Coastal Environment and Social Environment Affecting the Vulnerability of Communities to Malaria Events in the Coastal Area of Syiah Kuala Sub-district of Banda Aceh

B Edi¹ Yustina Ida² Juanita³

Faculty of Public Health, University of Sumatera Utara, Universitas Street No.21 USU Campus Medan 20155, Medan, Sumatera Utara Province, Indonesia
edybakhtiar@ymail.com

Faculty of Public Health, University of Sumatera Utara, Universitas Street No.21 USU Campus Medan 20155, Medan, Sumatera Utara Province, Indonesia
idayust@yahoo.com

Faculty of Public Health, University of Sumatera Utara, Universitas Street No.21 USU Campus Medan 20155, Medan, Sumatera Utara Province, Indonesia
joean_ita@yahoo.com

Abstract. Banda Aceh city is dominated by coastal areas which are vulnerable areas as malaria vector breeding sites, Syiah Kuala Sub-district is one of the Sub-districts located in coastal areas with Annual Malaria Incident of 133 cases in 2017. This study aims to analyze coastal environmental factors and social environment against malaria. This type of research is a survey, using the mixed method model Concurrent Embedded method with a population of all households in 6 Villages of 5,628 households taking a sample of 112 respondents using the proportion formula. Data collection was done through questionnaires, observations, distance measurements and in-depth interviews with 6 informants, the data were analyzed bivariately using the chi-square test. The results showed that there were influences of lagoons, fish ponds, activities at certain times and knowledge of the incidence of malaria. Maintenance of malaria elimination can be optimized with coordinated, integrated planning and implementation efforts in the malaria breakdown forum. Raising and enhancing partnerships with various programs, sectors, NGOs, religious organizations, professional organizations, international organizations, donor institutions, business institutions and all levels of society by conducting migration surveys, investigating at-risk residents and monitoring the mobility of people who come and go to endemic areas to prevent malaria cases from re-entering. Malaria vector control in larva and positive larvae in the location focus by involving the community to support malaria elimination maintenance programs, especially in potential mosquito breeding sites such as lagoons, unproductive fish ponds by maintaining tilapia and blue panchax.
1. Introduction
Malaria is an infectious disease that is a public health problem in the world. High malaria can have a broad impact on quality of life, economy and poverty. According to the 2017 World Health Organization report, malaria is one of the deadliest diseases in the world that can be prevented. The number of malaria causes 105,574 cases and high risk 3.02 billion of the world's 7.6 billion population, the Global Technical Target (GTS) for Malaria 2016-2030 through the Sustainable Development Goals (SDGs) is an eradication effort contained in the third objective of ensuring a healthy life and seeking prosperity for all people until 2030.[1] In 2007 the 60th Conference of World Health Assembly (WHA) held a regional meeting in Geneva to discuss malaria elimination.[2] On December 21, 2011, the Asia-Pacific Malaria Elimination Network (APMEN) took place in the city of Brisbane, Australia discussing malaria as one of the most dangerous deadly diseases in the world.[3] The Government of Indonesia as a member of the APMEN malaria free program issued a policy through the Decree of the Minister of Health of the Republic of Indonesia Number 293 / MENKES / SK / IV / 2009 dated 28 April 2009 concerning Elimination of malaria to realize a healthy living community, gradually free from malaria transmission until 2030.[4]

Five Provinces with Annual Parasite Incident (API) / 1,000 residents, the highest being Papua (31.93), West Papua (31.29), East Nusa Tenggara (7.04), Maluku (5.81) and North Maluku (2.77). Provinces with the lowest API are West Java, Banten, DKI Jakarta, Bali and East Java, each with 0.00.[5] Based on the profile of the Ministry of Health of the Republic of Indonesia in 2016, suspected clinical malaria was 1,450,894 cases, blood samples were examined for 1,412,438 (97%) of suspected suspects. The number of positive malaria was 200,378 cases (0.77%) Annual Parasite Incident (API) / 1,000 residents, treated with Artemisinin-based combination therapy (ACT) as many as 172,779 (86%) of the total malaria positive in 412 districts / cities in Indonesia.[6] Historically, malaria in Aceh Province showed a relatively unstable number in the past four years. In 2014 the number of malaria positive 909 cases with API was 0.2 / 1,000 at risk, in 2015 it dropped to 422 cases with API 0.1 / 1,000 at risk, 2016 to 259 cases with API at 0.05 / 1,000 at risk, 2017 there was an increase to 300 cases with API of 0.06 / 1,000 at risk.[7] The form of Aceh Province's support in the malaria program is set out in the Aceh Governor Regulation number 40 of 2010 concerning the guidelines for Malaria Elimination.[8] Banda Aceh city is located in the coastal area and vulnerable to malaria transmission. Based on the profile of the Banda Aceh City Health Service in the last two years, in 2016 there were 1,135 suspects, in 2017 there were 808 suspects, 2 of them (1 male and 1 female over 15 years) were positive for contracting malaria with the API 0.01 / 1,000 vulnerable population transmitted by malaria.[9] According to residential characteristics, people residing in rural and coastal areas have a higher percentage of 7.1% than people living in urban areas at 5.0%. Job characteristics as a farmer / fisherman / laborer has a higher priority of 7.8% because the type of work has a probability of vulnerability and exposure with a larger malaria vector.[10] According to the United Nations Office for Disaster Risk Reduction, vulnerability is a condition determined by physical, social, economic and environmental factors or processes that can increase the vulnerability of a community to the effects of hazards.[11]

