MINISTRY OF EDUCATION AND TRAINING

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NATIONAL INSTITUTE OF MALARIOLOGY-PARASITOLOGY AND ENTOMOLOGY

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STUDY ON SOME EPIDEMIOLOGICAL CHARACTERISTICS OF HUMAN RABIES IN GIA LAI, DAK LAK, AND THE EFFECTIVENESS OF INTERVENTIONS (2015-2022)

Major: Epidemiology
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SUMMARY OF DOCTORAL DISSERTATION

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ABSTRACT

Rabies is a deadly, acute infectious disease caused by the rabies virus that can readily expand into community epidemics. Rabies is spread to warm-blooded animals and people by bites, scratches, licks on the skin, and broken mucous membranes from infected animals.

Rabies is the top cause of death among infectious diseases in Vietnam and ranks 14th globally. In recent years, the number of rabies deaths has risen. According to General Department of Preventive Medicine, there were 846 rabies deaths in the United States between 2006 and 2015.

Although there have not been many rabies deaths in the Central Highlands, the number of rabies deaths between 2016 and 2020 has increased by more than 4 times compared to 2010 to 2015. In order to give additional scientific support for rabies control in this region, a study of the situation of rabies in Gia Lai and Dak Lak is required from a scientific and practical standpoint.

Raising public awareness has been demonstrated to increase the effectiveness of campaigns to eliminate canine rabies. Numerous earlier studies have shown that communication strategies improve people's understanding of rabies prevention. However, effective public education campaigns to lower rabies risk are frequently region-specific and necessitate extensive local adaptation. To improve its chances of success, an intervention program should consider variables including ethnicity, religion, and culture.

1. Objectives:

1.1. Describe some characteristics of human rabies epidemiology and prevention activities in Gia Lai and Dak Lak provinces (2015-2021).

1.2. Evaluation of the effectiveness of some interventions in the prevention of rabies in Gia Lai (2021-2022).

2. Significance of the study

- A map of the rabies risk in the community of the investigated provinces will be built using the survey data. There isn't yet a map depicting the rabies risk in Vietnam..

- It offers for an update on the recent rabies prevention situation in Gia Lai and Dak Lak. The effectiveness of rabies prevention in the community can be increased by following scientific and useful recommendations based on the study of rabies prevention initiatives.

3. Strucure of the study: The thesis consists of 149 pages, including parts and 4 chapters:

Question: 02 pages

Chapter 1. Literature review: 33 pages

Chapter 2. Research subjects and methods: 28 pages

Chapter 3. Research results: 44 pages

Chapter 4. Discussion: 36 pages

Conclusion: 02 pages

Recommendation: 01 page

Reference: about 117 documents (23 documents in Vietnamese, 94 documents in English).

Chapter 1. LITERATURE REVIEW

1.1. The characteristics of rabies virus and rabies

Rabies virus has a bullet shape with a round head and a flattened end, with an average length of 180nm (ranging from 130 - 250 nm) and an average diameter of 75 nm (ranging from 60 - 110 nm).

Warm-blooded mammals are the rabies virus's natural source. Dogs are the primary carrier of the rabies virus in Vietnam, accounting for 96–97% of cases, followed by cats (3–4%), with no cases of other animals (rabbits, mice, squirrels, etc.) being reported. Human usually get rabies from being bitten by rabid animals and only rarely does a person come into direct contact with an open wound and still contract rabies. Humans randomly contract rabies, which is primarily an animal disease with no epidemiological significance.

According to a report by the World Health Organization (WHO), rabies is widespread around the world. Each year, more than 10 million people are bitten by rabid or suspected rabies animals need to receive rabies vaccine prophylaxis, about 60,000 - 70,000 people have died from rabies, most of which are reported from countries in the tropics.

Vaccination and anti-rabies serum for persons who have been bitten by animals are two distinct control strategies that can be used in conjunction to prevent rabies.

1.2. Situation of rabies virus infection in humans and animals

Except for a few island countries, rabies is currently prevalent in every country on earth. Around 59,000 people in more than 150 countries contract rabies annually, with 95% of cases occurring in Asia and Africa, according to the WHO.

According to fragmentary data, there were 2,600 domestic animal rabies cases (dogs and cats) between 1991 and 1995. In 1996, there were 587 cases, which resulted in the deaths of 16,800 animals, of which 97% were dogs and 3% were cats and other livestock. The overall canine population's real rabies vaccination rate has remained low (less than 50%) over time. In 2015, there were almost 9 million domestic dogs in the country, according to statistics from the provinces and cities, but only 3.89 million of those canines had received rabies vaccinations, or 42.9% of the total. There haven't been any wild animals in Vietnam that have the rabies virus or are currently carrying it, like other nations in Southeast Asia and Asia where dogs are the main carriers of the disease.

In order to strengthen rabies prevention, the Prime Minister issued Directive No. 92/TTg in 1996. Since then, authorities at all levels have given rabies prevention more priority, and a large-scale rabies vaccination program for persons who have been bitten by dogs is established across many districts. Beginning in January 2007, there were 936 rabies vaccination sites across the nation. At the injection sites, there were books to record, manage, and report on a regular basis in accordance with the Preventive Medicine Centers system. In the entire nation of 2015, rabies claimed 78 lives.

1.3. Rabies prevention activities

Health services are crucial in lowering the number of fatalities when the source of rabies transmission in animals is not fully under control. Numerous studies have demonstrated that those who pass away with rabies either lack access to post-exposure prophylaxis (PEP) or receive treatment too late. PEP prevents an estimated 330,000 rabies-related deaths annually worldwide.

In Vietnam, dogs make up between 96 and 97 percent of the virus' reservoirs. In the Central Highlands provinces, there are still very few domestic animals that have received rabies vaccinations. Gia Lai, Dak Lak had a less than 15% rabies vaccination rate for dogs in 2015–2016. In comparison to the entire nation, the Central Highlands' post-exposure rabies prophylaxis rate for the years 2016 to 2020 remains low. Gia Lai has the fewest cases of rabies prevention and treatment per 100,000 residents.

