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Implementation of the One Health approach in controlling rabies in Minahasa Regency, Indonesia

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Abstract

Background and Aim: Minahasa Regency is one of the regions in Indonesia where rabies is endemic. Therefore, this study aimed to explore the implementation and the challenges of the One Health approach in the rabies control program in Minahasa Regency.

Materials and Methods: This qualitative study was carried out using semi-structured interviews involving 8 respondents who were stakeholders from five related sectors. A triangulation of source and method was conducted.

Results: The results showed that the collaboration between stakeholders had been limited due to a lack of control and evaluation of the One Health approach. Furthermore, the program faced challenges and there was a lack of advocacy for the local government and stakeholders to build multisectoral collaboration.

Conclusion: To successfully implement the One Health approach in rabies control program in Minahasa, stakeholders from human, animal and ecological settings need to have a better understanding and support the idea. Regular communication between stakeholders is also needed to develop interdisciplinary actions to combat rabies.

Keywords: control, Minahasa Regency, One Health approach, rabies.

Introduction

Rabies is a global problem that has gained significant attention and posed a threat to society for centuries [1]. It is a viral zoonotic disease that causes progressive and fatal inflammation of the brain, with a Case Fatality Rate (CFR) of 100% [2, 3]. Despite being entirely vaccine-preventable, rabies kills tens of thousands of people annually [4]. According to the Office International des Epizooties global data, rabies caused almost 70.000 human deaths annually, equivalent to one death in 10 min [5]. Fatal cases are concentrated in Africa and Asia, with over 95% of total death, making these regions the most vulnerable to rabies [6]. Indonesia is one of the developing countries in South-east Asia that is still trying to control rabies. Rabies remains a prioritized zoonosis disease in the country due to its public health importance and socio-economic impact. The Ministry of Health reported a high human death rate caused by rabies, ranging from 100 to 156 deaths every year with a 100% CFR. Between 2015 and 2019, 404,306 cases of rabid animal bites were recorded, with 544 deaths [7]. The five provinces with the highest number of deaths among provinces in Indonesia were North Sulawesi, West Kalimantan, South Sulawesi, North Sumatra, and East Nusa Tenggara [7]. Minahasa Regency in North Sulawesi Province had one of the highest rabies cases among the other 11 regencies and four cities. In 2020, there was one death case in July [8], and by April 2021, two death cases were recorded [9]. One method for preventing or controlling rabies is the "One Health" approach, which emphasizes the collaboration between humans, animals, and the environment [10–12]. The One Health approach is highly relevant in zoonotic diseases, including rabies control efforts [13].

According to the findings of a study conducted by Tenzin *et al*. [14] in Bhutan, only 17 cases of rabies were reported between 2006 and 2016. Bangladesh successfully piloted One Health multisectoral approach piloted in small villages and was integrated into all parts of the country. This approach produced deaths due to rabies from 1500 cases in 2012 to 200 cases in 2015. The trend of cases in humans changed quite rapidly after the One Health approach was introduced in 2011 [15]. Sri Lanka also reported that with an integrated approach, deaths due to rabies were reduced, with the mortality trend decreasing from 2009 to 2014 [16]. Dog vaccination programs using the approach achieved a minimum coverage of 70%, which was proven to effectively control rabies in resource-poor endemic areas such as Tanzania [17]. In Indonesia, the government selected

four regions as the One Health approach pilot areas to tackle zoonotic diseases. These areas included Ketapang (West Kalimantan), Boyolali (Java Central), Bengkalis (Riau), and Minahasa (North Sulawesi). In Ketapang, the application of the One Health approach in handling rabid animal bite cases is considered effective in minimizing the number of victims [18]. Boyolali successfully applied this approach to handling 22 suspected cases of rabies in 2017 by involving various cross-sectors [19]. With the concept of One Health, there was an efficient handling of rabies cases, from 2012 to 2019, with no reported cases of *Lyssavirus* from 2012 to 2019 in Bengkalis [20, 21]. In Minahasa, a cross-ministry pilot project with the One Health approach was started in 2018 through a collaboration between the government, World Health Organization, and Food and Agriculture Organization (FAO). Despite the implementation of this approach in recent years, the latest data obtained from the Minahasa Health Department showed that there are still rabies outbreaks in 2021. Therefore, implementing the One Health approach in Minahasa Regency still requires further inspection since it has not created a rabies-free area. It is expected that after a successful implementation, the regency should control rabies properly to prevent human deaths due to rabies.

Therefore, this study aimed to provide an overview of the role of stakeholders in implementing the One Health approach, program challenges, integrated One Health approach implementation activity as a form of collaboration and partnership, and advocacy efforts for One Health approach policy in rabies control. The results are expected to be used for future evaluations to show the better One Health approach in the Minahasa Regency.

Materials and Methods

Ethical approval and informed consent

This study was approved by the Faculty of Public Health, Sam Ratulangi University Research Ethics Committee. Before data collection began, each stakeholder who became a respondent in the research process was asked to provide informed consent as a commitment to participate. All respondents agreed to be involved by signing the existing informed consent, which was based on an official research permit application letter provided by Sam Ratulangi University to Minahasa Health Department (890/UN12.11.1/LL/2021), Minahasa Department of Agriculture/Animal Husbandry and Health (891/UN12.11.1/LL/2021), Pineleng Public Health Center (892/UN12.11.1/LL/2021), Minahasa Animal Health Center (893/UN12.11.1/LL/2021), and Pineleng sub-district local government 894/UN12.11.1/LL/2021. This study did not require ethical approval.