The potential to be affected by damage or loss related to the capacity to anticipate hazards, overcome hazards, prevent hazards and recover from the effects of hazards, both vulnerability and opponents of resilience, is determined by physical, social, political, cultural and institutional factors.[12] Vulnerability determined by physical factors including (risky buildings, insecure infrastructure, insecure important facilities, rapid urbanization), environmental factors including (deforestation, soil, water and air pollution, destruction of natural protection against storms, for example, mangroves) and climate change, social factors include (unsafe area settlements, high-density land settlements, low mobility, low risk perceptions, hazard-prone jobs, vulnerable groups and individuals), corruption, low levels of education, poverty, lack of vulnerability analysis and capacity, inadequate management and leadership, lack of disaster planning and preparedness and economic factors including agriculture with one type of food crop, non-diversified economy, economic subsistence, indebtedness, dependence on assistance / support prevented and cured, thus preventive action is one of the important actions to
overcome malaria. Efforts to prevent infectious diseases are a shared responsibility of the
government, regional government and society. Indicators of malaria prevention are sleeping using
mosquito nets, using mosquito coils / spray / electric / mosquito repellent lotion, installing wire netting
and using closed wear.

Syiah Kuala Sub-district is one of the second highest suspected malaria sub-districts out of 9 sub-
districts in Banda Aceh, with Annual Malaria Incidence (AMI) of 133 cases suspected of being
vulnerable to other coastal communities. The researcher focused on 6 villages from 10 villages in
Syiah Kuala Sub-district, 5 of which were directly adjacent to the coast, there were lagoons at several
points of settlement with global climate change which had unstable weather variability and resulted in
some community fish ponds being unproductive, there was 1 village with several point of swamps,
some people work as fishermen and fish pond farmers who are accustomed to activities at night do not
use closed clothing. In the breeding cycle, Anopheles mosquitoes need breeding sites to lay eggs. This
breeding place becomes an important thing in the life process of mosquitoes from larva then develops
into pupa. Then the pupa becomes an adult mosquito in the air. Only mosquito breeding sites have
certain criteria that can become a place for Anopheles mosquitoes to breed. Therefore, mosquito
breeding sites are one of the keys to analyzing the incidence of malaria. The purpose of this study was
to analyze the vulnerability factors of the community including environmental vulnerability (lagoons,
fish ponds) and social vulnerability (working at a certain time, knowledge) to the incidence of malaria
in the coastal of Syiah Kuala sub-district, Banda Aceh.

2. Methodology
This type of research uses the mixed method Concurrent Embedded model. In this case the author
uses quantitative data as the main data and qualitative data as a complement. The population in this
study were household in 6 villages in Syiah Kuala sub-district as many as 5,628 households with a
sample of 112 respondents and using the proportion formula. Data collection was done through
questionnaires, observations, measurements of the distance of houses with malaria mosquito habitat
related to the flying ability of anopheles mosquitoes ranging from 0.5 to 2000 meters and in-depth
interviews with 6 informants, data were analyzed bivariately using the chi-square test. For coastal
environment vulnerability variables including (lagoons and fish ponds) measured distance of
respondents 'homes to lagoons, fish farms using digital thrust Meter Rollers as research instruments
with not vulnerable categories if the distance of respondents' houses to lagoons and fish ponds> 2000
meters and vulnerable categories if the distance of the house respondents to lagoons and fish ponds
<2000 meters, while social vulnerability variables include (work / activity at a certain time and
knowledge) to work / move at a certain time when the checklist is categorized as non-vulnerable if the
respondent works at <18.00 and the category is vulnerable if the respondent works / moves at > 18:00
a.m.

For knowledge carried out using a structured questionnaire by submitting 15 questions to
respondents including knowledge about malaria, ways to transmit malaria, efforts to prevent malaria,
the habit of biting of anopheles mosquitoes, people's habits at night, clinical symptoms caused by
anopheles mosquito bites, anopheles mosquito habitat , how to control malaria, use vector breeding
places, how to treat malaria properly. Observations aim to obtain data on social phenomena related to
the control and utilization of lagoons, fish ponds, abandoned fish ponds in focus locations suspected of
influencing clinical malaria events. Furthermore, in-depth interviews with 6 informants consisting of 2
main informants namely farm owners who suffer from clinical malaria and 4 supporting informants
namely the head of Banda Aceh City Health Office, from malaria program coordinator of Banda Aceh
Health Office, head of Kopelma Health Center and head of Jeulingke Health Center in Syiah Kuala
Sub-district . The study was conducted from April to August 2018 in 6 villages (Langgugop, Rukoh,
Jeulingke, Tibang, Deah Raya and Aleu Naga) Syiah Kuala Sub-district, Banda Aceh City. The
sample is household, the part (subset) of the population chosen in a certain way until it is considered to
be able to represent the population and use the Lameshow formula to determine the number of samples
with the formula.
Meaning:

\[ n = \left( \frac{z_{1-\alpha} \sqrt{P_0 (1 - P_0)} + z_{1-\beta} \sqrt{P_a (1 - P_a)}}{P_a - P_0} \right)^2 \]  