Data from the Ministry of Health's rabies prevention and control project show that 90% of those exposed to the disease receive the vaccine within the first three days, and 10% wait until three days after being bitten.

1.4. The primary methods to prevent rabies

Domestic dog management: To support and monitor the effectiveness of the commune's rabies vaccination program, the People's Committees of communes, wards, and townships (referred to collectively as commune level) organize the control of dog breeding in the area.

Dogs are vaccinated against rabies every year, with the main phase taking place in March–April and a follow-up injection taking place in September–October. This is done by a concentrated vaccination campaign (in wards and towns) and successive injection method or visiting to each household to inject.

Post-exposure prophylaxis for those bitten by dogs and cats: Develop a nationwide strategy for the distribution and administration of rabies vaccines for those bitten by dogs and those who are at high risk of exposure to the disease.

Completing legal documents and policies of the State: the system of legal documents, which includes the Law on Veterinary Medicine and the documents guiding its implementation; approved programs and projects; the Law on Prevention and Control of Infectious Diseases and its guiding documents; and the Ministry of Health's Decision No. 1622/QD-BYT issued on May 8, 2014, regarding Guidelines for surveillance and prevention of human rabies.

Media: Public awareness-building through propaganda about the risks of rabies and ways to prevent it in humans.

Chapter 2. RESEARCH SUBJECTS AND METHODOLOGY

2.1. Subjects, location, time of research

2.1.1. Subjects

- All records and medical records of rabies cases and deaths.
- People died from rabies.
- Householders
- People exposed to rabies.
- Medical staff at vaccination facilities.
- Local people in interventional group
- Medical staff, relevant veterinary staff.

2.1.2. Location:

Situational study: two provinces Gia Lai, Dak Lak.

Interventional study: Ia Dom, Ia Nan and Ia Pnon communes of Duc Co district, Gia Lai province.

Control group: Ia Glai, Ia Hlop and Ia Blang communes in Chu Se district, Gia Lai province.

2.1.3. Time of research

The study was conducted for 3 years from 2020-2023.

- Retrospective secondary data analysis: gathering rabies statistics from two provinces compiled by the Centers for Disease Control between January 1, 2015 and December 31, 2019

- Cross-sectional descriptive analysis: all patients from January 2020 to December 2021 who had rabies or a rabies-related injury. Examine the current state of rabies prevention efforts and the potential for human rabies in the 2 provinces under study in 2021.

- Interventional research: Pre-intervention investigation: 6/2021-8/2021. Intervention time: 8/2021-8/2022. Post-intervention investigation: September 2022-October 2022.

2.2. Research design

- Retrospective and cross-sectional study (in 2021): Describe some epidemiological characteristics of human rabies and the current status of rabies prevention in Gia Lai, Dak Lak.

- Controlled trial of a community intervention (2021-2022): Evaluation of the effectiveness of some measures in preventing rabies in Gia Lai.

2.3. Content and method of data collection:

2.3.1. Descriptive study:

2.3.1.1. Sample size

- Retrospective secondary data analysis: All statistics on rabies cases, deaths and factors related to rabies in Gia Lai, Dak Lak are compiled by the Centers for Disease Control between January 1, 2015 and December 31, 2019

- Cross-sectional descriptive study in 2020-2021: Deaths due to rabies: The sample size is made up of all patients who contracted the disease and died from it between January 2020 and December 2021 in the two studied provinces.

- Sample size of the household survey to gauge rabies risk and local awareness and use of rabies prevention.

$$n = Z_{1-\alpha/2}{}^2 \, x \, \frac{p(1-p)}{d^2} \quad x \, DE$$

Where:

n: Study's sample size.

α = 0,05 (Statistical significance level)

Z 1- $\alpha/2$ = 1,96 (corresponding to α = 0,05)

p: percentage of homes using effective rabies prevention techniques. Nguyen Thi Thang's research indicates that in the province of Phu Yen (2019), 0.702 people correctly practice rabies prevention; therefore, choose p = 0.702.

d = 0,05 (Absolute error).

DE (Design effect): Choose DE = 2,0.

- Sample size of rabies vaccine and antirabies serum recipients who have been exposed to rabies: All exposed individuals who received the rabies vaccine or antirabies serum, or both at the injection sites of district/city health centers, and preventive medicine centers in two provinces between January 1, 2020, and December 31, 2021, comprise the sample size.

- Size of the steering committee for rabies prevention survey sample: surveying 34 steering committees (32 district steering committees and 2 provincial steering committees) to determine the current state of rabies prevention and control.

2.3.1.2. Evaluation indicators and data collection methods:

a, Evaluation indicators

- Indicators of death due to rabies::

+ The percentage of deaths over time.

+ Mortality per 100,000 (%) population.

+ Average mortality rate in percentage.

- Indicators on the epidemiological characteristics of rabies:

+ Personal traits of rabies patients and rabies-related fatalities.

+ Percentage of exposed animals (dogs, cats, and others).

+ Percentage of the quantity of bites and the body parts where they were inflicted.

+ Percentage of those who received wound care, post-exposure anti-rabies serum, and rabies vaccination in the group of those who contracted the disease or died from it.

+ Percentage of prompt immunization (15 days or less after exposure).

+ Clinical symptom frequency in rabies deaths

- Indicators on the status of rabies vaccination:

+ Determining the level of dog vaccination against rabies.

+ Percentage of personal traits of those receiving the anti-rabies vaccine and serum

+ Percentage of animal bites that expose humans; the ratio of bites to where they were placed on the body of the exposed person after receiving rabies vaccine or antirabies serum.

+ Percentage of people accessing to rabies vaccine, anti-rabies serum after exposure within ≤ 15 days and after 15 days from exposure.

- Indicators of knowledge - attitude - practice on rabies prevention of the community:

+ Percentage of people who are aware that rabies is a serious infectious disease.

+ Percentage of those who are aware that the rabies virus is what causes rabies.

+ Percentage of persons who are aware that rabies can spread through bites or scratches brought on by animal bites or licks.

+ Percentage of persons who are aware that they must seek medical attention after being bitten by a rabid dog.

+ Percentage of people who obtain rabies vaccine and antirabies serum after being bitten by a rabid dog.