Study period and location

This study was conducted from April to June 2021 in the working area of Minahasa Regency in several sectors or agencies such as Minahasa Health Department, Minahasa Department of Agriculture (Animal Husbandry and Health), Pineleng Public Health Center, Minahasa Animal Health Center, and Pineleng sub-district local government.

Study population and sampling

This study used a purposive sampling technique to identify informants, which involved reviewing the suitability and availability of data and information before selecting informants. The informants included two people from the Minahasa Health Department, three people from the Pineleng sub-district local government, and one person each from the Minahasa Department of Agriculture (Animal Husbandry and Health), Pineleng Public Health Center, and Minahasa Animal Health Center.

Data collection and instruments

This study collected data from primary and secondary sources. The primary data were obtained through in-depth interviews, involving the collection of information and explanations from informants during meetings and interactions, with documentation that supported the results. The secondary data were used to supplement the primary data, including rabies reports, One Health approach implementation activities, animal husbandry service data, health center data, books, and journals. The research instrument used for data collection was an in-depth interview guide, containing questions that were asked of the research subject, tape recorders/recording devices such as mobile phones, and writing instruments.

Processing and data analysis

This study involved several steps in processing and analyzing data, including:

a. To reduce the data collected, the results of interview recordings and additional notes were copied into transcripts
b. Reducing data, selecting, simplifying, and transforming raw data obtained from interviews by sorting data or reducing unnecessary data
c. Presenting data in a structured and logical manner so the information that has been reduced can be properly organized and analyzed. In this stage, researchers will try to compile interconnected data and make comparisons based on theory so that later the resulting information can answer research problems
d. Verifying data, concluding the data, and simplifying the subject matter under study in the form of a narrative, making it easy to understand.

Validity/reliability

A source triangulation technique was used to obtain data from various interrelated sources through interviews accompanied by documentation of activities simultaneously.

Results and Discussion

Roles of stakeholders

As described in the study methods section, joint interviews were conducted with representatives from

several related sectors. In these interviews, each respondent from the Minahasa Health Department, Minahasa Department of Agriculture, Pineleng Public Health Center, and Minahasa Animal Health Center served as a key informant that had passed through health training since the inception of the One Health approach project in Minahasa Regency. The characteristics of respondents are described in Table-1.

Health department and animal health department

Policy design in rabies control

Health policy frameworks can be described as systematic, where primary objectives or principles of health system are decided and programmatic, with intervention priorities set and translated into operational guidelines for service delivery [22]. Specifically, health policy on rabies control is a crucial determinant in achieving the objectives of rabies control. The following are excerpts of interviews with One Health approach practitioner in the Minahasa Health Department:

> *Hmm. when it comes to policy, we do not have written rules. We should have made a regulation, and it is more directed at how to control rabies-transmitting animals. But the amusing thing is, we do not have regulations here. In Southeast Minahasa, it seems that the policy has been made, although we do not have any regulations yet, we only have operational standards procedure for handling rabies from the Ministry. However, for regulations that we make ourselves among discussions from each sector in this One Health approach program, and for example, signed by the regent, so far it is not provided.* (R-1)
>
> *In terms of the One Health approach, we look forward to the rules through policy that will generate legality related to rabies prevention activities.* (R-2)

Table-1: Characteristic of respondents

Participant Code	Institution	Position
R-1	Minahasa Health Department	Head of Infectious Disease Prevention and Control
R-2	Minahasa Health Department	Head General of Disease Prevention and Control
R-3	Minahasa Department of Agriculture	Head General of Animal Husbandry and Health
R-4	Pineleng Public Health Center	Rabies Program Holder
R-5	Minahasa Animal Health Center	Head of Animal Center
R-6	Sea Village local government	Village Headman
R-7	Sea Village local government	Neighbourhood head
R-8	Pineleng Sub-district local government	Sub-district Head

R=Respondent

In the policy of rabid animal bites, health department does not have written regulations. However, they acknowledge the importance of having regulations to effectively control rabies-transmitting animals. In handling rabid animal bites, the sector only gives instructions to the public health center to follow operational standard procedures prepared based on technical instructions from the Ministry of Health. The animal husbandry field gives their opinion about the policy-making in rabies control as below:

> *We can only advise the public since rabies is already in our area and vaccinate to prevent… We do not know whether the dog is positive for rabies or not, right?* (R-3)

The animal husbandry field can only encourage the community to vaccinate their dogs to prevent the spread of rabies. However, no regulation can be used as legality regarding all the activities related to rabies control, such as a regional policy related to zoonoses. Regulations will be highly beneficial in controlling and eliminating rabies cases due to the restrictions set by the community on activities involving dogs. Several regions in Indonesia have created regional regulation, including the local government of Bali which designed a policy for controlling zoonotic diseases, namely Governor of Bali Regulation No. 18 of 2010 concerning Procedures for Maintaining Rabies Transmitting Animals [23]. Southeast Minahasa Regency, a district in North Sulawesi Province, also designed a policy as contained in Peraturan Daerah No. 2 of 2016, concerning the Management of Rabies Transmitting Animals. Therefore, a jointly designed similar regulation or policy by each related sector will generate legality that supports rabies control and must be applied in the Minahasa Regency.

At a global level, strict restrictions developed by the government or stakeholders have played a significant role in controlling rabies [24]. Therefore, the One Health approach practitioner from related sectors in Minahasa Regency should have designed a policy for controlling rabies but there has been no explanation and advocacy to stakeholders such as the local government.