(1)

\[ n = \left( \frac{1.96 \sqrt{0.23 (0.77)} + 0.842 \sqrt{0.6 (0.4)}}{0.1367^2} \right)^2 = 112 \]  

(2)

Based on the sample calculation formula above, the sample size that will be used in the study is 112 heads of household. To determine the number of samples in each village of Syiah Kuala Sub-district, the author used a proportionate sampling because the number of subjects in each region is not equal, it can be determined using the following formula:

\[ \text{Sample} = \frac{\text{head of household per village}}{\text{total head of household}} \times \text{total sample} \]  

(3)

Table 1. Distribution of samples per village in Syiah Kuala coastal area

| No | Village   | Total HH | Calculation        | Sample |
|----|-----------|----------|--------------------|--------|
| 1  | Lamgugop  | 1.362    | (1362/5628)x112    | 27     |
| 2  | Rukoh     | 1.560    | (1560/5628 x112    | 31     |
| 3  | Jeulingke | 1.552    | (1552/5628)x112    | 31     |
| 4  | Tibang    | 451      | (451/5628 x112     | 9      |
| 5  | Deah Raya | 234      | (234/5628)x112     | 5      |
| 6  | Aleu Naga | 468      | (468/5628)x112     | 9      |
|    | Total     | 5628     |                    | 112    |

3. Results and Discussion

3.1. Geography

Syiah Kuala Sub-district is one of the sub-districts in Banda Aceh with an area of 14,244 km² (1,424.4 Ha) consisting of 3 Settlements and 10 Villages, 5 Villages are the working area of Jeulingke Health Center including (Jeulingke Village, Pineung, Peurada, Tibang, Aleu Naga) and 5 Villages are the working areas of the Kopelma Health Center including (Kopelma Village, Rukoh, Lamgugop, Ie Masen Kayee Adang, Deah Raya). Some villages are directly adjacent to the coast, there are fish pond, lagoons and swamps. The area of Syiah Kuala Sub-district is bordered by: (1) The North is bordered by the Straits of Malaka, (2) The South is bordered by the District of Ulee Kareng, (3) The East is bordered by the District of Aceh Besar (4).

3.2. Demographics

The population of Syiah Kuala Sub-district in Banda Aceh City in July 2018 was 36,477 people, consisting of 18,581 men and 17,896 women with 10,241 households. The largest population is in Jeulingke Village with 6,440 inhabitants and the smallest population is in Deah Raya Village with 1,004 inhabitants.\(^{[18]}\)
3.3. Head of Household Characteristics in Coastal Area
The results showed that from 112 respondents, 41 (36.6%) heads of household finished their high school education, the smallest percentage of 3 (2.7%) heads of household did not go to school or finish elementary school and the rest 68 (60.7%) heads of household finished junior high school, associate degree and undergraduate degree. The largest respondents within 36-45 years of age are 41 (36.6%) heads of household. Related to gender, 93 (83%) respondents are male and for occupation, 46 (41.1%) heads of household work as entrepreneur.

3.4. Distribution of Lagoon
Of the 6 villages, the focus of the research is only Aleu Naga Village, which still has one lagoon with an area of 3 hectares. The number of lagoons and area can be seen in Table 2 below:

Table 2. Distribution of Lagoon Presence in the Coastal sub-district of Syiah Kuala Banda Aceh

| No | Village  | Total | area (Ha) |
|----|----------|-------|-----------|
| 1  | Lamgugop | 0     | 0         |
| 2  | Rukoh    | 0     | 0         |
| 3  | Jeulingke| 0     | 0         |
| 4  | Tibang   | 0     | 0         |
| 5  | Deah Raya| 0     | 0         |
| 6  | Alue Naga| 1     | 3         |
|    | Total    | 1     | 3         |

3.5. Distribution of Fish Ponds
Of 6 Villages, the focus of research in Aleu Naga and Tibang Village having the widest fish ponds of 145 hectares was in Aleu Naga Village and 125 were found in Tibang Village and the smallest fish ponds were in Jeulingke Village of 3 hectares. The existence and area of the fish pond can be seen in Table 3 below:

Table 3. Distribution of Fish Pond Existence in Coastal Syiah Kuala Sub-district, Banda Aceh

| No | Village  | Area (Ha) |
|----|----------|-----------|
| 1  | Lamgugop | 0         |
| 2  | Rukoh    | 6         |
| 3  | Jeulingke| 3         |
| 4  | Tibang   | 125       |
| 5  | Deah Raya| 42        |
| 6  | Alue Naga| 145       |
|    | Total    | 321       |

3.6. Distribution of Anopheles mosquitoes
Of 6 villages, the focus of research is 5 Villages, there are Anopheles mosquitoes with An.vagus species in fish ponds and An.Subpitis species in the lagoon. The presence of anopheles can be seen in Table 4 below:

Table 4. Distribution of Anopheles Types in the Coastal Sub-district of Syiah Kuala Banda Aceh

| No | Village  | Kind of Anopheles Mosquito | Place |
|----|----------|---------------------------|-------|
| 1  | Lamgugop | -                         | -     |
| 2  | Rukoh    | An. Vagus                 | Fish Pond |
3.7. Distribution of clinical malaria

