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Disease Transmission Risks Among Fish Farmers and Aquaculture-Linked Wildlife: Occurrence of Shared Gut Pathogens in Ibadan, Nigeria

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ABSTRACT

Background and Objective: Nigerian aquaculture, dominated by African catfish (*Clarias gariepinus*), faces recurrent bacterial disease outbreaks. The interface between cultured fish and wildlife creates complex epidemiological pathways, facilitating bidirectional pathogen transmission. This study investigated the prevalence of shared gut pathogens, particularly *Vibrio* and *Pseudomonas* species, in aquaculture-related wildlife and cultured fish, while assessing fish farmers' awareness of disease transmission risks in Ibadan, Nigeria. **Materials and Methods:** A cross-sectional study was conducted involving 21 consenting fish farmers. Structured questionnaires assessed knowledge and practices related to disease transmission. Gut samples from cultured catfish (n = 8) and wildlife associated with aquaculture, including striated heron (*Butorides striata*, n = 1) and crabs (n = 7), were collected from two pond locations. Samples were analyzed using biochemical characterization methods. Data were summarized descriptively, and statistical comparisons of pathogen traits, such as mannitol fermentation, were performed using chi-square tests. The level of significance was taken as 5%. **Results:** Most farmers were male (85.7%), highly educated (95.2% tertiary), and experienced (71.4% with >10 years). Wildlife encounters were common (71.4%), predominantly involving reptiles and birds, yet only 47.6% of farmers were aware of shared pathogens, and 33.3% recognized zoonotic risks. *Vibrio* species were isolated from 94.1% of wildlife and 77.8% of fish samples. *Pseudomonas* species were detected in 62.5% of wildlife and 77.8% of fish samples, with significantly higher mannitol fermentation in fish isolates (77.8%) compared to wildlife (25.0%) (χ^2 = 7.35, $p<0.05$). **Conclusion:** These findings reveal critical vulnerabilities in Nigerian aquaculture, highlighting gaps in farmer knowledge and the prevalence of shared gut pathogens at the fish wildlife interface. Integrated One Health strategies, including farmer education, biosecurity enhancement, and wildlife management, are essential to mitigate disease risks and safeguard aquaculture productivity.

KEYWORDS

Aquaculture, biosecurity, disease transmission, One Health, *Vibrio*

INTRODUCTION

Aquaculture represents a critical component of global food systems, providing essential protein sources for growing populations while generating employment and economic opportunities, particularly in developing nations. Nigerian aquaculture production predominantly focuses on two economically

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valuable species: *Clarias gariepinus* (African catfish) and *Oreochromis niloticus* (Nile tilapia). These species have been selected for cultivation owing to their remarkable adaptability to diverse environmental conditions, rapid growth rates, relatively low production costs, and strong market acceptance among local consumers[1]. Among these species, *C. gariepinus* has demonstrated exceptional resilience to fluctuating water quality parameters and handling stress, establishing it as the most economically significant and widely cultivated species throughout Nigeria's diverse agro-ecological zones[2].

Despite the sector's growth trajectory and economic significance, Nigerian aquaculture faces numerous constraints that threaten sustainable development[3]. Among these constraints, disease outbreaks represent one of the most economically devastating factors affecting aquaculture profitability and sustainability, with bacterial infections accounting for substantial production losses annually[4].

The ecological interface between cultured fish populations and wildlife species creates complex epidemiological networks that facilitate bidirectional pathogen transmission. Aquaculture facilities, particularly extensive and semi-intensive pond systems common in Nigeria, inevitably attract diverse wildlife communities including piscivorous birds, wading birds, aquatic mammals, reptiles, and numerous invertebrate species[5]. These wildlife assemblages are drawn to fish farms by the concentrated availability of prey (cultured fish), favorable habitat conditions, and accessible water resources. Birds, particularly herons, egrets, cormorants, and gulls, represent especially significant disease transmission risks in aquaculture systems. These avian species forage extensively in fishponds, directly consuming cultured fish while simultaneously depositing fecal material that may contain high concentrations of bacterial pathogens[6].

