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EPIDEMIOLOGICAL CHARACTERISTICS OF AFRICAN SWINE FEVER IN DIEN BIEN PROVINCE, VIETNAM, DURING THE PERIOD 2020–2024

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ABSTRACT

An investigation into the epidemiological characteristics of African Swine Fever (ASF) in pig herds in Dien Bien province from 2020 to 2024 revealed that outbreaks occurred each year throughout the study period. A major outbreak occurred in 2021, affecting 7 out of 10 districts in the province and involving 1.77% of the provincial swine population. All infected pigs either died or were culled, resulting in significant economic losses for the local swine industry. In 2023 and 2024, although ASF re-emerged in 8 out of 10 districts, early detection and rapid response kept outbreaks limited in scale and economic impact. All pig categories-including boars, sows, fattening pigs, and piglets,were susceptible to infection. The endemicity level of ASF was moderate throughout the investigation period. Effective disease prevention and control measures are essential for preventing future ASF outbreaks in local pig herds.

KEYWORDS: ASF, African Swine Fever, pigs, Dien Bien, 2020–2024

1. INTRODUCTION

African Swine Fever (ASF) is an acute infectious disease caused by a double-stranded DNA virus from the Asfarviridae family, genus *Asfivirus* (Nan Wang et al., 2019). According to Uner et al. (2021), African swine fever (ASF) has massively spread in recent years and threatens the global pig industry. ASF has been present in Latvia since 2014. Hunters play a major role in the implementation of measures to control ASF and in passive disease surveillance. The probability of detecting an ASF-positive wild boar is much higher in animals found dead than in hunted animals.

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According to Vietnam's National Standards (2018), ASF has an incubation period of 4–19 days. Virulent strains cause acute or subacute hemorrhagic fever, characterized by high fever, anorexia, skin and visceral hemorrhages, and death within 4–10 days, sometimes occurring before clinical signs

appear. Mortality rates can reach 100%. Less virulent strains may present mild clinical signs, such as low-grade fever and lethargy, which can be mistaken for other swine diseases.

ASF is a fatal viral disease affecting domestic pigs and wild boar of all ages with clinical presentations ranging from per-acute to chronic disease, including asymptomatic courses (Chenais et al., 2020).

Jori F. et al (2020) announced that the World Café method was perceived as an efficient tool for quickly grasping comprehensive perspectives from the professionals involved in managing ASF and wild boar populations, while promoting engagement in multi-disciplinary discussions. The exercise achieved a good overview of the perceived efficiency and applicability of the different control methods and generated useful recommendations for ASF control in wild boar populations in Europe.

According to Bui Thi To Nga et al. (2020), clinically infected pigs commonly exhibit high fever, anorexia, vomiting, petechial or ecchymotic hemorrhages on the skin, impaired blood coagulation, and bleeding from the nose and anus. Severe hemorrhages are observed in multiple organs and systems, including lymph nodes, heart, kidneys, stomach, intestines, gallbladder, and urinary bladder. Additional lesions include splenomegaly and dark-purple hemorrhagic gastric, hepatic, and renal lymph nodes.

ASF was first identified in Kenya in 1921 and has since become endemic in many African countries. The disease was first detected in Europe in 1957 and has since spread to various European countries.

In Vietnam, ASF was first detected on February 19, 2019, in Hưng Yên and Thái Bình provinces. The disease exhibited a rapid and complex pattern of spread. In response, the Prime Minister of Vietnam issued Directive No. 04/CT-TTg dated February 20, 2019, outlining urgent and comprehensive measures for ASF containment (Government of Vietnam, 2019).

From 2020 to 2024, ASF has continuously occurred in pig herds in Dien Bien province, causing significant economic losses to local farmers. To assess the epidemiological situation, we conducted a detailed investigation into the epidemiological characteristics of African Swine Fever in Dien Bien during the 2020–2024 period.

2. MATERIALS AND METHODS

2.1. Subjects, Locations, and Timeframe

- Subjects: Pigs in Dien Bien province and African Swine Fever occurrences.
- Location: Dien Bien province, Vietnam.
- Timeframe: 2020 to 2024.