+ Percentage of people willing to be vaccinated if exposed to rabies.

+ Percentage of persons who have cats and/or dogs registered

+ Percentage of people registering to vaccinate dogs and cats.

b, Research technique

- Gather secondary data from the Ministry of Health's database.

- Case collection: Each patient, who was diagnosed to have died from rabies was examined and recorded by trained medical personnel in the printed questionnaires with the relevant information.

- Using a pre-made questionnaire to get data from the patient's family.

- Investigate the status of rabies vaccination in animals and in the community.

- Utilize surveys to look at neighborhood rabies prevention initiatives.

- Utilizing a set of household interview questions to determine the knowledge, attitudes, and practices of the community on rabies prevention.

2.3.2. Interventional study

2.3.2.1. Sample size

- Sample size pre and post inventional trials:

$$n_1 = n_2 = \frac{\{z_{1-\alpha/2}\sqrt{2\bar{p}(1-\bar{p})} + z_{1-\beta}\sqrt{p_1(1-p_1)+p_2(1-p_2)}\}^2}{(p_1-p_2)^2}$$

Where:

n_1: Sample size pre-post test in the intervention group

n_2: Sample size pre-post test in the control group

$Z_{1-\alpha/2}$: Reliability coefficient (probability threshold $\alpha = 0,05$; $Z_{1-\alpha/2} = 1,96$).

$Z_{(1-\beta)}$: Power coefficient (with power $\beta = 90\%$; $Z_{(1-\beta)} = 1,28$).

p_1: Percentage of households receiving rabies vaccination for pets in 3 communes Ia Dom, Ia Nan and Ia Pnon at the baseline survey ($p_1 = 30,0\%$).

p_2: Proportion of households receiving rabies vaccination for pets in 3 intervention communes is estimated to be achieved at the time of survey completion. (p_2= 45,0%, dự kiến tăng 15,0% sau can thiệp).

$\bar{p} = (p_1 + p_2)/2$

The recommended sample size for the intervention group and control group is 217, although we actually used 356 household heads for the study. $n_1 = n_2 = 356$ persons. In order to assess before-after changes in the intervention group, a minimum sample size of 356 people (356 homes) is required. In the control group, a minimum sample size of 356 participants (representing 356 households) is required..

2.3.2.2. Evaluation indicators:

- Indicators to evaluate the intervention effectiveness

+ Communication effectiveness:

Percentage of participants in the study who had access to rabies prevention and control information in the pre-post intervention tests in the intervention and control groups.

Percentage of study participants in the intervention and control groups who had good knowledge of rabies prevention in the pre-post interventional tests.

Percentage of study participants in the intervention and control groups that correctly practiced rabies prevention and control in livestock (registering dogs, using dog leashes, and vaccinating dogs for the disease) before and after the intervention.

Percentage of study participants in the intervention and control groups that correctly practiced rabies prophylaxis while exposed to animals (wound treatment, rabies vaccination, post-exposure anti-rabies serum), before and after the intervention.

+ Effective policy advocacy and encouraging all levels and sectors to participate..

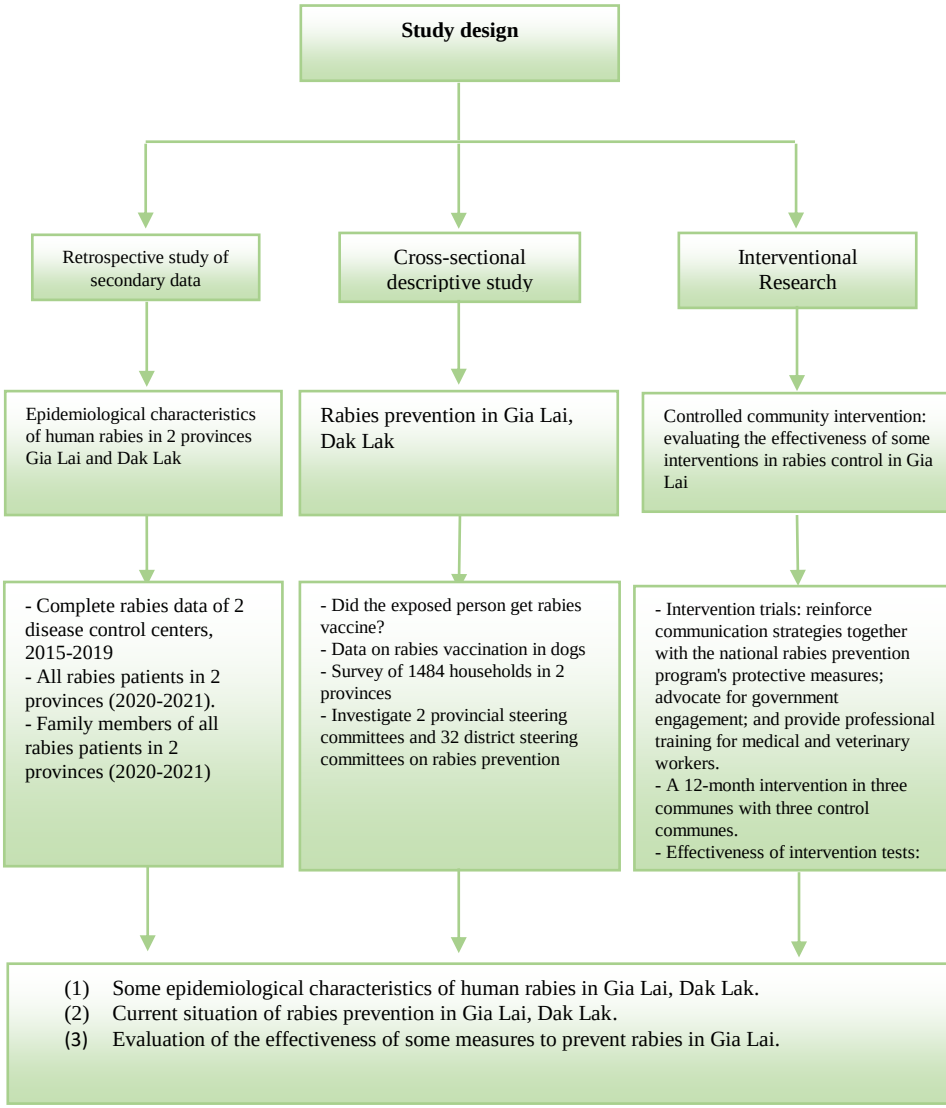
Results achieved (ratings: excellent, good, average, weak) through surveying the current status of rabies prevention and control activities in the intervention and control communes, before and after the intervention.