Vaccination

Rabies is a vaccine-preventable disease [25] and vaccinating dogs are the most cost-effective prevention strategy for humans. Dog vaccination reduces deaths attributable to dog-mediated rabies and the need for post-exposure prophylaxis (PEP) as a part of dog bite patient care. Therefore, it is essential to vaccinate both humans and animals as a preventative measure to minimize the risk of death from rabies. When the total dog population is largely vaccinated, it will provide a rabies-free environment. The following is a statement from the head of infectious disease prevention and control:

> *We must always have supplies of vaccines just in case. Before we run out of stock, we swiftly*

coordinate with the Provincial Health Department to ask for more rabies stocks. (R-1)

Rabies can be prevented when the vaccine is administered to humans after exposure [26]. Meanwhile, people at high risk of exposure to rabies should be offered pre-exposure vaccination [27]. This makes it necessary to prepare vaccines in advance to enable immediate treatment of every case and prevent delays in the provision of vaccination to individuals who have been potentially exposed to the virus. The animal husbandry field provides the following explanation regarding rabies-transmitting animal vaccines from the animal husbandry field:

The dog vaccine is always available from year to year, yet from more than 200 villages and sub-districts, we can only vaccinate dogs to a maximum of about 20%. At most 40 villages in 1 year due to the lack of personnel. From 70,000 dogs, there are roughly up to 10,000–15,000 dogs vaccinated. So that's why the vaccine is only allowed in the case areas and regions around the occurrence of cases when there is a request from the government. (R-3)

There is a stockpile of vaccines for rabies-transmitting animals, but the supplies are just for the case area and if we assess a certain area needs to be done vaccination as well, the stockpile of vaccines is impossible to be given to all the existing dogs because the total of the dog population is 68,000–70,000 here… Our dog vaccination schedule is uncertain, it depends on whether there is a case, there is a request government, and do we think an area is necessarily vaccinated because we haven't done it for a long-time vaccination there, Just like that. (R-5)

Rabies in humans can be eliminated by ensuring adequate animal vaccination and control, educating those at risk, and enhancing access to appropriate medical care for those bitten [26]. Rabies Transmitting Animal Bites vaccination is always accessible, including vaccine supplies for cases. However, out of the 68,000–70,000 dog population, only 10,000–15,000 dogs are affordable to be vaccinated due to limited resources such as manpower and funds. Dog vaccination schedules are uncertain and data collection as well as vaccine status in each region is not constantly up to date. This problem can be overcome by persuading or approaching the community with middle to upper socioeconomic levels and educating individuals to independently vaccinate their dogs to assist the livestock sector in reaching other rabies-transmitting animals that have not been vaccinated. The involvement of the general public is highly needed in dog vaccination activities to deal with the shortage of personnel and funds.

Cost budgeting for program implementation

Solikha *et al*. [28] in their article entitled "Healthcare financial operations," stated that "Health development requires sufficient financial support. The sustainability of integrated and stable budget allocation plays a vital role in the implementation of health services." Similarly, the One Health approach program is also inseparable from funding, which is a key factor in determining the process and especially, the future outcome. During the interview session, the comments obtained from the health department and the animal husbandry field are stated below:

At the beginning of the One Health approach project formation, all of the training and the meeting were funded by FAO in collaboration with Indonesia's Ministry of Agriculture. After the area was considered capable of running the One Health approach program, we used our local budgets in program implementation. This year, the program will be focused on integrated cross-sectoral coordination for One Health approach programs in the Minahasa Regency. Therefore, related sectors will attend are the distinctive allocation fund given to health department is expected to be used. (R-1)

There is a budgeting difference between health department and the animal husbandry field. The animal husbandry field is just a part of the Department of Agriculture. Therefore, we do not have the same budget as us and we must maximize our funds first. (R-2)

Yeah…. Because it is One Health, we follow up on the program with them (health department). They will conduct a program and we will contribute to it by attending the program activities. (R-3)

After the Minahasa Regency was selected as a pilot area for the One Health approach project, the funding and management were transferred to the related local sector. Minahasa Health Department maximized the existing budget to create an activity for One Health approach and invited all related sectors. Although the budget was solely funded by health department, other sectors were expected to contribute. There were differences in budget allocation between health department and the animal husbandry field, which is a unit in the Minahasa Department of Agriculture. However, health department maximized the existing budget to create a program of activities regarding One Health approach and invited the livestock sector, animal health, and other agencies.

Program observation and evaluation

Monitoring and evaluating are essential to measuring the quality of work. Investment in terms of human, financial, and other resources require proof of achieved results. The ability to measure and communicate the results of work has a significant impact on "trust" and "credibility." Monitoring is a continuous internal process that ensures the activities are on track. Regular monitoring of activities provides adequate feedback on the progress of project activities, use of resources, results achieved, and institutional systems. Meanwhile, process evaluation assesses whether an

intervention/model was implemented as planned, or whether the target population was reached, as well as the major challenges and successful strategies used. Outcome evaluation determines the expected changes that occurred, the prevalence rate, and the potential of attributing the changes to the program activities [25]. The following are the comments from the health department and the animal husbandry field representatives:

In 2019, there was One Health approach monitoring and evaluation program activity in Minahasa Regency to determine its implementation and progress. However, we did not evaluate in 2020 because as health workers, our attention was focused and we have been busy with COVID-19 (R-1)

Yeah, we evaluated the monitoring and evaluation activities held by the Minahasa Health Department related to this One Health approach program. The program was evaluated in unison by all of the sectors. (R-3)

Observations and evaluations of the One Health approach program have been carried out by existing agencies. In 2019, the agencies involved conducted a monitoring and evaluation program to assess the program's implementation, achievements, and development. However, from 2020 until June 2021, no convention was held to evaluate the program as public health workers were focused on handling COVID-19. This condition might trigger the emergence of one death in 2020 and two death cases until June 2021 from *Lyssavirus*.