2.2. Methodology

A retrospective epidemiological survey was conducted using outbreak records provided by the Dien Bien Sub-Department of Animal Health (2020, 2021, 2023) and the Department of Animal Husbandry,

Animal Health, and Aquaculture (January and December 2024). Data was analyzed to assess:

- ASF distribution by district;
- Outbreak scale by year;
- Morbidity and mortality rates due to ASF;
- Disease endemicity in the province.

2.3. Data Processing

Data was statistically processed using methods described by Nguyen Van Thien (2008) and Microsoft Excel.

3. RESULTS AND DISCUSSION

3.1. ASF Distribution in Dien Bien Province

African Swine Fever began affecting pig populations in Vietnam in 2019, rapidly spreading nationwide with numerous large-scale outbreaks. At the time, provincial authorities and swine producers lacked timely and effective countermeasures, resulting in widespread transmission and significant impacts on pig production. Despite the issuance of Directive No. 04/CT-TTg by the Prime Minister on February 20, 2019, which mandated urgent control measures, the disease continued to spread across the country, including in Dien Bien province. Many farmers attempted to sell off sick or dead pigs, further exacerbating the situation.

Since its introduction, ASF has occurred extensively across many districts in Dien Bien. The largest and most severe outbreak occurred in 2019, when the disease affected all 10 districts, leading to 22,978 pigs being infected and culled. From 2020 to 2024, ASF continued to reappear annually. Table 1 summarizes the distribution of ASF outbreaks in the districts and towns of Dien Bien province during this period.

Table 1. Distribution of African Swine Fever outbreaks across districts in Dien Bien province (2020-2024)

No.	District/Town	Survey Year					No. of Years with ASF
		2020	2021	2022	2023	2024	
1	Dien Bien Phu City	x	x	x	x	x	5
2	Muong Lay Town	x	x	-	x	x	4
3	Muong Nhe District	x	x	x	x	x	5
4	Muong Cha District	x	-	x	x	x	4

5	Tua Chua District	-	x	-	x	x	3
6	Tuan Giao District	-	-	-	-	x	1
7	Muong Ang District	x	x	x	x		4
8	Dien Bien District	x	x	x	x	x	5
9	Dien Bien Dong District	-	-	-	-	-	0
10	Nam Po District	x	x	x	x	x	5
Total number of districts with ASF		7/10	7/10	6/10	8/10	8/10	5/5

Note: x: outbreak reported; –: no outbreak reported

The data in Table 2 indicate that ASF occurred every year during the 2020–2024 study period in Dien Bien province. In 2023 and 2024, ASF was reported in the highest number of districts (8 out of 10). In 2022, the outbreak scale was more limited, affecting only 6 districts. Among the 10 administrative divisions in the province, four districts - Dien Bien Phu City, Muong Nhe, Dien Bien, and Nam reported ASF cases every year. Tuan Giao District reported an outbreak only in 2024, while Dien Bien Dong District remained ASF-free throughout the 5 years.

3.2. Scale of African Swine Fever Outbreaks in Dien Bien Province, 2020-2024

The scale of ASF outbreaks in specific localities serves as an essential indicator for assessing the economic impact of the disease. Furthermore, understanding outbreak magnitude contributes significantly to the development of an epidemiological mapping system, enabling authorities to proactively design and implement prevention and control strategies. A summary of the outbreak scale of African Swine Fever in pig herds across Dien Bien province during the period from 2020 to 2024 is presented in Table 2.

Table 2. Scale of African Swine Fever outbreaks in Dien Bien Province, 2020-2024

Year	No. of affected districts/ towns	Number of affected communes/ wards/ townships	Number of affected hamlets/ villages	No. of affected households	No. of pigs affected
2020	7	39	192	601	2,037
2021	7	49	279	1,309	5,019
2022	6	34	143	325	1,381
2023	8	26	43	130	871
2024	8	34	110	336	1,405
Total	36	182	767	2,701	10,713

The data in Table 2 indicate that during the 2020-2024 period, the largest ASF outbreak occurred in 2021, resulting in substantial economic losses. That year, 1,309 households across 7 out of 10 districts reported cases, with a total of 5,019 pigs infected and subsequently culled. In contrast, although ASF re-emerged in 8 out of 10 districts in 2023, the outbreak was the smallest in scale, with only 871 pigs affected.