+ Effective professional training and medical-veterinary coordination in response to rabies before and after intervention; effective delivery of medical and veterinary services.

Percentage of health professionals and veterinary employees in the intervention and control communes who have received training in

rabies prevention, before and after the intervention.

Percentage of patients exposed to rabies receiving rabies vaccine, antirabies serum per 1000 individuals in intervention and control communes before and after the intervention.



Graph 2.2. Study design diagram

Chapter 3. RESEARCH RESULTS

3.1. Some characteristics of human rabies epidemiology and rabies control activities in Gia Lai and Dak Lak (2015-2021)

3.1.1. Some epidemiological traits of rabies in humans in Gia Lai, Dak Lak between 2015 and 2021

Table 3.1. Some individual traits of patients who passed away from rabies in Gia Lai and Dak Lak (n=56)

Individual traits	**Classification**	**Frequency**	**Percentage (%)**
Sex	Male	27	48,2
	Female	29	51,8
Academic level	Not going to school, illiteracy	12	21,4
	High School (elementary to high school)	40	71,4
	Bachelor or higher	4	7,2
Location	Urban area	11	19,6
	Rural area	45	80,4
Economic condition	Poor households	35	62,5
	Non-poor households	21	37,5

Female made up a larger fraction (51.8%) of the 56 rabies deaths overall compared to male (48.2%). 92.8% of those who passed away from rabies had only a high school diploma or less. 80.4% of those exposed to rabies reside in rural areas, and 19.6% do so in urban areas. While 37.5% of households are not impoverished, 62.5% of them are..

Table 3.2. Some exposure characteristics of rabies deaths in Gia Lai, Dak Lak (n=56)

Exposure characteristics	**Classification**	**Frequency**	**Percentage(%)**
Vaccination status of exposed animals	Vaccinated	0	0,0
	Unvaccinated	56	100
Wound treatment	Treated	22	39,3
	Untreated	34	60,7
Post-exposure prophylaxis	Available	0	0,0
	Inavailable	56	100,0

100% of the animals who contracted rabies had never received a vaccination. In 22/56 (39.3%) of the patients, the wound or exposure site was treated after being bitten. The remaining 60.7% did nothing and allowed things to happen naturally. In particular, no preventative care was given in 100% of post-exposure deaths.

3.1.2. Current status of rabies prevention activities in Gia Lai and Dak Lak

Table 3.3. Some characteristics of those who had rabies vaccinations after being exposed in the 2 investigated provinces (n=27.732)

Variables	Classification	Number	Percentage (%)
Age group	≤ 15 years old	11.883	42,85
	16 - 35 years old	7.927	28,58
	36 - 59 years old	5.940	2,14
	≥ 60 years old	1.982	7,15
Economic conditions	Poor households	2.447	8,82
	Non-poor households	25.285	91,18

The majority of dog and cat bites among children under the age of 15 occurred in this age group (42.62%; p 0.001); 91.18% of those who received vaccinations do not come from low-income households. Between poor and non-poor households, there is a statistically significant difference in immunization rates (8.825 versus 91.18%, p 0.01).

Table 3.4. Results of an analysis of some rabies vaccine time-related parameters. (n=27.732)

Variables	Classification	> 15 days	≤ 15 days	OR (95% CI)	p
Academic levels	Not going to school, illiteracy	156	1	491,554 (68,796 - 3512,211)	< 0,001
	Elementary to high school	6.643	20.932		
Economic conditions	Poor	792	1.655	1,536 (1,404 - 1,680)	< 0,001
	Non- poor	6.007	19.278		

In contrast to educated people, those who did not attend school or who were illiterate had a greater rate of late rabies vaccination (OR = 491,554; 95% CI: 68.796 - 3512,211; p 0.001). Household income is another factor that affects the likelihood of rabies vaccination after 15 days; poor people have a greater rate of late rabies vaccination than wealthy people do (OR= 1,536; 95% CI: 1.404 - 1.680; p 0.001).

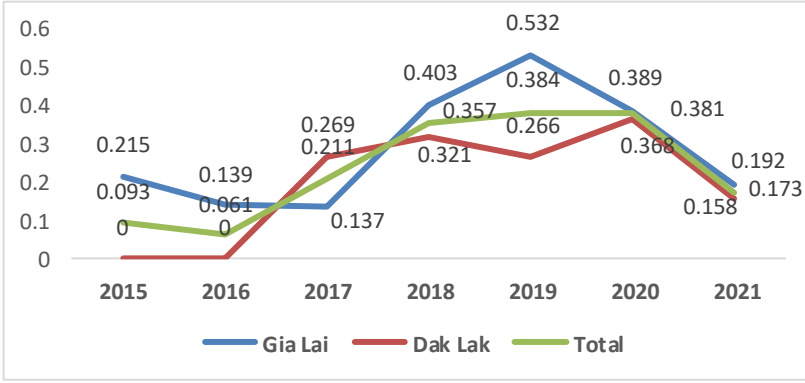


Table 3.1. Incidence and fatality rates of rabies per 100,000 people in Gia Lai and Dak Lak from 2015 to 2021.

Gia Lai's rabies mortality/morbidity rate per 100,000 people was highest in 2019 (0.532) and lowest in 2017 (0.137). In Dak Lak, the rabies mortality/morbidity rate per 100,000 people was highest in 2020 (0.368), and lowest in 2015 and 2016 (no death).