Local government officials

According to Subrata *et al*. [23] in their publication entitled "The role of stakeholders in rabies control with an integrated One Health approach in Bali," it is known that the village office played an important role in giving attention to village development during the era of regional autonomy, particularly through the "village fund," a funding system according to the law namely Law No. 6 of 2014. Villages became autonomous in managing their finances and developed village potential. Local government villages have a major role in forming rabies cadres by budgeting for training, preparing facilities, and funding activities. In a digital-based surveillance system, admin staff was also needed to tabulate and distribute data to the public and animal health centers. The following are the point of view of Pineleng local government- Sea Village regarding the One Health approach:

Yes. We don't have rabies cadres yet. We also have no administrative staff to provide and forward data to the public or animal health center regarding the dogs or rabies data. (R-6)

Who formed the cadre? Is it supposed to be provided by the village??. Should it be done in collaboration with them (the Pineleng public health center and Minahasa Animal Health Center)? or what?. Just now there was an incident or case, they came to do the injection. but then the injection was rare. It's only last month when there was a case, yeah, they came. Nothing like scheduled vaccinations once every 6 months. They'll come when the case occurs or goes viral only. (R-6)

Because until I've been here for 3 years, I've never met any employees or representatives from the animal husbandry field. (R-8)

The local government of Pineleng District, specifically the Sea Village, did not accommodate their part in controlling rabies due to the absence of their involvement in the One Health approach program. The government of sea village had no idea concerning the role that must be carried out in controlling rabies, such as procurement of rabies cadres (Dharma Program Cadres), training, funding of cadre programs, and provision of administrative staff to forward the data to Public Health Center and Animal Health Center. The Dharma Program Cadre is a community empowerment program that plays a role in controlling rabies in their zone. The procurement of these cadres must be reviewed by the related sectors and involve the government to run the One Health approach program comprehensively.

Program challenges

Lack of dog data surveillance

A good surveillance system will show the total dog population, which cannot be achieved through estimation only, as it may lead to insufficient number of vaccinated dogs. Therefore, a real data collection system is necessary to determine the number of dog populations per region. The data collected should also consider the annual population of female dogs giving birth and the influx of dogs through purchase or acquisition by locals. Comprehensive data will describe the number of vaccinated dogs, those kept in the yard, the number of released dogs, and the unvaccinated ones [23]. The comments from the field of animal husbandry about dog data surveillance are as follows:

We do active and passive surveillance. Therefore, when there are cases, we directly trace the data and conduct surveillance actively. There are data that we collect from our One Health approach WhatsApp group reports, accordingly, there is passive surveillance. (R-5)

When it comes to population, our data source is related to our dog population. and mostly comes from dog vaccinations. As an example, one village has 300 dogs (70%) vaccinated, we added that number to the total dog population data… From the vaccinations, we could see how much in total the existing population (R-3)

The collection of dog data in the field of Animal Husbandry and Animal Health Center in Minahasa Regency only included the total number of vaccinated dogs or those reported when a case occurred. There

was no data available on the number of lost dogs or those kept in the house. Furthermore, the system did not consider the female dog population that will give birth to a new one every year. To address this issue, local communities should be involved continuously and sustainably with the government to conduct the selection and training of cadres using village funds.

Less than maximum dog vaccination

Rabies is more common in other parts of the world where dogs are still carriers of the disease. The majority of rabies-related deaths worldwide are caused by bites from unvaccinated dogs [26]. People are usually infected following a deep bite or scratch from an animal with rabies and transmission to humans by rabid dogs' accounts for up to 99% of cases [25]. When more than 80% of dogs in the community are properly vaccinated against rabies, the incidence rate in humans or *Lyssavirus* will significantly decrease [29]. Vaccinating dogs are the most cost-effective strategy for preventing rabies in people. This is because dog vaccination reduces deaths attributable to dog-mediated rabies [25]. The following are the explanations for the dog vaccination in Minahasa Regency:

> *Out of 70,000, approximately 10,000–15,000 dogs are vaccinated. Therefore, the vaccine is only for the case area and the area around the occurrence case when there is a request from the government.* (R-3)
>
> *There is a stockpile of the vaccine for rabies-transmitting animals but there is an impossibility in its administration to all existing dogs because the total dog population is 68,000–70,000*. (R-5)

The vaccination rate, which only reaches 20% of the total dog population in the Minahasa Regency, is considered suboptimal due to limited manpower and funds. Without optimal vaccination, establishing a rabies-free area will be complicated. In-depth education, including community involvement, is needed to correct the wrong perception of public dog vaccination.

Population control program

Tiwari *et al*. [30] has stated "Efforts are needed to increase public awareness to prevent rabies by promoting knowledge and practice. Dog owners should also be educated about routine vaccination and sterilization as part of the population control effort." Dog population control is needed for released dogs and owners who cannot keep many dogs [23]. Dog population management is an integral part of rabies control programs [31]. However, there is no population control program for rabies-transmitting animals in Minahasa, as indicated by some respondent's statements below:

> *When we talk about control, it means that an action must be taken such as an attempt to kill or prevent the breeding of dogs. This action is taken to control the population to dismiss the breeding of the dog by castration, sterilization, or depopulation… unfortunately we don't have the funds for it.* (R-5)
>
> *Oh, it's hard. dogs are prolific. when the dog is female she'll calve, usually an average of 8.* (R-3)

In the Minahasa Regency, there is no population control program established by the animal husbandry field and animal health center. This is due to the cost of implementing the programs such as sterilization requires funds and the prolific nature of dogs. When the Animal Husbandry Field and Animal Health Center do not have the funds to undertake population control measures, they can make a regulation or policy to prevent people from arbitrarily released of dogs. However, sterilization is carried out when owners release their dogs to prevent the increase in population growth and continuously monitor its implementation.