Specifically:

In **2020**, ASF affected 601 farming households in 192 hamlets across 39 communes, wards, and townships in 7 out of 10 districts of Dien Bien province. A total of 2,037 pigs were reported infected.

In **2021**, the disease was recorded in 49 communes across 7 districts, involving 1,309 households from 279 villages. A total of 5,019 pigs were infected, died, or were culled. This was the largest ASF outbreak in the province during the five-year study period. The severity of the 2021 outbreak can be attributed to multiple factors: the adverse effects of climate change, complex weather patterns, widespread circulation of the virus, and especially the impact of the COVID-19 pandemic. Many areas were under lockdown or quarantine, and veterinary personnel at both provincial and local levels were subject to health isolation protocols (F1, F2 contacts), which delayed outbreak response activities. These factors created conditions conducive to the resurgence and sustained transmission of ASF throughout the year, making it the most economically damaging animal disease in Dien Bien and other provinces during that time (Dien Bien Sub-Department of Animal Health, 2021).

In **2022**, ASF occurred in 34 communes within 6 out of 10 districts, affecting 325 households and resulting in 1,381 pigs infected, deceased, and culled.

In **2023**, ASF was recorded as having the smallest outbreak scale, with only 871 pigs infected and culled, making it the year with the lowest economic impact from ASF in Dien Bien.

In **2024**, outbreaks were reported in 34 communes across 8 districts, involving 336 households and 1,405 pigs infected, deceased, and destroyed.

3.3. Morbidity, Mortality, and Culling Rates Due to African Swine Fever

The morbidity, mortality, and culling rates associated with African Swine Fever (ASF) are key indicators for assessing the disease's impact and the associated economic losses in Dien Bien province during outbreak years. We compiled data on ASF infection, death, and culling in the provincial pig population over the past five years (2020-2024). The results are presented in Table 3.

Table 3. ASF morbidity, mortality, and culling rates in pigs in Dien Bien Province, 2020-2024

Year	Total pig population	No. of infected pigs	Morbidity rate (%)	No. of pigs died/culled	Mortality rate (%)	Total weight of pigs deceased and culled (kg)
2020	290,817	2,037	0.70	2,037	100	113,411
2021	283,687	5,019	1.77	5,019	100	247,748
2022	293,037	1,381	0.47	1,381	100	81,718
2023	321,076	871	0.27	871	100	42,396
2024	326,336	1,405	0.43	1,405	100	69,768
Total	1,514,953	10,713	0.71	10,713	100	555,041

Note: *Morbidity rate (%)*: Percentage of infected pigs relative to the total pig population per year; *Mortality rate (%)*: Percentage of infected pigs that died or were culled (assumed 100% in this study); *Total weight*: Estimated weight of all pigs culled or deceased due to ASF, in kilograms.

The results presented in Table 3 demonstrate that African Swine Fever occurred frequently and infected a considerable number of pigs in Dien Bien province during the 2020-2024 period. Over the five years, the average morbidity rate was 0.71%, and the mortality and culling rate reached 100%, corresponding to a total of 555,041 kg of infected pig carcasses disposed of.

In **2019**, the disease emerged for the first time and spread rapidly and aggressively. Provincial authorities, departments, and livestock producers were unprepared to cope with the speed and extent of transmission and lacked effective prevention and containment measures. As a result, the number of infected, deceased, and culled pigs was extremely high. In **2020 and 2021**, the situation was exacerbated by the COVID-19 pandemic. Many areas in Dien Bien province were under lockdown or quarantine. Numerous veterinary officers, from provincial to communal levels, and field personnel involved in disease control were subject to medical isolation (as F1 or F2 contacts), which hindered the timely implementation of animal disease control activities. Consequently, ASF outbreaks continued to occur in numerous swine-rearing households: In 2020, 2,037 pigs were infected, resulting in the culling of 113,411 kg of pig carcasses. In 2021, ASF reached its peak severity with 5,019 infected pigs and 247,748 kg of carcasses destroyed.