Of the 6 villages, the focus of the study found that the largest clinical malaria in Rukoh Village was 46 cases and the smallest one in Lamgugop Village was 10 cases. The number of clinical malaria can be seen in Table 5 below:

Table 5. Number of Clinical Malaria in the Coastal of Syiah Kuala Sub-district Banda Aceh

| No  | Village      | Total of clinical malaria |
|-----|--------------|----------------------------|
| 1   | Lamgugop     | 10                         |
| 2   | Rukoh        | 46                         |
| 3   | Jeulingke    | 14                         |
| 4   | Tibang       | 18                         |
| 5   | Deah Raya    | 16                         |
| 6   | Alue Naga    | 29                         |
|     | Total        | 133                        |

3.8. Effect of Lagoon on Malaria Events

Based on the results of the statistical analysis using the Chi Square test, the p value = 0.000 was obtained, meaning that the lagoon factor affected the incidence of malaria (p <0.05) in the coastal area of Syiah Kuala Sub-district can be seen in Table 6 below:

Table 6. Influence of lagoon on malaria cases in Syiah Kuala coastal area

| Lagoon      | Malaria cases | Number | P value |
|-------------|---------------|--------|---------|
|             | High          | Low    |         |
|             | n  | %  | n  | %  | N  | %   |
| Vulnerable  | 12 | 92.3 | 1  | 7.7 | 13 | 100.0 |
| Not Vulnerable | 24 | 24.2 | 75 | 75.8 | 99 | 100.0 |

From the results of observations and secondary data in Syiah Kuala Sub-district, Aleu Naga Village still has a large lagoon with a 50-meter sea boundary, which is bordered by sand. The profile data of Syiah Kuala Sub-district in 2018 states that there are around 3 hectares of lagoons on the border of Aleu Naga Village with Bait Kaju Village, Aceh Besar. There are 2 out of 6 coastal villages including Aleu Naga and part of Tibang which their houses / residences are close to the lagoon. Respondents in this study aged 26-65 years were the age in the category of early adults up to the final elderly. The majority of respondents were 9 (8%) houses / dwellings close to the lagoon aged 36-45 years, namely the final adult age group and the smallest respondents of 4 (3.6%) houses / dwellings close to the lagoon aged 45-55 years namely early age groups were dominated by male family heads who were used to doing fishing.

From the results of measurements of the distance of the house / residence of respondents with a lagoon in 112 respondents obtained a description of distance with a vulnerable category as many as 13 families (11.6%). After a bivariate test with Chi-Square statistical test shows the lagoon variable has a relationship with the incidence of malaria (p <0.05), p = 0.000. Details of distance are 9 households in Aleu Naga Village, which are 200-500 meters away from 6 (66.67%) households and 600-1,500 meters in distance (3 (33.33%) households, from 4 families in Tibang Village with 3 (75%) KK is 1,000-1,300 m and 1 (25%) KK is 1,400-2,000 m. Female anopheles mosquitoes usually bite humans
at night or from dusk to dawn and the flight distance is no more than 0.5-2 meters from the breeding place.\[22\] Based on in-depth interviews with the head of the family who served as head of the hamlet with the profession of fish pond farmers in Aleu Naga Village suffering from clinical malaria, it was explained that in the past 6 months, health workers had visited their villages to check / snatch malaria larvae / parasites (plasmodium) in the lagoon. They did not know that the lagoon was a breeding ground for malaria mosquitoes and that for the past 3 months there had been no mutual aid to drain lagoon water into the sea. Some people use lagoons to fish, which are dominated by adult men early to late adulthood and look for oysters in lagoons dominated by mothers from late adulthood to the elderly. None of them collect / use the lagoon to maintain predatory fish larvae such as tin-headed fish, tilapia and blue panchax.

Malaria is an infectious disease that is a public health problem in the world. High malaria can have a broad impact on quality of life, economy and poverty. The WHO’s target of the 2016-2030 Global Technical Strategy (GTS) for malaria through the Sustainable Development Goals (SDGs) is eradication efforts contained in the third objective of ensuring a healthy life and seeking prosperity for everyone until 2030. Based on in-depth interviews with the Health Office of Banda Aceh city, which was represented in the field of prevention and infectious diseases (P2P), found that during this time the Health Office Banda Aceh city realized the programs / activities of infectious diseases, especially those related to mosquitoes, especially malaria in the maintenance phase of malaria. Laboratory to read the results of microscopic blood tests. Conduct surveys in the field if there are case reports from the community, conduct examination of thick blood preparations and peripheral blood in patients suspected of clinical malaria. Spraying the IRS in 1000 houses in cases and then running 20 houses in the working area of Kopelma Health Center. Until now there has been no special activity at potential mosquito breeding sites to monitor and pick up plasmodium larvae in the lagoon.

The absence of information dissemination to the good coastal communities of Syiah Kuala Sub-District, especially the control and utilization of lagoons for the coastal communities of Syiah Kuala sub-district, Banda Aceh. This is worsened by the lack of attention and cooperation from other sectors such as the Fisheries Service, Forest Service, Public Works Agency and others in controlling the environment such as lagoons, productive fish ponds and unproductive fish ponds. Whereas by utilizing the lagoon to maintain larvae predator fish such as tin-headed fish, tilapia and blue panchax can add income, reduce vulnerability and prevent good clinical malaria in the coastal areas of Syiah Kuala Sub-district, Banda Aceh.