The mobility of these bird populations, which frequently move between multiple water bodies, including natural wetlands, aquaculture facilities, and municipal water sources, enables them to serve as efficient vectors for pathogen dissemination across geographic regions[7]. Several research works have reported that wild birds can harbor and transmit numerous bacterial species relevant to aquaculture health, including *Vibrio* spp., *Aeromonas* spp., *Salmonella* spp., and *Pseudomonas* spp., among others[8].

The transmission pathways linking wildlife, cultured fish, and bacterial pathogens are multifaceted and operate through several mechanisms. Direct predation, mechanical transmission through faecal contamination, and shared water resources connecting natural water bodies with aquaculture facilities which enable passive pathogen dispersal, thus creating epidemiological linkages across broader landscapes[9].

Vibrio species represent globally significant pathogens causing substantial economic losses and mortality across numerous cultured species. The bacteria cause vibriosis, a disease syndrome characterized by hemorrhagic septicemia, skin lesions that can result in acute mortality[10]. Various *Vibrio* species have been implicated in fish diseases, including *V. anguillarum*, *V. vulnificus*, *V. alginolyticus*, and *V. parahaemolyticus*, each exhibiting different host preferences, virulence factors, and environmental distributions[9]. Some researchers in Nigeria have recently identified multidrug-resistant *V. cholerae* and *V. mimicus* strains in aquatic environments and seafood products, a possibility for horizontal gene transfer of antimicrobial resistance determinants and zoonotic dissemination through the aquaculture value chain[11]. Similarly, *V. vulnificus* and *V. parahaemolyticus* cause serious infections in humans following consumption of contaminated seafood or exposure to contaminated water with fatal outcome on immunocompromised individuals[12].

Pseudomonas aeruginosa is an opportunistic pathogen frequently isolated from diseased fish exhibiting hemorrhagic septicemia, fin rot, ulcerative lesions, and systemic infections[13]. This organism possesses numerous virulence factors including extracellular enzymes, toxins, and biofilm-forming capabilities that enhance its pathogenicity and environmental persistence[13]. *Pseudomonas fluorescens*, while generally considered less virulent than *P. aeruginosa*, has also been associated with mortality events in various cultured fish species, particularly under conditions of environmental stress or immune suppression[14]. Experimental studies have documented that co-infections of *Vibrio* and *Pseudomonas* in African catfish (*Clarias gariepinus*), could increase pathogenicity and mortality compared to single-pathogen infections[15].

There is a widespread occurrence and transmission of bacterial pathogens at aquaculture-wildlife interfaces. It has been reported that there is co-presence of *Vibrio* and *Pseudomonas* species in tilapia and catfish farms via shared water systems, bird-contaminated ponds, and through wildlife vectors[12]. The role of aquatic insects and crustaceans as carriers of *Vibrio* and *Pseudomonas* in their digestive tracts has been increasingly recognized through microbiological surveys of aquaculture environments[16]. These invertebrates can harbor substantial bacterial loads while exhibiting no apparent disease, effectively functioning as asymptomatic reservoirs that maintain pathogen populations in aquaculture systems even in the absence of clinically diseased fish.

Despite accumulating evidence regarding wildlife-aquaculture disease interfaces globally, significant knowledge gaps persist regarding the specific epidemiology, transmission dynamics, and management implications of shared bacterial pathogens in Nigerian aquaculture systems. The prevalence of *Vibrio* and *Pseudomonas* species in both cultured fish and aquaculture-related wildlife within Nigerian production environments remains inadequately characterized. In addition, farmer awareness and knowledge regarding disease transmission risks associated with wildlife presence at aquaculture facilities appear limited based on anecdotal observations, potentially constraining the adoption of appropriate biosecurity measures. This study therefore, establishes fish farmers' awareness of pathogen transmission between aquaculture-related wildlife and cultured fish, including zoonotic transmission risk, investigates and provides evidence of shared gut pathogens, particularly *Vibrio* spp. and *Pseudomonas* spp., in cultured fish and aquaculture-related wildlife species in selected fish farms in Nigeria.