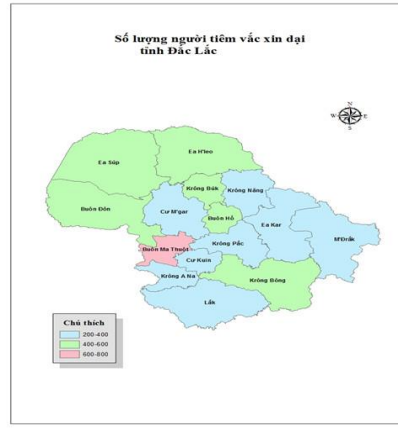


Table 3.2. Map showing those in Gia Lai, Dak Lak who will be vaccinated against rabies in 2021.

3 out of 17 districts in the entire province of Gia Lai have 600 to 800 people receiving the rabies vaccine and anti-rabies serum. Duc Co, Chu Se, and Pleiku City have the highest rates of rabies vaccinations among the districts. There are 1/15 districts in the Dak Lak province where there are 600-800 persons who have received a rabies vaccination, with Buon Ma Thuot city having the greatest number.

Table 3.5. Vaccine coverage ratio in dogs in 2 studied provinces

Studied location	**Total packs** (dogs)	**Vaccinated dogs** (dogs)	**Vaccine coverage ratio** (%)
Gia Lai	104.026	35.369	34,00
Dak Lak	116.919	43.879	37,50
Total	220.945	79.248	35,87

There are 220,945 canines overall in the two investigated provinces, with Gia Lai (34.00%) and Dak Lak (37.50%) having the highest vaccination coverage rates. The rates of rabies immunization in animals were the same in the two provinces under investigation.

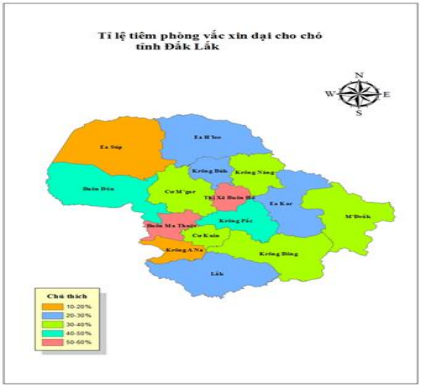


Table 3.3. Map of rabies vaccination in dogs in Gia Lai, Dak Lak in 2021

Gia Lai province has seven out of its seventeen districts, including Duc Co, Chu Prong, Chu Se, Chu Puh, Chu Pah, Kbang, and Kong Chro, where less than 30% of dogs have received the rabies vaccine. Ia Sup

and Krong Ana are two of the 15 districts in Dak Lak province having rabies vaccination coverage rates for dogs that are under 20%.

Table 3.6. Public awareness of rabies prevention (n=1484)

Knowledge about rabies prevention		Gia Lai (n=742) SL, TL(%)	Dak Lak (n=742) SL, TL(%)	Total (n=1484) SL, TL(%)
Rabies is	Dangerous and life-threatening disease	238 (32,1)	337 (45,4)	575 (38,75)
	Incurable illness	260 (35,0)	248 (33,4)	508 (34,23)
	The disease can be prevented by vaccination	338 (45,6)	455 (61,3)	793 (53,43)
	The disease can be transmitted to other animals	435 (58,6)	582 (78,4)	1017(68,53)
	Infectious diseases	371 (50,0)	529 (71,3)	900 (60,65)
	Get rabies by coming into contact with a rabid dog or person.	212 (28,6)	135 (18,2)	527 (35,51)
	Be preventable	293 (39,5)	361 (48,7)	527 (35,51)
Average point ± SD		**6,64 ± 2,06**	**7,67 ± 1,64**	**7,15 ± 1,93**

In Gia Lai, only 32.1% of people are aware that rabies poses a threat to human life, compared to 45.4% in Dak Lak. Gia Lai (50.0%) has a substantially lower understanding of rabies' infectious nature than Dak Lak, where it is much higher (71.3%). 53.43% of people know that rabies can be prevented by vaccination, while 68.53% of respondents are aware that rabies can be spread by many animals. Only 34.23% of those surveyed are aware that rabies is an incurable illness.

Table 3.7. General assessment of the general public's awareness of rabies prevention in Gia Lai and Dak Lak (n=1484)

General assessment of knowledge	Gia Lai SL, TL(%)	Dak Lak SL, TL(%)	Total SL, TL(%)
Satisfactory	406 (54,7)	593 (79,9)	999 (67,32)
Unsatisfactory	336 (45,3)	149 (20,1)	485 (32,68)

In the poll, 67.3% of participants reported having strong awareness of rabies prevention, whereas 32.6% reported having no such information. With findings of 79.9% and 54.7%, respectively, Dak Lak has a higher percentage of persons with knowledge than Gia Lai.

Table 3.8. Attitudes about rabies prevention of people in Gia Lai and Dak Lak (n=1484)

Attitudes about rabies prevention	Gia Lai (n=742) SL, TL(%)	Dak Lak (n=742) SL, TL(%)	Total (n=1484) SL, TL(%)
Ready to get vaccinated if bitten by a rabid dog	509 (68,6)	539 (72,6)	1048 (70,62)
Willing to pay for registration fee if dog registration is required	16 (2,2)	17 (2,3)	33 (2,22)
Willing to pay for vaccinations if dog vaccinations are required	321 (43,3)	466 (62,8)	767 (51,68)

After exposure, more people in Dak Lak (72.6%) are willing to get immunized than in Gia Lai (68.6%). In Gia Lai, just 43.3% of residents are willing to pay for canine vaccinations, compared to 62.8% in Dak Lak.

Table 3.9 ***General assessment of people's attitude about rabies prevention*** **(n=1484)**

General assessment	Gia Lai (n=742) SL, TL(%)	Dak Lak (n=742) SL, TL(%)	Total (n=1484) SL, TL(%)
Satisfactory	276 (37,2)	379 (51,1)	655 (44,14)
Unsatisfactory	466(62,8)	363 (48,9)	829 (55,86)

655 interviewees (44.14%) expressed a positive attitude toward rabies prevention, while 829 (55.86%) expressed an unpleasant attitude.