Dogs are released irresponsibly

The outcome of eradicating rabies can be successful when vaccination is combined with proper dog maintenance. Therefore, it is necessary to educate the community on how to maintain dogs properly, by limiting their movement by tying or keeping them caged) [32]. In the Minahasa Regency, most people keep their dogs free, which has led to uncontrolled dog population growth and difficulty in eradicating rabies. The following are some opinions given by the animal husbandry field:

> *Most people free their dogs to roam. that's what happened in Minahasa. They free their dogs often to find their food in the neighborhood, or well. they're just enough to know that it's their dog… they don't tie it up, have no cage, and most of the mutts are released even some purebred dogs are also treated so.* (R-5)
>
> *For those who still let their dogs roam, it's a harmful thing. because when we talk about dogs. When a female dog is in heat, the male may mate with her, and when there are seeds diseases, they can be transmitted.* (R-3)

Poor community first aid to rabid animal bite

Rabies can be prevented by seeking medical care after potential exposures and before any symptoms begin to manifest. This applies to anyone who has been bitten by an animal suspected to have rabies or exposed to the virus. The wound should be cleaned and a health-care provider immediately regardless of vaccination status determines whether the post-exposure rabies vaccination [26]. The following are excerpts of interviews with some respondents from their respective points of view:

> *Even when there is a case of death, it must have been previously untouched by the public health center. The victims didn't report so that was the trigger. We just found out after the victim died because he did not understand the mechanism of the first precaution or how to take the preventive*

measures immediately. Also, there are still people who do not understand how to take appropriate action. (R-1)

We got information that two cases of Lyssavirus were caused by people who only received a small scratch and they did not know where the biting dog died. After 3–4 months when the bite had healed, the symptoms appeared and had already affected the nerves, making it too late for treatment. The victim was an adult in his 40s and it was even a bite, just a scratch. (R-3)

Some citizens quickly report cases, while others do not. Just like the last victim who died, he did not report and did not even go to health service. (R-7)

In 2021, the two cases of *Lyssavirus* in Minahasa Regency were caused by victims who did not have a vaccination history and failed to report their bite wounds immediately to the Public Health Center or hospital. However, some people in the regency still do not take preventive measures, namely, PEP such as washing the wound with stream soapy water or disinfectant and checking the wound immediately at the nearest health service. This indicated that the community must continue to educate and remind the community not only when there is a case but also periodically through existing meetings.

Lack of education and community involvement in vaccination

Education about dog behavior and bite prevention is an essential extension of a rabies vaccination program for both children and adults. It can significantly reduce the incidence of human rabies and the financial burden of treating dog bites [25]. Increasing awareness of rabies prevention and control in communities includes education and information on responsible pet ownership, methods to prevent dog bites, and immediate care measures after a bite such as (PEP, the immediate treatment of a bite victim after rabies exposure. This treatment is given to the bite victim immediately after exposure to rabies and prevents the virus from entering the central nervous system, which can cause death. Engaging the community in the program enhances the ownership and uptake of key messages. Several comments stated by the respondents regarding community involvement within the vaccination program are expressed below:

I only provide individual education as rabies program holder here, while I treat the patient, but for general socialization, we have our health promotion officers who provide explanations through existing meetings. When the patient comes, I educate them directly. We also conduct counseling around our work area when a case occurs., The same as in the previous case…. If there is a sub-district or village-scale coordination meeting, the head of the public health center will also provide counseling and give notification cases are increasing. (R-4)

Community education depends on the village government. If they have a request, for instance, want our technical personnel to provide socialization to the community at any meeting, we are always disposed of. (R-3)

In a society where most of the community frees their dogs, some people still do not care or underestimate bite cases. This highlights the need for more comprehensive education on rabies control in the community. Education on the risk of rabies is only provided to the public whenever a case occurs or during treatment. However, individual education is not enough. Based on the results obtained, the Public Health Center also provided socialization at community meetings called Posyandu or Posbindu, while education was given at an inopportune time when a case occurred. Continuously educating the community when there were no cases as a prevention effort had been identified as a preferred approach. Community involvement in the vaccination programs was still lacking, although their participation in dog vaccination will be beneficial in controlling rabies for the limited resources.

Integrated One Health approach implementation activities as a form of collaboration and partnership

Integrated One Health approach activities for epidemiological surveillance for the animal (Animal Husbandry and Health Field and Animal Health Center) and human (Health Department and Public Health Center) aspects are accomplished through data collection and case reporting by filling out the standard formats in forms that have been mutually agreed upon previously. The format can describe the characteristics of rabies-transmitting animals. Some of the statements about the experiences of the respondents are provided below:

What we do now is active and passive surveillance. We are always sighting and responding to any reports we receive in our group. We anticipate each case report by monitoring the group always so we could step in right away when needed. (R-5)

There is a standard format we use in every case report. When there is a case, it will be investigated in the laboratory whether positive or negative. However, when the bite is located on the face, there is no need to wait for us to come down to decide on giving vaccine/serum, the person must be directly given any anti-rabies vaccine and anti-rabies serum eventually when the case is severe to prevent rabies virus ascends to the nerves. When we talk about rabies-transmitting animals, the public health center through the WhatsApp group reports a case that needs to be investigated both positive or not, we will collaborate to check the result at the laboratory. (R-3)