MATERIALS AND METHODS

Ethical consideration: Sample collection and laboratory analyses were conducted following the University of Ibadan's Research Ethics Committee (ACUREC) guidelines in Ibadan, Nigeria. Informed consent was duly obtained from the fish farmers before sampling, and there are no procedures in the study that are against animals/animal welfare.

This study was carried out from the months of September, 2023 to the end of March May, 2024. Well-structured and pre-tested questionnaires were administered by interviewers to 21 consenting fish farmers at different farm locations in Ibadan, Oyo State.

Sample collection was done at two aquaculture locations at Moniya, in the Akinyele local government area in Ibadan, where there was a large population of fish farmers. The cultured *Clarias gariepinus* (African Cat-fish) and the wild aquaculture-related species (birds and crabs) were gotten from two different pond locations. From the first location, the bird gotten was a striated heron *Butorides striata* (n = 1), *Clarias gariepinus* (n = 2). From the second location, Crabs were gotten (n = 7), *Clarias gariepinus* (n = 6).

Processing of sample fishes: Fish samples were brought to the Department of Veterinary Public Health and Preventive Medicine, University of Ibadan, Fish Laboratory. Fish were killed by pithing; a technique used to immobilize an animal, it involves inserting a needle or metal rod into its brain, then fishes were dissected, and the gut system was exposed. The gut was divided into the foregut, the midgut, and the hindgut systems. The foregut starts from the esophagus to the beginning of the small intestine after the duodenum. The midgut was the whole small intestine. The hind gut was taken from the beginning to the end of the large intestine. The gut sections were cut with a surgical blade and placed in 10 mL of distilled water. The gut parts were macerated with a sterile pestle and mortar. Aliquot solutions of macerated samples (2 mL) were pipetted into 18 mL of distilled water, giving 1:10 mL stock sample solution dilution. The stock solution was serially diluted up tom 10-5 as described by Mac Faddin[16]. The isolates were subjected to morphological and biochemical characterization as described Mac Faddin[16].

Preparation of agar media: All media (nutrient agar, MacConkey agar, and eosin methylene blue agar) were prepared following the manufacturer's instructions for bacterial isolation. Thereafter, they were autoclaved at 121°C for 30 min, glass wares were sterilized in the hot air oven for 30 min at 160°C. Agar preparation was made according to the procedure as earlier described by Olaogun *et al.*[17].

Biochemical tests: Biochemical tests carried were carried out according to procedures described by Mac Faddin[16] and Cappuccino and Sherman[18,19].

Statistical analysis: The results were analyzed using descriptive statistics.

Data was analysed using an online statistical tool, Social Science Statistics (2025). Results were presented using descriptive statistics. Biochemical test results between cultured fish and wildlife were compared using Pearson chi-square tests. The level of significance was taken as 5%.

RESULTS

Table 1 shows the results of 21 fish farmers interviewed. The majority of respondents were male (85.7%), predominantly in the 61 and above age category (38.1%), followed by the 41-50 age group (23.8%). Nearly all respondents (95.2%) had tertiary education, and most were married (90.5%). Table 2 shows that majority of respondents (71.4%) cultured catfish exclusively, with most having significant experience (71.4% with >10 years). While 71.4% had encountered aquaculture-related wildlife on their farms predominantly reptiles (monitor lizards, snakes, alligators) and birds knowledge gaps were evident. Only 47.6% were aware of shared pathogens between wildlife and cultured fish, and just 33.3% recognized potential zoonotic transmission to humans.

Vibrio species were successfully isolated and characterized from both aquaculture-related wildlife (n = 8) and cultured fish (n = 9). In Table 3 and 4 respectively. The universal positivity for catalase (100%) and oxidase (100%) tests in both groups confirms the aerobic nature of *Vibrio* species and validates the preliminary identification. The high prevalence of TCBS/PC agar positivity (94.1% in wildlife vs 77.8% in fish) was reported, while wildlife samples showed slightly higher rates of sucrose fermentation (82.4 vs 55.6%), the TSI test results reported (88.2% in wildlife vs 66.7% in fish) and carbohydrate fermentation patterns indicate metabolic versatility in both groups (Table 3 and 4).