Table 3.10. People's practices for preventing rabies (n=1484)

Practice on rabies prevention	Gia Lai (n=742) SL, TL(%)	Dak Lak (n=742) SL, TL(%)	Total (n=1484) SL, TL(%)
Register dog and cat status with the local authority	15 (2,02)	13 (1,75)	28 (2,08)
Rabies vaccination for pets	369 (52,04)	474 (74,17)	843 (62,54)
How to act when there are off-leash dogs and wild dogs at the residential area			
Chasing away	424 (57,14)	267 (35,98)	691 (46,56)
Reporting to the village chief	365 (49,19)	510 (68,73)	875 (58,96)
Reporting to veterinarian	83 (11,19)	114 (15,36)	197 (13,27)

Practice on rabies prevention	Gia Lai (n=742) SL, TL(%)	Dak Lak (n=742) SL, TL(%)	Total (n=1484) SL, TL(%)
How to act when visiting someone else's home and ensuring that the dog is not restrained or tied up			
Advising the dog's owner to lock up their pet	382 (51,48)	306 (41,24)	688 (46,36)
Not entering	394 (53,10)	320 (43,13)	714 (48,11)
If there is a dog living there, when a visitor arrives, the owner should:			
Keep the dog locked up	384 (51,75)	221 (29,78)	605 (40,77)
Advising the visitor not to enter	110 (14,82)	221 (29,78)	331 (22,30)
How to act if someone is bitten by a dog or cat			
Immediate first aid	209 (28,17)	302 (40,70)	511 (34,43)
Give oriental medicine treatment	139 (18,73)	176 (23,72)	315 (21,23)
Take the patient to the community health center	185 (24,93)	239 (32,21)	424 (28,57)
Take the patient to hospital	146 (19,68)	114 (15,36)	260 (17,52)
Take the patient to the rabies vaccination site	200 (26,95)	219 (29,51)	419 (28,23)
If a dog or cat dies from disease, kill and bury it.	412 (55,53)	548 (73,85)	960 (64,69)

More over one-third of respondents correctly identified washing the wound with soap and warm water or an antiseptic as the first appropriate line of action. The best line of action after that is to suggest that patient should visit the hospital, the commune health station, and the rabies vaccination location. The percentage of correct responses is, in order, 28.57%, 17.52%, and 28.23%. There are still a lot of people who give incorrect answers, do nothing, and use oriental medicine as treatment.

Table 3.11. General assessment of people's rabies prevention practices in Gia Lai and Dak Lak Provinces (n=1484)

Assessment	Gia Lai (n=742) SL, TL(%)	Dak Lak (n=742) SL, TL(%)	Total (n=1484) SL, TL(%)
Satisfactory	207 (29,90)	260 (35,04)	467 (31,47)
Unsatisfactory	503 (67,79)	482 (64,96)	1017 (68,53)

The percentage of participants who provided responses that satisfied the requirements for rabies prevention practice was 31.47%; the unsatisfactory rate was 68.53%.

Table 3.12. Results of the survey on the quality of rabies prevention activities of the District Steering Committee in 2021

Studied research	Average point	Excellent SL, TL(%)	Good SL, TL(%)	Average SL, TL(%)	Weak SL, TL(%)
Gia Lai	59,0 ± 7,0	0/17 (0)	5/17 (29,41)	12/17 (70,59)	0/17 (0)
Dak Lak	54,5 ± 4,5	0/15 (0)	4/15 (26,67)	11/15 (73,33)	0/15 (0)

Gia Lai Province's districts' rabies prevention efforts in 2021 were of a high caliber, with a success rate of 29.41% and an average success rate of 70.59%. 17 districts received a total of 59.0 + 7.0 points on average. In Dak Lak province, there are 26.67% of districts with successful outcomes and 73.33% of districts with average-quality rabies preventive initiatives.

3.2. Intervention effectiveness against rabies

3.2.1. Results of the implementation of intervention activities in the studied field

Table 3.13: Percentage of people who have been propagated to raise awareness about rabies prevention

Propaganda measures	Number of people accessible	Population of 3 intervention communes	Percent of those who are knowledgeable (%)
Direct propaganda	8.108	21.768	37,24
Mobile propaganda campaign by motorcycle	16.898	21.768	77,62
Propagating households to sign a commitment to prevent rabies	16.898	21.768	77,62
Building panels cluster	2.493	21.768	11,45
Handing out leaflets	16.898	21.768	77,62
Celebrating World Rabies Day	3.386	21.768	15,55
Rabies prevention message through loudspeakers	16.898	21.768	77,62

In three intervention communes, 37.24 percent of the population reported receiving direct and indirect propaganda. Through the use of the loudspeaker system, 77.62% of those in the three intervention communes increased their understanding of rabies prevention.

Table 3.14. Results of the implementation of interdisciplinary conferences on strengthening rabies control

Level	Frequency of hosting conferences	Number of people	Delegate Composition			
			Authority leaders (%)	Departments, unions (%)	Medical officer (%)	Veterinary officer (%)
District	1	15	13,3	26,7	46,7	13,3
Commune	3	55	10,9	50,9	32,7	5,5
Total	4	70	11,4	45,7	35,7	7,1

Three conferences at the commune level and one district conference were held in the communes of Ia Dom, Ia Nan, and Ia Pnon. The conference's goal is to spread fundamental understanding regarding the mechanism of rabies transmission as well as strategies for preventing the disease in both humans and animals.

3.2.2. Intervention effectiveness against rabies

Table 3.15. Intervention effectiveness on rabies prevention knowledge

Rabies prevention knowledge		Intervention group (n_1=356)	Control group (n_2=356)	Intervention effectiveness (%)
		Effective index (%)	Pre-post change (%)	
Subjects with rabies	Human	103,7	3,6	**100,1**
	Dog	14,4	1,1	**13.3**
	Cat	4,8	6,4	**-1,6**
	Others	29,9	11,4	**18,5**
Rabies is	Dangerous and life-threatening disease	102,5	14,1	**88,4**
	An incurable disease	64,0	6,1	**57,9**
	The disease can be prevented by vaccination	57,4	13,0	**44,4**
	The disease can be transmitted to other animals	35,4	1,0	**34,4**
Rabies is a contagious disease		39,5	-18,2	**57,7**
Get rabies from contact with an rabid person or dog		86,6	-9,6	**96,2**
Rabies is preventable		65,7	11,7	**54,0**

The study's findings indicated that the effectiveness index was 103.7% and 64.0% with the correct knowledge about human being the host of rabies and rabies is an incurable disease. The effectiveness index of answer: preventable rabies and exposure to rabies exposure were 65.7% and 86.6%, respectively. The highest intervention efficiency (100.1%) belonged to the answer that humans are the hosts of rabies. The third most effective intervention (88.4%) belongs to the answer that rabies is a dangerous and life-threatening disease.