3.9. The Influence of Fishponds on Malaria Incidence

Based on the measurement results of the distance from the respondent's house to the fishponds, 85 (75.90%) respondents are of vulnerable category and of 27 (20.10%) respondents are of not vulnerable category. The results of statistical analysis using the Chi-squared test showed (p<0.003), meaning that there is a significant influence between fishponds and the incidence of malaria (p<0.05) in the coastal area of Syiah Kuala. It can be seen in the table below:

| Fishponds  | Malaria cases | Number | P value |
|------------|---------------|--------|---------|
|            | High | Low | N   | %
| Vulnerable | 51   | 34  | 85  | 100.0 |
| Not vulnerable | 25 | 2  | 27  | 100.0 |

Based on the results of observations and measurements of the distance from the respondents’ house to the fishponds, the distance with a bad category was 85 heads of household (75.90%). After bivariate analysis with Chi-squared test showed that fishpond variables have a significant relationship with the incidence of malaria (p<0.05), p=0.003. Houses with mosquito breeding vectors around them have a
greater proportion of malaria incidence (54.5%), compared to houses that have no mosquito breeding sites around them (49.4%).\textsuperscript{[23]} The malaria case increased because there was a lack of support from related sectors. The community considers malaria is not a serious problem, so if people are affected by malaria, they do not immediately check with health service officials that will lead to higher malaria transmission. This is worsened by the lack of attention from other related sectors such as the Fisheries Agency, Forestry Service, Public Works Agency and other related agencies or services.

From the observation results and secondary data in Syiah Kuala Sub-district, there were 5 out of 6 coastal villages that have both productive and unproductive fishponds. The data from Syiah Kuala Sub-district in 2018, there are around 356 hectares of fishponds scattered in 5 coastal villages in Syiah Kuala. The largest fishponds are located in Aleu Naga Village with 145 hectares and the second ones are in Tibang with 125 hectares while the smallest fishponds are in Jeulingke Village with 3 hectares. Activities in handling abandoned fishponds in Sidodadi Village, Padang Cermin sub-district, Pesawaran Regency are the removal of moss and the spread of tilapia predatory fish which involves malaria cadres.\textsuperscript{[24]}

Malaria Care Forum (NGO) was in charge of the activity, while the fish spreading activity involving malaria cadres and the community with Pesawaran District Fisheries Service in charge of the activity. The spreading of 10,000 fish in abandoned fishponds in Sidodadi Village is a cross-sector program between the Fisheries Service and the Public Health Office. After the program to remove moss and algae and the spreading fish, cases of clinical malaria and positive plasmodium appear to be decreasing. In addition to handling abandoned fishponds, the other malaria control program was Indoor Residual Spraying (IRS), mass blood survey, larva catching, mangrove planting, and clean Friday movement. Cross-sector support related to malaria treatment is a necessity. The phenomenon of malaria is a continuous sequence. Firstly, a person falls ill due to contact with the environment, then an agent reacts in the body to fight the disease which may end up in a condition of being sick or healthy. The continuous phenomenon occurs around the world that includes infectious diseases such as malaria incidence on the coast of Syiah Kuala Sub-District, Banda Aceh.

Related to respondents’ occupation, 46 heads of household are entrepreneurs (41.1%), others are 24 (21.4%), 15 are civil servants (13.40%), 10 are housewives (8.10%), 9 are fishpond farmers (8%) and the smallest number is 8 fishermen (7.1%). Related to the measurement results of the distance from the house of the respondents to the fishponds, from 9 heads of household in Aleu Naga Village, 7 (77.8%) have a distance of 200-500 meter and 2 (22.2%) have a distance of 600-1,500 meter. From 9 heads of household in Tibang Village, 6 (66.67 %) have a distance of 100-500 meter and 3 (33.3%) have a distance of 600-1,000 meter. From 5 heads of household in Deah Raya Village, 4 (80%) have a distance of 100-500 meter and 1 has a distance of 600-1,000 meter. From 31 heads of household in Rukoh Village, 10 have a distance of 100-500 meter and 21 have a distance of 600-1,000 meter. From 31 heads of household in Jeulingke village, 8 (25.80%) have a distance of 100-500 meter and a 23 (74.20) have a distance of 600-1,000 meter.

Region-based disease management must be carried out in an integrated manner from the planning, implementation, financing and monitoring of its implementation, likewise, the management of abandoned fishponds with an integrated manner must be carried out at all stages of malaria control activities, for example, at the prevention stage, integration can be applied to extension programs both carried out by the Public Health Office and other agencies, from the health aspect, besides explaining the symptoms and treatment of malaria, it is also necessary to explain about the potential mosquito breeding sites and their dangers, whereas from the Forestry Service, it is necessary to explain the effects of mangrove removal and the benefits of mangrove preservation, also from the legal aspect, it is necessary to explain the rules and regulations per se; it also needs to be conveyed about the importance spatial planning of coastal area in the spatial planning of regency/city.\textsuperscript{[25]} Likewise, the Spatial Planning in the coastal area of Syiah Kuala needs to be carried out.