Table 1: Demography of fish farmers (n = 21)

Variable	Category	Frequency (n)	Percentage
Sex	Male	18	85.7
	Female	3	14.3
Age (years)	20-30	1	4.8
	31-40	3	14.3
	41-50	5	23.8
	51-60	4	19.0
	61 and above	8	38.1
Education level	Secondary	1	4.8
	Tertiary	20	95.2
Marital status	Single	2	9.5
	Married	19	90.5

Table 2: Knowledge of disease risk transmission among fish farmers on aquaculture-related wildlife and pathogens (n = 21)

Variable	Type of fish farming	Frequency (n)	Percentage
Type of fish cultured	Catfish only	15	71.4
	Catfish+Tilapia	3	14.3
	Catfish+Hybrid+Tilapia	1	4.8
	Catfish+Common carp+Tilapia+Heterotis	1	4.8
	Catfish+Pangasius	1	4.8
Years of experience in fish farming	Less than 5 years	1	4.8
	5-10 years	5	23.8
	11-15 years	7	33.3
	Above 15 years	8	38.1
Experience with aquaculture-related wild animals	Yes	15	71.4
	No	6	28.6
Families of wild animals observed	Reptiles only	6	40.0*
	Avian only	2	13.3*
	Reptiles + Amphibians	1	6.7*
	Reptiles+Avian	1	6.7*
	Reptiles+Amphibians + Avian	5	33.3*
Common wildlife species	Snakes	9	60.0*
	Monitor lizards/Alligators/Crocodiles	10	66.7*
	Frogs/Toads	6	40.0*
	Birds (Kingfisher, Hawk, Egret, Heron)	8	53.3*
Awareness of shared pathogens	Yes	10	47.6
	No	11	52.4
Knowledge of pathogens treated	Yes (named specific pathogens)	9	42.9
	No/Not specified	12	57.1
Knowledge of zoonotic transmission	Yes	7	33.3
	No	14	66.7

*Percentage calculated based on those who experienced wildlife (n = 15)

Table 3: Number/percentage of *Vibrio* species from aquaculture-related wildlife based on biochemical tests (n = 8)

Biochemical tests	Aquaculture-related wildlife	Percentage
TCBS	7	94.1
Catalase	8	100
Oxidase	8	100
TSI	8	88.2
Indole	5	64.7
Glucose	6	82.5
Sucrose	6	82.4
Mannitol	5	76.5
Methylred	5	64.7

Table 4: Number/percentage of *Vibrio* species from cultured fish based on biochemical tests (n = 9)

Biochemical tests	Cultured fish	Percentage
PC Agar	7	77.8
Catalase	9	100
Oxidase	9	100
TSI	6	66.7
Indole	5	55.6
Glucose	7	77.8
Sucrose	5	55.6
Mannitol	7	77.8
Methyl red	5	55.6

In Table 5 and 6, *Pseudomonas* species were isolated from both aquaculture-related wildlife (n = 8) and cultured fish (n = 9), with 100% positivity for catalase and oxidase tests in both groups, a notable finding was the significantly higher mannitol fermentation rate in fish (77.8%) compared to wildlife (25.0%) (χ^2 = 7.35, $p<0.05$). Lower carbohydrate fermentation rates was reported in wildlife isolates (sucrose: 25.0%, glucose: 50.0%) compared to fish isolates (sucrose: 55.6%, glucose: 77.8%) The PC agar positivity was moderate in both groups (62.5% wildlife vs 77.8% fish), Table 5 and 6, confirming the presence of pyocyanin-producing strains.

