MINSA, Estrategia COMBI para la prevención y control del Dengue en Pampa Grande y Pampas de Hospital 2006 – 2008 - Tumbes. Perú. 2011.
- [17] Ministerio da Saude. Brasil. Secretaria de Vigilância em Saúde, Diagnostico rápido nos municípios para vigilância entomológica do *Aedes aegypti* no Brasil. LIRA a: metodologia para avaliação dos índices de Breteau e Predial. 2005. 60p.
- [18] Barrera R. Recomendaciones para la vigilancia de *Aedes aegypti*. *Biomédica* 2016; 36:454-62.
- [19] Servicio Nacional de Control de Enfermedades Transmitidas por Vectores Artrópodos "SNEM", Alcance sobre la ejecución del Plan COMBI, Provincia de Guayas y Guayaquil II – Guasmo Sur. Ecuador. Ministerio de Salud Pública del Ecuador. 2003.
- [20] Subsecretaría de Vigilancia de la Salud Pública. Dirección Nacional de Vigilancia Epidemiológica de Enfermedades transmitidas por vectores, Dengue. Ministerio de Salud Pública. Ecuador, SE 01 hasta 10, 2017.
- [21] Valmi, S., Driessnack, M. and Costa, I, Revisión de diseños de investigación resaltantes para enfermería. Parte 1: diseños de investigación cuantitativa. *Rev Latino-am Enfermagem* 2007; 15(3).
- [22] Hernández –Sampieri, R, Diseños de investigación transversal y longitudinal. 2012; p11-13.

- [23] Plan de Desarrollo y Ordenamiento Territorial GAD 2015-2020. Plan de ordenamiento territorial GAD Municipal de Quinindé. 2014.
- [24] Estévez, A, "Jóvenes Rurales en Ecuador. Grupos de Diálogo Rural, una estrategia de incidencia". Serie documento de trabajo N° 224. Grupo de Trabajo Inclusión Social y Desarrollo. Programa Jóvenes Rurales y territorio: Una estrategia de diálogo de políticas". Rimisp, Santiago Chile. 2017.
- [25] Plan de Desarrollo y Ordenamiento Territorial del Gobierno Autónomo Descentralizado Parroquial de Malimpia 2015-2019, GADPM. 2015. Quininde-Esmeraldas-Ecuador.
- [26] Plan de Desarrollo y ordenamiento Territorial del Gobierno Autónomo Descentralizado Provincial de Esmeraldas 2011-2020, GADPE. 2011. Esmeraldas-Ecuador.
- [27] Instituto Nacional de Meteorología e Hidrología de Ecuador, Anuario Meteorológico 53-2013. 2017. 165p.
- [28] Instituto Nacional de Estadística y Censos INEC, Secretaría Nacional de Planificación y Desarrollo (SENPLADES). 2010. Ecuador.
- [29] PAHO, Sistematización de lecciones aprendidas en proyectos de comunicación para impactar en conductas (COMBI) en dengue en la Región de las Américas. Costa Rica: OPS/OMS, 2011.
- [30] Prado, M, Nota Técnica. Metodología COMBI - Comunicación para El Cambio Conductual. Washington, DC 2006: OPS.
- [31] Gubler, D.J, "Epidemic dengue/dengue hemorrhagic fever as a public health, social and economic problem in the 21 st century." Trends Microbial 2002; 10(2): 100-3.
- [32] Cáceres, F.d.M. and Hernández, A, Participación comunitaria y control del dengue. Revista de la Universidad Industrial de Santander. Salud. 2008; 40(3):222-228.
- [33] Criollo, I., Bernal, A. and Castaneda, O, Conocimientos, actitudes y prácticas sobre dengue, tras aplicación de estrategias de movilización social. Yopal-Casanare, Colombia, 2012. Investig. Andina. 2014: 16(29); 1001-1015.
- [34] Guzmán, M.G., Triana, C., Bravo, J.R., and Kouri, G, Estimación de las afectaciones económicas causadas como consecuencias de las epidemias de Dengue Hemorrágico ocurrido en Cuba en 1981. Rev.Cubana Med Trop. 1992; 44: 13-7.