While in the spatial planning of province, the extension program will succeed well if there is an integration from planning, implementation, financing and monitoring. The management of abandoned fishponds so as not to be a place for breeding mosquitoes is a cross-sector program involving various
agencies. Besides, it also requires a large amount of funds. Because many parties are involved and require large funds, the government's political will is crucial. Without the support and involvement of all parties, the management activities of abandoned fishponds will not be sustainable or only a temporary activity. The need for community empowerment in handling abandoned fishponds and active participation from the community are also highly expected in mosquito breeding management programs in abandoned fishponds. With the involvement of the community, there is a guarantee for the sustainability of activities because the community can participate in monitoring the activities or at the same time implementing them. Utilizing the fishponds again are not an easy thing, many factors can influence it, in addition to the availability of funds, human resources, and technology.

Constraints on community empowerment programs for the spread of predatory fish such as red tilapia in the fishponds that are not productive are not easy. Although in terms of HR, it is not a problem with the active involvement of the community, but in terms of technology regarding fish farming, both red tilapia and milkfish are not easy, requiring the technology of water flow in the fishponds. The availability of this technology initially received assistance from the Fisheries Service but in its implementation there were obstacles that the community could not immediately resolve. The communities often act passively and no effort to solve the problem on their own.

Malaria is a complex problem so that eradication of malaria must be carried out in an integrated manner by all related components and becomes an integral part of national development for the realization of healthy communities, gradually getting rid of malaria transmission until 2030. Based on in-depth interviews with householders who work as fishpond farmers in Deah Raya Village who suffer from clinical malaria, it has been stated in the last 6 months that health workers have never visited their villages to check malaria and catch parasite larvae (plasmodium) in fishponds. In the past year, moss has never been cleaned on farms, because the fishponds were only partially in use by making barrier on fishponds because their harvest had declined in the last two years, so there was not enough fund to clean the fishponds. While fishpond farmers also experienced the same thing, there was a crop failure due to pest. And until now the village financial assistance has not been disbursed, only few fish seeds are kept and they have much time to go fishing, sometimes also fishing in neglected fishponds for additional income.

In the last three months, they fished or sailed without using long-sleeved clothes and did not always use mosquito repellent lotion, except while going for fishing that they use lotions because there are lots of mosquitoes. They use the neglected fishponds just to fish as a hobby that can give them extra income. Malaria is a serious problem and the handling of abandoned fishponds is necessary to break the chain of transmission of malaria. In addition to reviving abandoned fishponds with shrimp farming, it can also replace it with cultivation of blue panchax, parrot fish and tilapia fish that require funds not as large as shrimp farming. Cross-sector, integrated, and sustainable cooperation are the groundwork in handling abandoned fishponds.

Based on the in-depth interview with a section chief of infectious disease prevention in the Public Health Office, there were funds originating from health operational costs to monitor mosquito breeding vectors, but now the funds are only utilized to monitor the larvae around the house such as bathtubs, used bottles and trenches in rural areas which are more likely to monitor aedes aegipty larvae (DHF).

Whereas in unproductive or neglected fishponds, larvae catching has never been conducted. Until now there is no mutual cooperation program to clean moss on the fishponds, and the community itself either individually or in groups do not clean the moss in fishponds because the cost of cleaning is expensive while the crop are small (crop failure) and there is no socialization to inform coastal communities, both in the Syiah Kuala sub-district and the other sub-districts in Banda Aceh related to the use of abandoned fishponds for coastal communities. The lack of attention from other related sectors such as the Fisheries Service, and others in environmental control has exacerbated the situation. In fact, using fishponds to keep blue panchax, parrot fish and tilapia fish can add up income, reduce vulnerability and prevent clinical malaria and positive malaria in the coast of Syiah Kuala Sub-district of Banda Aceh.
3.10. Working / Activity Factors at a Specific Time with Malaria Events
Based on the results of statistical analysis using the Chi Square test, the value of p = 0.000, meaning that the activity / work at a certain time has an effect on the incidence of malaria (p <0.05) in the coastal area of Syiah Kuala can be seen in Table 8 below:

| Work/ activity at specific time | Malaria cases | Number | P value |
|-------------------------------|---------------|--------|---------|
|                               | High          | N      | %       | n      | %     |        |
| Vulnerable                    | 34            | 51     | 60,0    | 85     | 100,0 | 0,00   |
| Not vulnerable                | 2             | 25     | 92,6    | 27     | 100,0 |        |

Based on the results of interviews and community observations on 112 households in the coastal area of Syiah Kuala Sub-district, descriptions of work / activities at certain times were obtained with a vulnerable category of 49 (43.75%) households. After bivariate testing using the Chi-Square statistical test shows that the variable work / activity at a certain time has an influence on the incidence of malaria (p <0.05), p = 0.000. Observations found that malaria caused by work / activity outside the home at night was related to the habits of some species of mosquitoes that were exophagic at night. Exophagic mosquitoes are mosquitoes that bite a lot outside the home, but can enter the house if humans are the preferred main host. This is also related to the number of respondents who work / do activities outside the home such as some households of early adulthood and late adulthood who fish in the lagoon, the fish pond is neglected and some mothers look for oysters in the lagoon until late at night on the coastal District Syiah Kuala.