Table 5: Number/percentage of *Pseudomonas* species from aquaculture related wildlife species based on biochemical tests (n = 8)

Biochemical tests	Cultured fish	Percentage
PC Agar	5	62.5
Catalase	8	100
Oxidase	8	100
TSI	3	37.5
Indole	4	50.0
Glucose	4	50.0
Sucrose	2	25.0
Mannitol	2	25.0
Methyl red	4	50.0

Table 6: Number/percentage of *Pseudomonas* species from cultured fish based on biochemical tests (n = 9)

Biochemical tests	Cultured fish	Percentage
PC Agar	7	77.8
Catalase	9	100
Oxidase	9	100
TSI	6	66.7
Indole	5	55.6
Glucose	7	77.8
Sucrose	5	55.6
Mannitol	7	77.8
Methyl red	5	55.6

DISCUSSION

Study reveals that fish farming in Ibadan, Nigeria is predominantly practiced by male farmers (85.7%) with tertiary education (95.2%), which aligns with findings from similar African aquaculture studies[20]. The high proportion of educated farmer's contrasts with observations by Adedeji and Okocha[21], who noted that despite growing education levels among Nigerian fish farmers, there remains insufficient teaching of fisheries and wildlife medicine in veterinary curricula, contributing to poor disease management. The dominance of catfish monoculture (71.4%) observed in this study is consistent with national trends, as Nigeria is currently the second-largest aquaculture producer in Africa, with African catfish (*Clarias gariepinus*) being the primary cultured species[22]. However, this heavy reliance on a single carnivorous species reduces sector resilience and increases vulnerability to pathogen outbreaks.

The substantial experience levels among farmers (71.4% with >10 years' experience) suggests established farming practices, yet paradoxically, our findings reveal significant knowledge gaps regarding disease transmission and biosecurity. This disconnect between experience and knowledge as observed in a recent Nigerian study by Alexander *et al.*[6], which reported 96.82% of catfish farms in Ogun and Delta States did not implement biosecurity procedures at stocking, highlighting systematic deficiencies in disease prevention practices despite years of operational experience.

The high prevalence of aquaculture-related wildlife encounters (71.4%) documented in this study, particularly reptiles (monitor lizards, snakes, crocodilians) and avian species (kingfisher, hawk, egret, heron), underscores the significant interface between wildlife and aquaculture systems. Peter and Neukirch[23] provided early evidence of herons (*Ardea cinerea*) transmitting fish pathogenic viruses, an indication that aquatic birds can serve as mechanical reservoirs for disease transmission. More recently, studies in Malaysian cage-cultured marine fish systems have confirmed that wild fish can transmit *Vibrio* species to cultured fish populations, with water serving as a natural transmission medium[24].

The detection of both *Vibrio* and *Pseudomonas* species in aquaculture-related wildlife at rates comparable to or exceeding those in cultured fish in our study provides compelling evidence for wildlife serving as pathogen reservoirs. This finding has significant implications for biosecurity, as wildlife can introduce or maintain pathogen populations in aquaculture systems through various pathways including fecal contamination, direct contact, and predation activities.

The successful isolation of *Vibrio* species from both wildlife (94.1% TCBS positivity) and cultured fish (77.8% PC agar positivity) with universal catalase and oxidase positivity confirms their widespread distribution in aquaculture environments. These findings are consistent with global patterns, as *Vibrio species* are among the most common and widespread disease-causing agents in aquaculture worldwide, playing a leading role in constraining sustainable sector growth[9].

The similar biochemical profiles between wildlife and fish isolates, with no statistically significant differences in most parameters, suggests shared *Vibrio* populations circulating between these groups. This observation aligns with findings from a recent study in mariculture from Brazil, which detected multiple *Vibrio* species (*V. alginolyticus*, *V. fluvialis*, *V. harveyi*) in both scallops and water samples, demonstrating environmental persistence and circulation of these pathogens[25]. The high sucrose fermentation rate in wildlife isolates (82.4%) compared to fish (55.6%), though not statistically significant, may indicate strain-level variations worthy of molecular characterization.

From a One Health perspective, *Vibrio species* pose dual threats to aquaculture productivity and public health. Recent reviews confirm that *Vibrio species* can spread between hosts through water, posing threats to both aquaculture operations and humans via zoonotic transmission[26]. In African contexts, *Vibrio* species have been associated with cholera outbreaks and foodborne illnesses, with detection in Georgian waters revealing ten pathogenic species including *V. cholerae* over a two-year surveillance period[27].