When there is a case report involving rabies-transmitting animals such as dogs, an assessment is carried out and an epidemiological

investigation will be executed. After fulfilling an epidemiological investigation, the results are examined in a provincial laboratory. An assessment is needed for decision-making based on whether the laboratory results are positive or negative and contaminated with rabies virus. The animal husbandry field and animal health center quickly report to the public health center to take appropriate prevention measures. However, the community still needs to get socialization about the mechanism of reporting cases when there is an incident. The following are excerpts of interviews from the public health side:

> *When there is a bite caused by a rabies-transmitting animal such as a dog, it needs to be checked. When the result is negative, it is a relief... only continue with the treatment of the wound... but when the result is positive, it means that we, from the animal husbandry field, must get in.* (R-1)
>
> *Therefore, when a patient comes with bite wounds from a dog, monkey, or cat, we quickly educate them about the treatment. Some patients came a few days after being bitten, we asked them whether when he/she was bitten, or the wound was washed. Subsequently, we will consider when it needs to be injected with the anti-rabies vaccine or serum. There are many criteria, depending on the location of the bite.* (R-4)

In the management of reporting any rabid animal bites, when there is a report, the public health center immediately follows up by providing treatment for the victim's bite wound. The next steps are to report the case to each related sector through the existing WhatsApp group, extract information from patients over the interviews, and administer an anti-rabies vaccine or anti-rabies serum in severe cases. When the case provides any indications, the public health center directly contacts the animal husbandry field or animal health center to enforce a risk assessment of biting dogs. From the statements that have been provided by the relevant sectors, they always give a straight response to reports provided through WhatsApp group. With integrated One Health approach activities as a form of collaboration and partnership, related sectors can take hold of rabies cases with good coordination and communication to prompt case handling. This is indicated by the following statement from the head of infectious disease prevention and control.

> *Now, when there is a rabies case, such as a case in Wolaang that was bitten by a dog, his dog turned becomes positive, hence, we act in coordination with each other. The information makes us faster to take any action.* (R-1)

The involvement of local government and the community is needed for effective epidemiological surveillance from both human and animal perspectives. This will facilitate coordination between all sectors involved in the management of humans and animals.

Advocacy efforts for One Health approach policy in rabies control

Advocating a One Health approach perspective at the policy level has the potential to ensure the adoption of a more comprehensive approach by different sectors to prevent and respond to the threat of disease outbreaks [29]. According to Indonesia One Health University Network, a policy involves general principles that assist governments and organizations in managing public affairs or legislatures in making laws [33]. As stated in the previous sub-bab regarding the regulation, based on the interview results with the One Health approach expert in their respective sector, Minahasa Regency has no policy advocacy effort for controlling rabies through One Health. Reviewing European rules once more, the statutory rule can significantly aid in reaching the desired outcomes. In Europe, the main European institutions lay down and pass legislation specific to the veterinary sanitary and food safety area, with judicial effects [24]. Stakeholders play their role effectively and create laws or regulations about animal health and food safety, which are highly valued in society. Subsequently, over 6000 regulatory acts have been passed until now for the animal health component alone [34] because laws are made and prioritized. Implementation of the veterinary sanitary and food safety legislation represents a "*sine qua non*" obligation of the member states, otherwise, sanctioning procedures and mechanisms of the European Union are activated, up to the infringement procedure [24]. Since consequences will be imposed when existing regulations are not followed. Therefore, the conception and implementation of new ones are prioritized to encourage compliance.

It is crucial to examine and apply this example of a stakeholder's role as a blueprint in promulgating regulations related to rabies control and dog ownership. The government is expected to establish or publish regulations, monitor compliance continuously, and impose sanctions on those who break the approved regulations.

The following are some questions by the Pineleng local government:

> *Approach. What approach is that? I also just heard that term... it's not even familiar to my ears. Because also until I've been here 3 years, I have not met the animal husbandry Department yet (R-8)*
>
> *Yes... I don't understand what the One Health approach is. Who formed the cadre? Is it from the village? Should it be formed in a collaboration with the public health center or what?* (R-6)

The explanation above showed that policyholders on a local scale who have great influence in the village, still do not understand the One Health approach and have several questions related to rabies cadre. Government advocacy is necessary to fully use their

role in policy-making and effectively control rabies. The head of the animal husbandry field statement is as follows:

> *In our type of advocacy effort, we just go out to the districts/villages and provide counseling to the government and the community to prevent the occurrence of similar cases.* (R-3)

The animal husbandry field and the animal health center sector only provide counseling to the government and the community in the affected area to prevent similar incidents. The following is the statement from one of the health department representatives:

> *Advocacy is also carried out at coordination meetings held in districts. They did those the public health workers did it. The head of the public health center is invited to the coordination meeting usually* (R-1)

The current advocacy is only a warning to the government about the risks of rabies, which is communicated to the community during a coordination meeting held in the sub-district where the case is found. However, this is not a comprehensive One Health approach advocacy effort because the government has not fully been supportive. Regional governments can potentially adopt rabies control regulations when they are informed of the One Health approach. Considering the existing regulations, the government can directly engage the community in rabies control by complying with the rules to maintain rabies-transmitting animals. From a purely judicial and applicative perspective, Bondoc 2016, argued that regulations can be considered the most important community regulatory acts. Policies have a general goal or tendency toward fulfilling a country's or society's prosperity if the rules are enforced [34].