Based on in-depth interviews with the households who served as head of the hamlet with a fish pond farming profession in Aleu Naga Village who suffered from clinical malaria, explained that the farm had not been cleaned for the past 2 years and found many mosquitoes and usually went to the fish pond using short-sleeved clothes and not using mosquito repellent lotion, they only burn dried tree trash to repel mosquitoes. Malaria prevention efforts can be carried out by increasing awareness of the risk of malaria, preventing mosquito bites, controlling vector / suspect vectors and chemoprophylaxis. Prevention of mosquito bites can be done using mosquito nets, mosquito repellent lotion / spray / mosquito repellent / electric mosquito repellent and for those who are accustomed to working / doing activities above 6:00 p.m. you should use closed clothes or long sleeves and trousers to avoid mosquito bites. [26]

3.11. Knowledge with Malaria Events in the Coastal of Syiah Kuala Sub-district Banda Aceh
Based on the results of statistical analysis using the Chi Square test, the value of p = 0.002 is obtained, meaning that there is a significant influence between knowledge and the incidence of malaria (p <0.05) in the coastal area of Syiah Kuala Banda Aceh can be seen in Table 9 below:

| Knowledge | Malaria cases | Number | P value |
|-----------|---------------|--------|---------|
|           | High          | Low    |         | n      | %     |        |
| Poor      | 27            | 32     | 54,2    | 59     | 100,0 | 0,00   |
| Good      | 9             | 44     | 83,0    | 53     | 100,0 |        |

Based on the results of research on 112 respondents obtained a description with a bad category as many as 59 (52.68%) households. After bivariate testing with Chi-Square statistical tests showed that the knowledge variable had a significant effect on the incidence of malaria (p <0.05), p = 0.002 in the Coastal of Syiah Kuala Sub-district, Banda Aceh. Respondents only know partially about
understanding, clinical symptoms, modes of transmission, prevention methods, places to breed mosquitoes, how to find the right treatment. Based on the results of the statistical analysis, it can be explained that one’s knowledge will influence the incidence of malaria on the coast of Syiah Kuala Sub-district, Banda Aceh. This is supported by Bloom’s theory stating that knowledge is knowing what is done and how to do it; knowledge is the result of knowing someone about an object through their senses and is influenced by the intensity of attention and perception of the object.\textsuperscript{[27]}

In this study respondents did not know that malaria was transmitted by parasites to anopheles mosquitoes as many as 41 (36.6%) households, did not know malaria transmission through direct contact with malaria sufferers as many as 63 (56.3%) households, did not know one efforts to prevent malaria are to use mosquito nets during sleep at night as many as 47 (42.0%) households, do not know that malaria mosquitoes actively bite in the morning, afternoon and night as many as 63 (56.3%) households, do not know the habit of doing activities outside the home at night will be at risk of being bitten by malaria mosquitoes as many as 57 (50.9%) households. Not knowing malaria will heal on its own as many as 55 (49.1%) households, not knowing malaria can be affected by all age groups, except toddlers as many as 52 (46.4%) households, do not know the clinical symptoms of malaria, namely the presence of spots in the arms and body as many as 62 respondents (55.4%) households, did not know that malaria mosquitoes could breed in bathtubs and buckets filled with water in the house as many as 56 (50.0%) households, did not know that malaria mosquitoes could not develop multiply in unproductive lagoons / fish ponds and swamps as many as 51 (45.5%) households, do not know need to hoard as soon as swamps, puddles that can breed malaria mosquitoes as many as 63 respondents (56.3%) households.

Unaware of how to make a lagoon water irrigation channel into the sea is needed as many as 60 respondents (53.6%) households, do not know to maintain tilapia and blue panchax can reduce vulnerability, prevent malaria and increase income by 55 (49.1%) households, not knowing malaria can cause death if untreated immediately as many as 48 (42.9%) households did not know if the fever, shivering (malaria) had to go directly to the public health center, they only had 57 (50.9%) households. This is in line with the results of testing with chi square, the solution is to use fisher exact, the results show that \( p = 0.02 \) with continuity correction \( p \) value is 0.002, this shows that Ho is rejected with \( \alpha = 0.05 \), meaning that \( p \)-Value is smaller than the level of error that has been determined so that it can be seen that there is a relationship between the level of knowledge with the incidence of malaria in the Public health center area Kasongan Katingan Hilir Sub-district Katingan Regency.\textsuperscript{[28]} This is reinforced by the research results of statistical analysis obtained \( \chi^2 \) count (33,885) > \( \chi^2 \) table (3,841) and \( p (0,000) < \alpha (0,05) \), meaning there is a relationship between knowledge and incidence of malaria in Koeleoda Health Center, Golewa Sub-district Ngada Regency.\textsuperscript{[29]}

Knowledge determines a person’s behavior, for example preventive measures (health prevention behavior) for malaria, i.e. every action taken by individuals to prevent malaria, among others, sleeping using mosquito nets, using anti-mosquitoes, installing mosquito nets, using long-sleeved clothes when working / doing activities above 18.00 hours, flowing water from the lagoon or lagoon or creating a coastal barrier, cleaning the fish ponds from moss, closing / hoarding marshes and dealing with lagoons, ponds are not productive to maintain predator mosquito larvae like blue panchax, indigo and tilapia. Efforts to increase public knowledge about the dangers of malaria have been carried out by the Banda Aceh City Health Office through the management of eradication and prevention of malaria is to carry out counseling and promotions in the form of solicitation such as morning patrol conducted by Kopelma Public Health Center. However, providing information on lagoon production, productive ponds and unproductive ponds as a place that has the potential and susceptibility to malaria has never been done. Likewise the management / utilization of lagoons, unproductive fish ponds can be utilized to maintain tilapia and blue panchax as predatory fish to eat mosquito larvae which can reduce the malaria vector and can increase additional income.