The isolation of *Pseudomonas* species from both wildlife (62.5% PC agar positivity) and cultured fish (77.8%) revealed a notable finding: significantly higher mannitol fermentation in fish isolates (77.8%) compared to wildlife (25.0%) (χ^2 = 7.35, $p<0.05$). This statistically significant difference suggests either distinct *Pseudomonas* species distribution or selective pressure in aquaculture environments favoring mannitol-fermenting strains.

Pseudomonas species, particularly *P. anguilliseptica* and *P. putida*, are recognized opportunistic pathogens affecting diverse fish species in marine and brackish water aquaculture globally[28]. The species has been isolated from both cultured and wild fish species, indicating its widespread environmental distribution. Recent studies identified *P. putida* and *P. monteilii* in Brazilian scallop tissues, with *P. putida* showing higher resistance to ciprofloxacin[28], raising concerns about antimicrobial resistance development in aquaculture-associated Pseudomonas populations.

The lower overall carbohydrate fermentation rates in wildlife Pseudomonas isolates (glucose: 50.0%, sucrose: 25.0%) compared to fish isolates (glucose: 77.8%, sucrose: 55.6%) may reflect ecological adaptation differences. *Pseudomonas* species in aquaculture environments may be under selective pressure from management practices including feeding regimes, water quality parameters, and intermittent antimicrobial use, potentially driving metabolic diversification.

In Nigerian aquaculture specifically, the challenge of Pseudomonas infections is compounded by poor disease management infrastructure. Adedeji and Okocha[21] noted that the shortage of skilled aquatic veterinarians and lack of fish disease diagnostic laboratories remain major limiting factors for aquaculture development in Nigeria. This shortcoming leads to poor antimicrobial stewardship, potentially contributing to the emergence of resistant Pseudomonas strains.

The alarming knowledge deficits revealed in this study with only 47.6% aware of shared pathogens and merely 33.3% recognizing zoonotic transmission potential represent significant public health concerns. These findings contrast sharply with recommendations from international experts who emphasize that individuals engaged in fish-related activities must be knowledgeable about zoonotic illnesses and prevention methods[29].

The principal bacterial pathogens acquired topically from fish include *Aeromonas hydrophila*, *Edwardsiella tarda*, *Mycobacterium marinum*, *Streptococcus iniae*, *Vibrio vulnificus*, and *V. damsela*[30]. While bacterial zoonosis from aquaculture often affects immunocompromised individuals and true zoonoses are relatively rare due to thermal incompatibility, the risk through topical exposure is greater than previously recognized[31].

In African contexts, a systematic review on antimicrobial use and resistance in African fish production found that most studies originated from Nigeria (37.1%), with *Clarias gariepinus* being heavily represented[32]. The study highlighted serious concerns about tetracycline and ampicillin resistance among aquaculture-associated pathogens. The low awareness documented in our study, combined with high antimicrobial use rates reported elsewhere (90% of Nigerian farmers using oxytetracycline, penicillin, and enrofloxacin according to Olatoye and Basiru[32], creates conditions conducive to antimicrobial resistance development and zoonotic disease transmission.

The widespread wildlife encounters (71.4%) coupled with poor biosecurity awareness suggests multiple pathogen introduction and maintenance pathways. A recent epidemiological study of Nigerian catfish farms found that 96.82% of farms did not implement biosecurity procedures at stocking, and farms restocking after initial stocking had significantly higher unusual mortality rates (42.86 vs. 9.39%)[33]. Furthermore, farms using solely homemade feed had 5.1 times greater odds of unusual mortality compared to commercial feed users, yet only 1.36% utilized veterinary services[34]. These observations align with broader African aquaculture challenges. Disease outbreaks, particularly in hatcheries, are significant challenges exacerbated by poor disease prevention practices, climate change impacts on water temperature, and inadequate infrastructure[23]. The Nigerian aquaculture sector's rapid growth (13.6% annually since 2000) has outpaced the development of adequate health management systems[23].