Other types of policy advocacy that can be intervened by the related sector within the One Health approach program to the government are the use of village funds for the procurement of rabies cadres or commonly referred to as Dharma Program cadres. The responsibilities of rabies cadre are collecting dog data, ownership, vaccine status, providing education to the public, serving citizen reports on dog observation, and handling dog bite victims through coordination with the public and animal health centers. Therefore, the government's role is urgently required in procuring rabies cadres.

The creation of policies or regulations in controlling rabies-transmitting animals, particularly to regulate the community in maintaining dogs also needs advocation. The policy design must be made through joint discussions between stakeholders and some experts from each related agency. When the advocacy is carried out properly, the impact on controlling rabies through the One Health approach by involving wider sectors will produce an extraordinary outcome.

Conclusion

The stakeholders involved in the One Health approach program, such as the Minahasa Health Department, Department of Agriculture and Animal Health Sector, Pineleng Public Health Center, and Minahasa Animal Health Center, have carried out some of their roles effectively. However, certain tasks and roles have not been implemented and can still be improved.

Several challenges have been encountered in the program's effort to control rabies through the One Health approach. These include inadequate dog data surveillance, suboptimal vaccination, population control program, dogs being lost carelessly, poor community first aid to a rabid animal bite, and lack of education and community involvement in vaccination.

The collaboration and partnership between the Minahasa Health Department, Minahasa Department of Agriculture (Animal Husbandry Field), Pineleng Public Health Center, and Minahasa Animal Health Center have enabled the integrated implementation of the One Health approach. This facilitates the prompt handling of rabies cases through effective coordination and communication.

However, there has been no policy advocacy directed at the Pineleng local government, which is an influential stakeholder in the procurement of rabies cadres and policy-making related to One Health approach and rabies control.

Authors' Contributions

ASK and AFCK: Conceived the idea and designed the study. ASK: Conducted research, collected and analyzed the data, and drafted the manuscript. AFCK and EMM: Analyzed the data and drafted and revised the manuscript. All authors have read, reviewed, and approved the final manuscript.

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Competing Interests

The authors declare that they have no competing interests.

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References

1. Baer, G.M. (1975) The Natural History of Rabies. 2nd ed., Vol. 1. Academic Press, Inc., New York.
2. Zhang, X., Tian, X., Pang, B., Wang, Z., Zhai, W., Jiang, X.,