Based on the results of interviews with the Head of the Health Office represented by the prevention, control of infectious diseases and the Malaria Program Coordinator, the Banda Aceh City Health Office said that counseling was carried out individually when the community was sick with
The results of interviews with the Head of the Jeulingke Public Health Center said that counseling was not carried out related to mosquito breeding places such as lagoons, fish ponds, while the explanation of the Kopelma Public Health Center head was now conducted only in the morning to clean the house using ambulances in one neighborhood each Village Kopelma Health Center as a pilot project. Based on the results of the study on 112 respondents 36 (32.14%) Households experienced clinical malaria. The results of in-depth interviews with pond farmers who suffered from clinical malaria in the past 6 months, health workers never came to the village to inform them that potential places for developing malaria mosquitoes such as lagoons, unproductive fish ponds with the reason that they might not have monitoring programs especially on lagoons, fish farms are not productive. Some people do not know that the lagoon is a breeding ground for malaria mosquitoes on the grounds that there is no information that the lagoon is a breeding ground for anopheles mosquitoes. During the last 2 years, some community farms were not operated and did not carry out maintenance, cleaning moss on ponds with the reason of crop failure so that there was not enough funds to clean up the removal of moss because the cost of cleaning fish ponds was expensive.

During the last 3 months the community had never had a mutual aid flowing water from the lagoon to the sea on the grounds that there was no appeal from the Village Head also from Health officials and part of the coast had been made embankments but was cut off in the middle of Aleu Naga Village with the border of Bait Kaju Village, Aceh Besar. When going to unproductive farms /fish ponds at> 18:00 a.m. usually do not use mosquito repellent or do not use clothes on the grounds that when they go to fish farms, they usually burn trash of dried tree branches or use mosquito coils, also accustomed to using open clothing or short sleeve shirt. Non-productive ponds are not utilized to maintain predatory larvae fish such as blue panchax, tilapia for the reason that the place is like a lot of crabs and various other types of fish. They did not know that maintaining blue panchax and tilapia, besides being able to increase income, could also reduce the breeding of plasmodium mosquito vectors so that the incidence of malaria both clinical and malaria positive was reduced. The malaria control program carried out in Syiah Kuala Sub-district based on this research seems to emphasize more on goal rationality, namely health workers are still limited to being part of the “healer” facility, these officers have not been optimal in carrying out preventive and preventive functions on the coast of Syiah Kuala Sub-District, Banda Aceh.

4. Conclusions

Based on the results of the research and discussion described earlier, some conclusions can be drawn as follows:

1. There is an effect of lagoons on the malaria incidence at p=0.000 on the coast of Syiah Kuala.
2. There is an effect of fish ponds on malaria incidence at p = 0.003 on the coast of Syiah Kuala Sub-District, Banda Aceh.
3. There is the influence of work / activity at a certain time on the incidence of malaria in the amount of p = 0,000 in the coastal area of Syiah Kuala Sub-District, Banda Aceh.
4. There is an influence of knowledge on the incidence of malaria at p = 0.002 on the coast of Syiah Kuala Sub-District, Banda Aceh.

5. Suggestions

Suggestions that can be given for prevention, control of malaria vectors related to the vulnerability of the community to the incidence of malaria on the coast of Syiah Kuala Sub-District, Banda Aceh are:

1. For the Banda Aceh City Health Office, in planning and implementing efforts to maintain malaria elimination, it should be carried out in a coordinated and integrated manner in the national malaria eradication forum. Raising and enhancing partnerships with various programs, sectors and all levels of society by conducting migration surveys, investigating at-risk residents and monitoring the mobility of people who come and go to endemic areas. Malaria vector control in larva and positive larvae by
involving the community by keeping fish such as blue panchax and tilapia on potential mosquito breeding sites like lagoons, productive fishponds and unproductive fishponds.
2. For the Jeulingke and Kopelma Public Health Center in Syiah Kuala Sub-District, it is expected to increase surveillance that reaches all eliminated areas. Detect cases early and treat appropriately, increase socialization / extension of sustainability. Encourage the community to participate in mutual cooperation in potential breeding places for mosquitoes, support the management of breeding places such as lagoons, productive fishponds and unproductive fishponds so as to produce economic value.
3. For coastal communities in Syiah Kuala Sub-district are expected to avoid mosquito bites by using repellent, wearing closed clothes when they go out above 18.00, using mosquito nets and willing their house be sprayed by the IRS. Using unproductive fishpond and lagoons to maintain blue panchax and tilapia fish as a malaria larvae control. Supporting and getting involved in local malaria snatching in seeking malaria sufferers as early as possible.

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