In **2023 and 2024**, due to increased adaptation and improved biosecurity awareness among farmers, proactive outbreak responses were more effective. Early disease detection, timely reporting, and containment measures helped limit the spread of infection, resulting in reduced outbreak scale; in 2023, only 871 pigs were affected, with 42,396 kg culled; in 2024, 1,405 pigs were infected and culled, totaling 69,768 kg of carcasses.

Dang Thi Thu (2020) reported that between March 8 and May 24, 2019, ASF had spread across all 14 districts of Quang Ninh province, leading to the culling of 141,915 pigs from 16,062 outbreak sites. Truong Van Hieu (2020) recorded a morbidity rate of 12.4% in pig herds in Ben Tre province in 2019. According to Dinh Duc Giang (2021), the culling rate in Cao Bang province due to ASF in 2020 was 2.31% of the total pig population.

According to Aliro T. et al (2023), the results show that during ASF quarantine, pig value chain actors shifted their activities from formal places such as livestock markets, slaughter slabs, pork butcheries, and pork joints to informal places such as farmers' homesteads. Farmers were perceived as the most economically affected stakeholder group with forgone income due to unsold pigs, costs for implementing biosecurity measures, and extra costs for feeding unsold pigs being the major perceived causes of the losses. The continued trade in pigs and pig products in informal marketplaces suggests that quarantine might not be effective for hindering activities that might spread ASF in these settings.

The findings of our study regarding ASF morbidity, mortality, and culling rates in Dien Bien are generally consistent with those reported in the studies mentioned above.

3.4. Prevalence of African Swine Fever per 100,000 Pigs

To evaluate the intensity of ASF spread, the number of infected pigs per 100,000 healthy pigs raised in Dien Bien province was calculated for each year with reported outbreaks (2020-2024). The results are shown in Table 4.

Table 4. ASF Prevalence per 100,000 Pigs in Dien Bien Province (2020-2024)

Year	Total pig population	No. of ASF cases	Prevalence per 100,000 pigs
2020	290,817	2,037	700.44
2021	283,687	5,019	1,769.20
2022	293,037	1,381	471.27
2023	321,076	871	271.28
2024	326,336	1,405	430.54

The ASF prevalence in pig herds in Dien Bien was highest in **2021** (1,769.20 cases per 100,000 pigs), followed by **2020**, with the lowest prevalence recorded in **2023** (271.28 cases per 100,000 pigs).

In 2021, the prevalence rate of African Swine Fever (ASF) was 1,769 diseased pigs per 100,000 healthy pigs, which was significantly higher compared to 2023, with only 271 cases per 100,000 pigs.

The significant decrease in ASF prevalence in **2023** and **2024** suggests that districts and towns within Dien Bien province had effectively implemented and maintained biosecurity and disease prevention measures. Continued efforts are needed to sustain these gains and prevent future outbreaks.

4. CONCLUSION

Over the past five years (2020-2024), African Swine Fever (ASF) outbreaks were reported each year in Dien Bien province, with overall outbreak scales ranging from moderate to small. Notably, Dien Bien Dong District was the only locality that remained ASF-free throughout the entire five-year investigation period.

ASF first emerged in the province in 2019 and spread rapidly, inflicting considerable damage on the local pig farming sector. By 2020 and 2021, the disease was brought under partial control, leading to moderately scaled outbreaks. In 2023 and 2024, enhanced implementation of disease prevention measures further reduced outbreak intensity.

The average ASF morbidity rate over the five years was 0.71%, with a 100% mortality and culling rate among infected pigs.

ASF prevalence per 100,000 healthy pigs was notably high in 2021, but showed a marked decline in 2023 and 2024. Nevertheless, due to the highly contagious nature of the disease, there remains a substantial risk of large-scale outbreaks in the absence of effective and sustained control measures in local pig populations.

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