Kou, Z., Ding, S. and Wang, X. (2022) Epidemiological characteristics of human rabies-Shandong province, China, 2010–2020. *China CDC Wkly*., 4(35): 793–797.
3. Setyowati, T.I.B. and Machmud, P.B. (2018) A study of correlation between agent, host, environment and vaccine factors with prevalence of rabies in Indonesia 2015. *Indones. J. Trop. Infect. Dis*., 7(1): 1–5.
4. Wentworth, D., Hampson, K., Thumbi, S.M., Mwatondo, A., Wambura, G. and Chng, N.R. (2019) A social justice perspective on access to human rabies vaccines. *Vaccine*, 37(Suppl 1): A3–A5.
5. World Organization for Animal Health. (2014) No more Deaths from Rabies. Available from: https://www.oie.int/en/no-more-deaths-from-rabies Retrieved on 25-10-2021.
6. Ripani, A., Mérot, J., Bouguedour, R. and Zrelli, M. (2017) Review of rabies situation and control in the North African region with a focus on Tunisia. *Rev. Sci. Tech*., 36(3): 831–838.
7. Ministry of Health of the Republic of Indonesia. (2021) 8 Out of 34 Provinces in Indonesia are Rabies-free. Available from: https://sehatnegeriku.kemkes.go.id/baca/umum/20200928/4735079/8-34-provinsi-indonesia-bebas-rabies Retrieved on 18-09-2021.
8. Minahasa Health Department. (2020) Rabies Report, 2020. Department of Disease Prevention and Control, Minahasa.
9. Minahasa Health Department. (2020) Rabies Report, 2021. Department of Disease Prevention and Control, Minahasa.
10. Degeling, C., Brookes, V., Lea, T. and Ward, M. (2018) Rabies response, One Health and more-than-human considerations in Indigenous communities in northern Australia. *Soc. Sci. Med*., 212: 60–67.
11. Berrian, A.M., Smith, M.H., van Rooyen, J., Martinez-Lopez, B., Plank, M.N., Smith, W.A. and Conrad, P.A. (2017) A community-based One Health education program for disease risk mitigation at the human-animal interface. *One Health*, 5: 9–20.
12. Standley, C.J., Carlin, E.P., Sorrell, E.M., Barry, A.M., Bile, E., Diakite, A.S., Keita, M.S., Koivogui, L., Mane, S., Martel, L.D. and Katz, R. (2019). Assessing health systems in Guinea for prevention and control of priority zoonotic diseases: A One Health approach. *One Health*, 7):100093.
13. World Health Organization. (2017) One Health. World Health Organization, Geneva. Available from: https://www.who.int/news-room/q-a-detail/one-health Retrieved on 18-09-2021.
14. Tenzin, T., Namgyal, J. and Letho, S. (2017) Community-based survey during rabies outbreaks in Rangjung town, Trashigang, Eastern Bhutan, 2016. *BMC Infect. Dis*., 17(1): 281.
15. Dimaano, E.M., Scholand, S.J., Alera, M.T. and Belandres, D.B. (2011) Clinical and epidemiological features of human rabies cases in the Philippines: A review from 1987 to 2006. *Int. J. Infect. Dis*., 15(7): e495–e499.
16. Nihal, P.D.B., Dangolla, A., Hettiarachchi, R., Abeynayake, P. and Stephen, C. (2019) Surveillance opportunities and the need for intersectoral collaboration on rabies in Sri Lanka. *J. Vet. Med*., 2019: 7808517.
17. Sambo, M., Johnson, P., Hotopp, K., Changalucha, J., Cleaveland, S., Kazwala, R., Lembo, T., Lugelo, A., Lushasi, K., Maziku, M., Mbunda, E., Mtema, Z., Sikana, L., Townsend, S., Hampson, K. (2017) Comparing methods of assessing dog rabies vaccination coverage in rural and urban communities in Tanzania. *Front. in Vet. Sci*., 4(8). 10.3389/fvets.2017.00033.
18. Ariyanto, A.M., (2018) OH-7 Optimizing the One Health Approach Application for Rabies Transmitting Animal Bites in Ketapang District. In: The 20th Federation of Asian Veterinary Associations (FAVA) Congress and the 15th National Veterinary Scientific Conference of Indonesian Veterinary Medical Association (KIVNAS PHDI). Nusa Dua Convention Center, Bali, Indonesia, 1st-3rd November 2018.
19. Ministry of Environment and Forestry of the Republic of Indonesia. (2018) Indonesia be Cautious of Emerging Infectious Diseases Threat. Available from: https://ppid.menlhk.go.id/berita/siaran-pers/4259/indonesia-waspada-ancaman-penyakit-infeksi-emerging. Retrieved on 18-09-2021.
20. Government of Bengkalis Regency. (2019) FAO Sets Bengkalis as a National One Health Pilot. Information Management and Documentation Officer. Available from: https://ppid.bengkaliskab.go.id/web/detailberita/1683/2019/03/21/fao-tetapkan-bengkalis-jadi-percontohan-one-health-nasional Retrieved on 18-09-2021.
21. Hartini, R., Fitria, Y., Rahmadani, I., Krisnandana, Putra, A.A.G., Susetya, H. and Mardani, M. (2019) The Ecology and Demographic Studies of Dogs for the Rabies Eradication Program Preparation on Rupat Island, Bengkalis Regency, Riau Province. Animal Disease Investigation Technical Meeting and Scientific Meeting (RATEKPIL) and 2019 Animal Health Surveillance. Yogyakarta, 24th -28th June 2019.
22. Massie, R.G.A. (2009) Health policy: Process, implementation, analysis and researches. *Bul. Penelitian Sistem Kesehatan*, 12(4): 409–417.
23. Subrata, M., Purnama S.G., Utami, A., Agustina, K.K. and Swacita, I.B.N. (2020) The role of stakeholders in rabies control with an integrated One Health approach in Bali. *J. Kebijakan Kesehatan Indones*., 9(1): 20–32.
24. Bondoc, I. (2016) European Regulation in the Veterinary Sanitary and Food Safety Area, a Component of the European Policies on the Safety of Food Products and the Protection of Consumer Interests: A 2007 Retrospective. Part One: The Role of European Institutions in Laying Down and Passing Laws Specific to the Veterinary Sanitary and Food Safety Area. Universul Juridic, Supliment. p12–15. Available from:https://revista.universuljuridic.ro/supliment/european-regulation-veterinary-sanitary-food-safety-area-component-european-policies-safety-food-products-protection-consumer-interests-2007-retrospective. Retrieved on 07-02-2023.
25. World Health Organization. (2021) Rabies. Available from: https://www.who.int/news-room/fact-sheets/detail/rabies Retrieved on 18-09-2021.
26. Center for Disease Control and Prevention. (2019) Rabies Vaccine Information Statement. Available form: https://www.cdc.gov/vaccines/hcp/vis/vis/-statements/rabies.html Retrieved on 18-09-2021.
27. Center for Disease Control and Prevention. (2019) How Can You Prevent Rabies in Animals? Available from: https://www.cdc.gov/rabies/prevention/animals.html Retrieved on 18-09-2021.
28. Solikha, D.A., Ariteja, S. and Soewondo, P. (2020) Healthcare Financial Operations. Indonesian Ministry of National Development Planning, Jakarta.
29. World Health Organization. (2014) Emerging Infectious Disease (EIDs) and Zoonosis. WHO Library Cataloguing-in-Publication Data. WHO Regional Office for South-East Asia. World Health Organization, Geneva.
30. Tiwari, H.K., Robertson, I.D., O'Dea, M. and Vanak, A.T. (2019) Knowledge, attitudes and practices (KAP) towards rabies and free roaming dogs (FRD) in Panchkula district of north India: A cross-sectional study of urban residents. *PLoS Negl. Trop. Dis*., 13(4): e0007384.
31. Office of International des Epizooties. (2009) Guidelines on Stray Dog Population Control. Ch. 7.7. OIE Terrestrial Animal Health Standards Commision. Office of International des Epizooties, Paris, p313–332.
32. Tarigan I.M., Sukada I.M. and Puja, I.K. (2012) Anti-rabies vaccination coverage in dogs and profile of dog owners in Baturiti district, Tabanan," Indonesia. *Indones. Med. Vet*., 1(4): 530–541.
33. Indonesia One Health University Network. (2014) One health soft skill application guidelines. INDOHUN National Coordinating Office: SEAOHUN, Thailand.

34. Bondoc, I.I. (2016) European Regulation in the Veterinary Sanitary and Food Safety Area, a Component of the European Policies on the Safety of Food Products and the Protection of Consumer Interests: A 2007 Retrospective. Part Two: Regulations. Universul Juridic, Supliment. p16–19. Available from: https://revista.universuljuridic.ro/supliment/european-regulation-veterinary-sanitary-food-safety-area-component-european-policies-safety-food-products-protection-consumer-interests-2007-retrospective-2. Retrieved on 07-02-2023.

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