Table 3.16. Effectiveness of interventions on attitudes towards rabies prevention

Attitudes towards rabies prevention	Intervention group (n_1=356)			Control group (n_2=356)			Intervention effectiveness (%)
	Pretest (%)	Posttest (%)	Effectiveness index (%)	Pretest (%)	Posttest (%)	Pre-post change (%)	
Ready to get vaccinated if bitten by a rabid dog	58,1	63,2	8,8	57,8	62,5	8,1	**0,7**
Willing to pay for registration fee if dog registration is required	2,0	3,9	95,0	2,2	3,1	-4,5	**98,4**
Willing to pay for vaccinations if canine vaccinations are required	52,2	63,8	22,2	50,1	55,4	10,6	**11,6**

In the intervention group, the percentage of people who would get vaccinated if they were attacked by an animal rose from 58.1% to 64.1% in T_{12} (p 0.01). Dog vaccination willingness to pay increased from 52.2% to 63.8%.

Table 3.17. Intervention effectiveness on rabies prevention practices

Rabies prevention practices		Intervention group (n_1=356)	Control group (n_2=356)	Intervention effectiveness (%)
		Effective index (%)	Pre-post change (%)	
Register dog and cat status with the local authority		73,6	14,3	**59,3**
Rabies vaccination for pets		36,8	2,2	**34,6**
Pet dogs and cats are kept locked and on a leash		477,7	-12,2	**489,9**
Action to act when there are off-leash dogs and wild dogs at the residential area	Chasing away	-4,6	0,7	**-5,3**
	Reporting to the village chief	60,9	1,9	**59,0**
	Reporting to veterinarians	58,2	6,8	**51,4**
Action when visiting someone else's home and ensuring that the dog is not restrained or tied up	Advising the dog's owner to lock up their pet	10,9	4,6	**6,3**
	Not entering	15,3	3,1	**12,2**
Action if someone is bitten by a dog or cat	Immediate first aid	208,4	14,1	**194,3**
	Take the patient to the community health center	54,3	15,0	**39,3**
	Take the patient to hospital	82,0	12,0	**70,0**
	Take the patient to the rabies vaccination site	60,9	14,5	**46,4**

The pet vaccination rate increased from 44.9% to 61.5% after a 12-month propaganda intervention; the effective index was 36.8%. The proportion of individuals in the intervention group who promptly sought medical attention after exposure rose compared to the control group; the effectiveness of interventions choosing commune health stations, hospitals, and rabies vaccination sites after exposure is 39.3%, 70.0%, and 46.4%, respectively; $p < 0.05$.

Table 3.18. Intervention effectiveness on vaccine coverage in dogs

Commune	Pre-intervention		Post-intervention		Effective index (%)
	Total number of dogs	Vaccine coverage percentage (%)	Total number of dogs	Vaccine coverage percentage	
Intervention	4607	35,5	3859	69,8	96,6
Control	4706	30,7	4614	36,8	19,9

After a year, dogs in three intervention communes had a markedly higher vaccination coverage rate. The effective index in the intervention commune was 96.6%. The coverage of canine rabies vaccination did not significantly increase in the three control communes.

Table 3.19. Quality of rabies prevention activities in the intervention and control areas, pre and post intervention trials.

Type	Commune	Results			
		Pre-intervention		Post-intervention	
		Point	Rating	Point	Rating
Intervention	Ia Dom	59,0	average	85,5	excellent
	Ia Nan	55,5	average	71,0	good
	Ia Pnon	50,5	average	72,0	good
Control	Ia Glai	51,0	average	54,5	average
	Ia HLop	48,5	weak	49,0	weak
	Ia Blang	54,0	average	57,0	average

The effectiveness of rabies preventive efforts in the 3 intervention communes has significantly improved after 12 months of intervention. Following the intervention, two communes—Ia Pnon and Ia Nan—whose grades were average at time T_0 improved to good points. Ia Dom commune's rating, which had been average at time T_0, was improved to excellent level in the post-intervention trial. Pre-post intervention testing in the control group revealed no differences in the quality evaluation of rabies prevention efforts.

Chapter 4. DISCUSSION

4.1. Epidemiological characteristics of human rabies and the status of rabies prevention in Gia Lai and Dak Lak

4.1.1. Situation of human rabies in Gia Lai, Dak Lak in the period 2015-2021

With 92.8%, those with only a high school diploma or less made up the majority of those who died from rabies. The lack of rabies

awareness among those with low levels of education can be used to explain this. The likelihood of preventing rabies after exposure is low because so many people are unaware of what it is or how dangerous it is. Up to 60.7% of those who passed away after contracting the rabies virus went untreated. Particularly, no preventative care was given to 100% of post-exposure cases.

4.1.2. Current situation of rabies prevention in Gia Lai and Dak Lak

The percentage of people who sought out rabies vaccination in the first 15 days accounted for the majority mean that most local residents who have been bitten by an animal are aware of the importance of post-exposure prophylaxis.

Children, those with low education levels, and household income are factors that affect the late vaccination period (more than 15 days after exposure). When compared to non-poor people, those from impoverished households have greater rates of rabies immunization and anti-rabies serum after 15 days (OR = 1,536).

There are 220,945 canines altogether in the two provinces under study, of which 79,248 have received rabies vaccinations. Dogs in Dak Lak (37.5%) and Gia Lai (34.0%) have their vaccinations. That dog owners have not responded to rabies vaccination for their pets and the lack of human resources and state funds to support this endeavor may be the cause.