The presence of shared gut pathogens in wildlife and cultured fish highlights the interconnectedness of aquatic ecosystems and the importance of One Health approaches. Recent literature emphasizes that aquaculture systems involve complex interactions between host, pathogen, and environment, with environmental factors such as water quality, temperature, and salinity significantly influencing disease susceptibility[28].

Climate change impacts are particularly concerning for Nigerian aquaculture. Rising water temperatures can increase pathogen virulence, alter host immunity, and expand the geographic range of thermophilic pathogens like *Vibrio* species[23]. The presence of wildlife reservoirs may amplify these effects, as stressed wildlife populations can shed higher pathogen loads into aquaculture environments[35].

Moreover, aquaculture farms can carry antimicrobial resistance genes into surrounding water bodies, creating feedback loops where resistance spreads further into the environment effluents[36]. This has implications for wild aquatic life, biodiversity, and human health through recreational exposure and seafood consumption.

Comparing our findings with those of other African nations reveals common challenges. In Egypt, the continent’s largest aquaculture producer, parasites account for 80% of fish disease conditions, though bacterial infections also cause significant mortalities[35]. Egyptian tilapia farms experience infectious disease-related mortalities, particularly during summer months (June-October), resulting in approximately USD 100 million in annual economic losses.

Similar to Nigeria, many African aquaculture systems suffer from inadequate disease diagnostic capacity, limited access to quality veterinary services, and poor implementation of biosecurity measures. A One Health systematic review of freshwater fish in Africa found that between 2015 and 2022, focal points addressed antimicrobial resistance, parasites, and heavy metals, with most studies concentrated in Asia and Africa[12].

This study has several limitations that warrant consideration. The small sample sizes (n = 8 wildlife, n=9 fish) limit statistical power and generalizability. Biochemical identification alone cannot definitively identify organisms to species level; molecular confirmation using 16S rRNA sequencing or MALDI-TOF mass spectrometry would provide more definitive identification. The study did not assess antimicrobial susceptibility patterns, which would be valuable for understanding resistance profiles in these populations. This study provides important baseline data on shared gut pathogens between aquaculture-related wildlife and cultured fish in Ibadan, Nigeria. High prevalence of *Vibrio* and *Pseudomonas* species in both wildlife and cultured fish populations, lined substantial knowledge gaps among fish farmers regarding disease transmission and zoonotic risks and frequent wildlife-farm interactions providing multiple pathogen introduction pathways.

Findings from this study underscore the urgent need for integrated approaches to disease management in Nigerian aquaculture, recognizing the interconnected health of wildlife, fish, environment, and humans. Only through coordinated One Health strategies can the sector achieve sustainable growth while protecting both aquaculture productivity and public health.

CONCLUSION

This study provides critical evidence of shared gut pathogens between aquaculture-linked wildlife and cultured fish in Nigerian systems, with high *Vibrio* (94.1% wildlife, 77.8% fish) and *Pseudomonas* (62.5% wildlife, 77.8% fish) prevalence. Significant knowledge gaps exist among farmers, with only 47.6% aware of shared pathogens and 33.3% recognizing zoonotic risks, despite frequent wildlife encounters (71.4%). These findings underscore urgent biosecurity vulnerabilities requiring integrated One Health interventions incorporating farmer education, enhanced biosecurity protocols, and wildlife management strategies. Future research should employ molecular characterization to identify pathogen strains, assess antimicrobial resistance profiles, and evaluate biosecurity intervention effectiveness. Only through comprehensive approaches can Nigerian aquaculture achieve sustainable growth while safeguarding animal and public health.

SIGNIFICANCE STATEMENT

This study discovered the high prevalence of shared gut pathogens at the fish–wildlife interface in Nigerian aquaculture, which can be beneficial for improving disease surveillance, biosecurity planning, and farmer training programs. By integrating microbiological evidence with farmer awareness assessments, this study will help researchers to uncover the critical areas of pathogen spillover dynamics and knowledge gaps that many researchers were not able to explore. Thus, a new theory on One Health–driven aquaculture disease management may be arrived at.

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