4.1.3. Rabies prevention activities in 2 studied provinces

Gia Lai Provincial Steering Committee's rabies prevention efforts received a total score of 77 (indicating that overall results were good), whereas Dak Lak received a score of 62.5 (indicating that overall results were average). In the province, not all communities have rabies prevention programs that are of a high enough caliber. According to the survey's findings, Gia Lai province had an average score of 59,0 ± 7,0 and Dak Lak province received a score of 5 4,5 ± 4,5for the effectiveness of rabies prevention efforts.

4.2. Effective measures against rabies

4.2.1. Intervention activities in the studied field

Instruct the homeowner about the danger level of rabies, the source and route of rabies transmission, measures to prevent rabies, how to handle an animal bite, scratching and licking, the need to vaccinate pets for rabies, and the proper way to raise dogs and cats, including keeping them on a leash and locking them. The animal

must also be monitored after biting someone. If the pet exhibits rabies symptoms at the time of the bite or is unable to be monitored, it should receive a complete dose of rabies vaccination right once..

4.2.2. Intervention effectiveness against rabies

After the intervention test, the intervention group had more access to resources for knowledge on rabies prevention. Information provided by medical staff increased from 21.6% to 40.8% at the post-intervention test. After 12 months of intervention, information from relatives increased from 25.6% to 36.7%.

After a year, the intervention group's results showed an improvement. At the latter time point, the mean pre-intervention knowledge score increased from 6.49 ± 2.10 to 9.53 ± 2.23. After the intervention, there was a statistically significant score improvement in the overall score. After the intervention, more people were willing to receive injections after being bitten by an animal. This demonstrates their seriousness.

In this study, intervention effectiveness for rabies vaccination of animals was 34.6%, and the effective index was 36.8% ($p < 0.05$). After the intervention, the proportion of people who received the rabies vaccine after being bitten by an animal rose from 40.4% to 71.8%. Effective index is 77.7%; pre-post test change are -11.1%. The effectiveness of post-exposure rabies vaccination as an intervention on proper rabies prevention measures is 88.8%.

CONCLUSION

1. Some aspects of the epidemiology of human rabies and rabies prevention initiatives in Gia Lai, Dak Lak (2015–2021)

56 people have died in the two provinces of Gia Lai and Dak Lak between 2015 and 2021. Dog exposure was the cause of every fatality, and none of the victims had been vaccinated against rabies. After being bitten by an animal in 2021, 27,732 people in the two provinces of Gia Lai and Dak Lak received rabies vaccinations and anti-rabies serum. In which, those who sought post-exposure prophylaxis were more prevalent among children under the age of 15 (42.62%) and late injectors (24.51%) after exposure for 15 days. Gia Lai had a vaccination rate of 34.0% and Dak Lak had a 37.5% vaccination rate for dogs.

Out of 1484 study participants, evaluation of the community's knowledge, attitude, and practice about rabies revealed that: 67.32% have good knowledge; 44.14% have good attitude; and 31.47% have

good practices. Those with good attitudes and behaviors have a high rate of post-exposure vaccination while those with good knowledge and practice have a high rate of rabies vaccination in animals.

While 70.59% of districts in Gia Lai province have average quality activities, 73.33% of districts in Dak Lak have average quality activities, according to an evaluation of the quality of rabies preventive efforts at the district level in 2021..

2. Intervention effectiveness against rabies in Gia Lai (2021-2022)

Propaganda, policy advocacy, mobilization of participation of sectors and levels, professional training, and medical-veterinary coordination in response to disease have all been demonstrated to have clear effects after 12 months of implementation of synchronous interventions. The efficiency of the intervention improved knowledge of rabies prevention to 40.6%, attitude improvement was up to 7.2%, and rabies prevention practices rosed by 49.4% of the population.

The proportion of people who receive rabies vaccine after exposure has increased as a result of the intervention results. To be more precise, the rate of rabies prophylaxis per 1,000 post-exposure people increased 1.83 times in the intervention communes compared to 1.15 times in the control communes.

After 12 months of intervention, the vaccine coverage rate for dogs in 3 intervention communes rose from 35.5% to 69.8%, and the effective index reached 96.6% as opposed to 19.9% in the control group.

The quality of rabies prevention activities in the three intervention communes has been significantly improved, with the average score pre and post intervention trials of 55 points and 76.2 points, respectively.

RECOMMENDATION

1. The community health center must have a rabies vaccination program that supplies enough anti-rabies serum and rabies vaccine. Support the expense of rabies vaccination for low-income households in part or in full, and provide free rabies immunization for kids. The Central Highlands require the creation of a network of rabies vaccination programs for both humans and animals in addition to more supportive rabies prevention legislation.

2. The three communes of Ia Dom, Ia Nan, and Ia Pnon have demonstrated the effectiveness of a number of programs. To completely eradicate rabies, the Central Highlands should use the rabies prevention communication model after which it should be implemented nationwide.

SIGNIFICANCE AND CONTRIBUTION OF THE STUDY

1. A map of the rabies risk in the community of the investigated provinces will be constructed using the survey data. There isn't yet a map depicting the rabies risk in Vietnam..

2. Allowing for updating the most recent rabies prevention situation in the provinces of Gia Lai and Dak Lak. Scientific and useful recommendations can be made to increase the effectiveness of rabies prevention in the community based on the analysis results of rabies prevention efforts..

LIMITATIONS OF THE STUDY

1. Limitations of the interview process: Despite the presence of local interpreters, it can be challenging to avoid mistakes during the interview process due to the low cultural level of ethnic minorities in this region and linguistic barriers.

2. Limitation on the scope of the study site: the study was only undertaken in the two provinces of Gia Lai and Dak Lak; it has not yet been expanded to the Central Highlands provinces or other bigger geographic areas.

LIST OF PUBLISHED AND RELATED WORKS

1. Ngo Quy Lam, Nguyen Van Ba, Nguyen Van Chuyen, et all. (2022), Factors related to vaccines for both patients exposed with rabies and dogs, Journal of Revista Cubana de Medicina Militar, 2022, 51(1): e02201753.

2. Ngo Quy Lam, Nguyen Xuan Kien, Cao Ba Loi (2022). Evaluation of the effectiveness of some interventions in the prevention of rabies in Duc Co district, Gia Lai province. Journal of Vietnamese Medicine, Vol. 524, No. 1B, March 2023, pp.248-252.